AN INVESTIGATION OF THE RELATION BETWEEN WORK ON ASSIGNMENTS AND ACHIEVEMENT IN A GENERAL EDUCATION SCIENCE COURSE

By

Edward Vernon Perkins

A THESIS

Submitted to the School of Graduate Studies of Michigan State College of Agriculture and Applied Science in partial fulfillment of the requirements

for the degree of

DOCTOR OF EDUCATION

Department of Higher Education



AND ACHIEVEMENT IN A GENERAL EDUCATION SCIENCE COURSE

h

Manard Vernon Perkins

AN ABSTRAOT

Submitted to the School of Oraduate Studies of Michigan State College of Agriculture and Applied Science in partial fulfillment of the requirements

for the degree of

DOCTOR OF EDUCATION

Department of Higher Education

Approved Milosh Muntyan



Edward Vernon Perkins

AN INVESTIGATION OF THE RELATION DETWEEN WORK ON ASSIGNMENTS AND ACHIEVEMENT IN A GRENERAL EDUCATION SCIENCE COURSE

ADSTRACT

The problem of this investigation is the question: What is the relation between completion of homework assignments and subsequent achievement in a college science course? The attendant problems studied are: (1) an examination of the purported functions of homework assignments; (2) the development of a survey technique to obtain accurate data from students concerning homework performance; (3) the analysis of the survey data, by appropriate statistical methods, to determine the extent of the assumed correlative relation between work done on assignments and achievement; and, (4) the careful appraisal of the value of homework assignments in a typical classroom situation where scholastic growth is known to oscur.

The study consists of the survey of homework performance of 473 college science course students who kept a study log of assignments, work done, and work reported done during a full term of classes. Weekly questionnaires were used to elicit the data as to performance of the assignments. Data from the questionnaires and data concerning psychologic and reading test deciles, quartile rank in high school graduation class, and size of high school from which graduated, were transferred to

Idward Vernon Perkins

Hollerith correlations were computed botween the variables studied. under investigation appeared to be linear the Pearson product-manent for statistical computations. **31100** F relationshipe

ported; (3) amount of library readings reported read; (4) amount of of predictive value were found between achievement and (1) 910 reported at the college level and the results of the published reports relation to achievement is the only aspect of the problem ahown 20 performance in relation ings reported for the lower school levels. but none were high enough to have predictive value. between achievement and the psychological and reading tests decile ranks study hours per week reported. textbook reading reported; (2) amount of lecture syllabus size of high school from which graduated, revealed no consistent pattern - trudy relationships. contradictory. The data of this investigation correborate the findbeen reported for elementary and secondary school levels have 8 tudies the value of homework assignments to be negligible. decile ranks, quartile rank in high school graduation questions and problems reported done; and, (5) average number of of homework assignments in relation to achievement which to variables The highest correlations were obtained such as psychological and rending No correlative relationships Analysis of homewort which has been reading Study time amount of clase. 7 5

N

Edward Verbon Perkins

Ample evidence of scholastic growth in the subject matter field of the investigation was found but apparently the work done on the assignments is not closely related to the subsequent achievement in the course. The learning which takes place appears to eccur in the classroom itself and is apparently more related to psychological factors and reading ability than to the amount of work done on out-of-class assignments. This investigation did not show why the coursely assumed correlative relation between homework performance and achievement is not correborated.



ACKNOWLEDGMENTS

The writer wishes to express his thanks to the chairman of his Guidance Committee, Milosh Muntyan, Professor and Head of the Department of Higher Education, and to the other members, Cecil Millard, Acting Dean of the School of Education and Graduate Council representative, Clyde Campbell, Professor and Head of the Department of Educational Administration and Supervision, Walter Johnson, Associate Professor of Guidance and Counselor Training, and Chester Lawson, Professor and Head of the Department of Natural Science. Special indebtedness to Professor Lawson for kind guidance and valuable help is gratefully acknowledged.

The cooperation of Professors Miriam S. Lucas and Marvin D. Solomon, and of James M. Elliott, Instructor, all of the Department of Natural Science, is appreciated. The investigator extends his thanks to the following members of Michigan State College who also rendered assistance: John N. Moore, Department of Natural Science, Mr. Leisenring, Mr. Stoutenberg, and Mr. Benley of Records, Registration and Admissions offices, Mr. Martin and Miss Teachner of the Tabulating office.

The author wishes to express his sincere gratitude to Dr. George Hilliard, Professor of Education, Western Michigan College of Education, under whose inspiration and continual encouragement, the author continued his advanced education, and to whom the study is dedicated.

The financial support of the Michigan State College All College Research Fund, which made the completion of the study possible, is deeply appreciated.

Edward Vernon Perkins

candidate for the degree of

Doctor of Education

VITA

Final Examination: March 9, 1953, 8-10 a.m., 202A Morrill Hall.

Thesis: An Investigation of the Relation between Work on Assignments and Achievement in a General Education Science Course.

Outline of Studies:

Major subject -- Higher Education

Cognate field--Biological Science

Biographical Items:

Born: December 16, 1917.

- Undergraduate Studies: Albion College, 1936-1939; Western Michigan College of Education, 1939-1941.
- Graduate Studies: University of Michigan, 1946-1947, Master of Arts in Education, University of Michigan, 1947; Michigan State College, 1948-1953.
- Experience: Teaching principal, Pinnebog High School, Pinnebog, Michigan, 1941; Classification Interviewer and Classification Section Chief, Personnel Technician, Chemical Warfare Services Headquarters, 1942-43; Control Tower Operator, U. S. Army Air Forces, 1943-1945; Instructor, Michigan State College department of Biological Science, 1947--.
- Member of: American Association for the Advancement of Science; Michigan Academy of Science Arts and Letters; American Association of University Professors.

TABLE OF CONTENTS

ACKNOWL	EDGMENTS	11
VITA .	• • • • • • • • • • • • • • • • • • • •	111
CHAPTER	I. INTRODUCTION	
A.	The Problem	
	Statement of the problem Importance of the problem	1 2
B .	Definition of Terms	
	Homework assignment	7 8 8
c.	Plan of the Study	9
D.	Limitations of the Study	9
E.	Organization of the Remainder of the Dissertation	10
CHAPTER	II. REVIEW OF THE LITERATURE	
A.	Purported Functions of Homework Assignments	12
B.	The Questionnaire as a Survey Method in Education	13
c.	The Study Log and Diary as a Survey Method in Education	18
D.	Related Studies at the College Level	19
E.	Summary	23
CHAPTER	III. THE METHODS OF INVESTIGATION OF THE PROBLEM	
A.	The Population	25
В	Official Sources of Data	
	Records, Registration and Admissions offices Biological Science departmental records Board of Examiners	25 26 27

с.	The Pilot Studies and the Development of the Log- Questionnaire Survey Method	
	Pilot questionnaire and method Pilot questionnaire findings Trial revisions of the pilot questionnaire method	28 29 31
D.	The Construction of the Study Log and Questionnaire	
	Construction of the Study Log	33 33
E.	The Administration of the Study Log and Questionnaire to the Population.	
	Administration of the Study Log	34 35
F.	Methods of Analysis of the Data	
	Mechanical tabulation Clerical and tabulation procedures Statistical computation	38 39 43
G.	Some Limitations of the Method of Investigation	
	Limitations of the questionnaire data Minimizing errors attributable to memory Correlation coefficients from re-take data Interpretations from simple correlations	44 45 46 50
ĪV	. PRESENTATION AND ANALYSIS OF THE DATA	
Α.	Data and Statistical Inferences	52
в.	Summary of Statistical Inferences	72
c.	Homework Performance of the Mean Student of the Investigation	79
D.	Scholastic Growth of the Population	81

▼.

- V. SUMMARY OF FINDINGS, EDUCATIONAL IMPLICATIONS, AND LIMITATIONS OF THE FINDINGS, WITH SUGGESTIONS FOR FURTHER STUDY
 - A. Summary of Findings

Homework assignments in the investigation Homework performance in the investigation Relation of the amount of homework reported done	86 87
and achievement	88
Analysis of achievement	39
Counseling of students about homework	90
Scholastic growth and homework performance	91
B. Educational Implications of the Investigation	91
C. Limitations of the Findings with Suggestions for Further Study	93
APPENDIX I. TABLE	102
APPENDIX II. LOG-QUESTIONNAIRE MATERIALS	108
APPENDIX III. CLERICAL AND TABULATION MATERIALS	113
BIBLIOGRAPHY	117

LIST OF TABLES

р		
<u> </u>	<u>ago</u>	

Table I.	Pilot Study Data from 226 Students Reporting on the Questionnaires	30
II.	Data for Calculation and the Calculated Simple Correlation of the Questionnaire Items from Original and Written Re-Take	4 8
III.	Data for Calculation and the Calculated Simple Cor- relations of the Questionnaire Items from Original and Oral Re-Take	49
I V.	Data for Calculation of Simple Correlations of Home- work Performance with Term Grades	54
۷.	Data for Calculation of Simple Correlations Between Term Grades, Certain Indices of General College Abil- ity (Cooperative Test of Reading Comprehension Decile Rank, American Council Psychological Examination Q, L, and Total Score Decile Ranks), and Class of High School from which Graduated	55
VI.	Data for Calculation of Simple Correlations of Home- work Performance with Comprehensive Examination Grades	61
VII.	Data for Calculation of Simple Correlations Between Comprehensive Examination Grades and Cooperative Test of Reading Comprehension Decile Rank, American Gouncil Psychological Examination Q, L, and Total Score Decile Rank, and Class of High School from which Graduated	62
VIII.	Data for Calculation of Simple Correlations of Homework Performance with Decile Rank as Determined by the Cooperative Test of Reading Comprehension Scores	64
IX.	Data for Calculation of Simple Correlations of Homework Performance with Decile Rank as Determined by American Council Psychological Examination Q Score	65
X.	Data for Calculation of Simple Correlations of Homework Performance with Decile Rank as Determined by the American Council Psychological Examination L Score	66

Table	XI.	Data for Calculation of Simple Correlations of Homework Performance and the American Council Psychological Examination Total Score Decile Rank	67
	XII.	Data for Calculation of Simple Correlations of Homework Performance with Quartile Rank in High School Graduation Class	68
	XIII.	Data for Calculation of Simple Correlation of Homework Performance with Class of High School from which Graduated	69
	XIV.	Summary of Correlation Coefficients Computed for the Analysis of Achievement	73
	xv.	Summary of Correlation Coefficients Computed for the Analysis of Homework Performance	74
	XVI.	Intercorrelations of Homework Performance	78
	XVII.	Grade Equivalents of Scores Made by Students on a Biological Science Pre-Test and on Comprehensive Examination	82
	XVIII.	Measures of Central Tendency and Dispersion of Pre-Test Scores of Entering Freshmen and Scores of a group of Students on the Same Test after Com- pleting the Course	85
	XIX.	Distribution of Term Grades and Homework Performance for the 28 Respondents in the American Council Psy- chological Examination Tenth Decile Group	97
	XX.	Distribution of Term Grades and Homework Performance for the 30 Respondents in the American Council Psy- chological Examination First Decile Group	98
	XXI.	Distribution of Term Grades and American Council Psychological Examination Deciles of a Random Sample of 178 of the Respondents According to the	•
THE OFF		Number of Hours Fer Week of Study	99
- 프 그 (순나)는	10-1 <u>-</u> 11'04	Α ΜΕΡΠ ΑΙΊΟΡΝΕ ΟΙ ΤΟΡ ΙΝΎΡΟΙΖΟΝΕΙΛΟ.	- X()



CHAPTER I

INTRODUCTION

A. THE PROBLEM

Statement of the problem. The problem of this investigation is the question: What is the relation between completion of reading and problem assignments which instructors give to students to be done outside of class and the subsequent achievement in a college science course?

Teachers, students, administrators, and parents have accepted the prevalence of the assignment of work to be done outside of class, in American schools and colleges. Teachers and institutions which have not incorporated the assignment of outside reading and problems as a regular teaching method have been exceptions to such an extent that anonymity or notoriety have accompanied such a deviation from the usual procedure. Teachers have employed this device as if the positive correlative relationship between performance of such outside work and subsequent achievement in the course were a foregone conclusion. A widely practiced teaching method, based on such an assumption, should be subjected to investigation to discover the values and limitations of the method in educational institutions.

The problem has been delimited in this study to the investigation of the relation between the amount of the assigned outside work the students do for a given college science course and their subsequent achievement in that course. The design of the study includes the following: (1) the examination of the purported functions of outside assignments in educational



methodology; (2) the survey of the literature related to the problem; (3) the development of a survey technique and its use with students in a college classroom situation to obtain data as to the amount of work done on outside assignments; (4) the analysis of the survey data, by appropriate statistical methods, to determine the extent of the quantitative relation between performance on the outside assignments and subsequent achievement in the course as indicated by grades or marks; and, (5) the limitations of the investigation, along with recommendations for further study of the problem.

Importance of the quantitative investigation of the homework assignment performance in relation to achievement. Homework has been assigned by so many teachers in so many teaching situations for so many years that no one appears to question very seriously the contribution of homework to achievement. Teachers in the typical classroom situation apparently make homework assignments with the expectation that the students will carry them out. One assumption, inherent but seldom uttered, is that the amount of performance of the homework makes a positive and significant contribution to the subsequent achievement of the students. The assignment of homework seems to be accepted as one of the methods for bringing about learning on the part of students.

Published investigations have disclosed no evidence to indicate the extent to which students do the assigned homework. The assignment of homework has not been questioned seriously by many authors of educational methods textbooks. These authors have customarily devoted space to a discussion of assignments and have given more than casual emphasis to





it. Even those teachers and authors who stressed the importance of homework for student learning have failed to produce evidence which substantiates the quantitative assumptions underlying the assignments.

Woodring, in a general discussion of assignments, says:

Of all the responsibilities which the teacher must face, the assignment is the most important. It is the pivot of successful teaching.... With the assignment she sets the stage for action and controls the amount and kind of pupil activity. It is the crux of the study problem. The amount of time spent in study and the quality of the preparation will be conditioned by the kind of assignment given.¹

Woodring's statement in support of the assignment as an important activity of the teacher does not include any substantiation of the claim. Such statements presume that the pupil activity produced as a result of the assignment makes a significant contribution to student learning.

A similar discussion of assignments by Yoakum describes certain attributes which would seem to make the assignment indispensible to any learning situation. It states, in part:

The assignment is still fundamental.--Assignment of lessons is still fundamental in teaching. The practice of assignment, at least as to theory, is changing very rapidly, but fundamental principles of value still remain. The assignment is important because it is the vital activity in the pursuit of learning, it provides an opportunity for creating mental set, it includes the appraisal of knowledge, it makes necessary knowledge concerning organized procedures in teaching and learning, it requires a consideration of individual differences, it necessitates plans for socialized living and learning.²

¹M. N. Woodring and C. W. Fleming, "Directing Study Through the Assignment," <u>Teachers College Record</u>, 33:673, May, 1932.

²G. A. Yoakum, The Improvement of the Assignment (New York: The Macmillan Company, 1932), p. 4.

While Yoakum gives recognition to desirable characteristics of assignments, a lengthy discussion is included without reference to any study which reports evidence in support of the stated contentions.

Some arguments offered for the assignment method are: to assure that students will go in the desired direction, and to make a course more challenging. Such arguments, bearing the mark of a typical homework assignment, are suggested by Luella Cole:

Assignments are the student's sailing directions. If they are confused or boresome, he either will not know where he is supposed to go or will not care whether or not he ever gets there. Although not every assignment needs to be original-after all a teacher is only human and cannot be expected to have inspirations daily---a dash of ingenuity and novelty in assignments adds greatly to the value. It is the consensus of opinion that the progress of students in a course bears direct relation to the degree of challenge in the work required of them.³

The discussions of assignments offered by Woodring and Fleming, Yoakum, and Cole omit one very important consideration. For, even if the assumption were that assignments could possibly accomplish the outcomes stated, evidence is still lacking in the discussions to indicate that the amount of the assignments performed makes a significant contribution to achievement in the course. An example of the reasoning of an authority on college teaching is that of Cole in the statement, "The value that students derive from a course is usually in direct ratio to the kind of work they are asked to do. On the college level there has been almost no research in this matter, probably because supervisors





³Luella Cole, <u>The Background for College Teaching</u> (New York: Farrar and Rinehart, Inc., 1940), p. 368.

do not walk into college classes and listen....⁴ The lack of research concerning assignments and outcomes indicates one reason for the study of a teaching method which is so nearly universal in American schools and colleges.

The writer's survey of fifty educational methods textbooks indicates that teacher training institutions apparently continue to include the assignment of homework as a suggested teaching method. The analysis of the fifty educational methods textbooks listed in the Table in Appendix I, reveals that while 21,433 pages in these texts are devoted to the various aspects of teaching, only 1,079, or five per cent of the pages were listed in the indexes under "assignments." Apparently the authors of these books felt that assignments were essential enough to include some mention of them in a methods textbook, but, with the exception of the two who wrote complete volumes on the subject of assignments, these authors devoted only a very small percentage (five per cent) of the pages to the enlightenment of students of teaching methods concerning assignments. Most of the discussions of assignments in these texts deal with the "how" of assignments but do not mention "why" assignments are essential, "why" one assignment is more effective than another, or "what" the assignment actually accomplishes for the student. The complete omission of substantiating evidence for homework assignments to which these authors commit themselves is most unfortunate because no basis is provided for judging the values and limitations of homework assignments and the expected outcomes. This lack of evidence points up the importance of an investigation of homework assignment performance in relation to achievement.

Ibid., p. 362.



Any investigation of the assignment of homework as a teaching method should attempt to evaluate the method by examining the results of the method as indicated by student achievement. The literature found relative to homework assignments, performance on homework, and achievement, reported no investigations, at the college level, of the assumed "cause-effect" relationships between the amount of homework performance and the subsequent achievement by students as indicated by marks or grades.

The need for an investigation of the relation between performance on homework assignments and achievement is indicated also by the counseling functions where a diagnosis of student achievement in relation to performance of homework is attempted frequently. The counseling of students concerning modification of performance of homework assignments in anticipation of improved scholastic performance is frequently attempted by teachers and counselors who assume laggardliness to be the cause of deficient scholarship. The assumption is expressed in the advice that "There's no reason why you can't do better if you'll just work harder and longer." While laggardliness may be one of the causes of poor achievement in individual cases, there are no studies which show that it is the most frequent or most consistent cause of poor achievement in schools and colleges. An investigation of the relation between performance of homework assignments and achievement is necessary before the counseling of students for the modification of homework performance can become consistently effective and reliable.

Improvement of instructional methods may be aided by a careful evaluation of relations between achievement and various factors of classroom activities. These might include the students' reading and psychological aptitudes, quartile rank in high school graduation class, academic growth in subject-matter courses, and the size of high school from which the student graduated.

The importance of an investigation of homework performance in relation to achievement in American schools and colleges is derived from (1) the lack of evidence to corroborate the assumed high and positive relationship between the amount of performance on homework and subsequent achievement as indicated by grades or marks; (2) the prevalent practice of the assignment of homework, as usually propounded by some educational textbook authors with no pretense of substantiation; (3) the inadequacy of evidence upon which to base counsel of students to modify their study habits in anticipation of more performance of homework and consequent improved scholastic achievement; and, (4) the continuous study of educational practices to aid the improvement of instruction.

B. DEFINITIONS OF TERMS

Homework assignment. The word "assignment" has been used to describe almost everything that students do or are expected to do to en-5 hance learning. The meaning of homework assignment in this study is

⁵A description of assignments may be found in W. S. Monroe, ed., <u>Encyclopedia of Educational Research</u> (New York: The Macmillan Company, 1950), p. 749.

limited to any and all matters within the course to which the instructor dictates the students shall direct their attention outside of class.

<u>Homework performance</u>. Performance of homework assignments in this study has been defined as including only certain activities outside of class which the participating students actually reported on weekly questionnaires in class. The reports of reading assignments completed and the number of assigned problems completed, together with the number of hours spent doing homework, have been utilized as the indices of homework performance.

Achievement. Regardless of the faults, limitations, and errors often attributed to marks or grades as indicators of scholastic achievement, grades and marks are used commonly in the schools and colleges of America. The local variations of the letter systems and the associated numerical point systems are numerous but in all cases the marks and grades are used for extra-curricular activity qualification, scholastic recognition, and promotion. The scholastic grade or mark, together with the homework assignment, are the trademarks of the classroom methods of today's schools and colleges. Inherent in such methods is the assumption that the grade or mark given to a student is a reasonable indication of his achievement.

g

C. THE PLAN OF THE STUDY

The plan of the study involved, essentially, a survey method of research. Students in four lecture sections of a Biological Science course were surveyed by a questionnaire method to obtain data as to the percentage of the out-of-class reading and problem assignments they completed. Psychological and reading test score deciles, quartile rank in high school graduation class, and the class of high school from which graduated, were recorded for each questionnaire respondent. Simple correlations were computed between the variables of homework performance reported, achievement, and various indices of general college ability. Statistical inferences were drawn from the correlation data computed for the analysis of achievement in this study.

The findings of the study permitted a partial answer to the question being investigated, within the limitations of the survey method used to obtain the data.

D. LIMITATIONS OF THE STUDY

The findings of this study were based upon, and stated within the limitations of, the assumed validity of the data obtained from the questionnaire method.

The quantitative nature of the questionnaire data used in this study did not permit analysis of the quality of the homework performance.

The statistical inferences drawn from the study did not permit conclusions as to why the relationships between the variables studied did or did not appear. Neither did the data indicate which of the variables studied contributed most to the students' achievement in the course.

E. ORGANIZATION OF THE REMAINDER OF THE DISSERTATION

Chapter II is the presentation of the review of the literature related to the historical and current status of the investigation of the assumed relation between the amount of homework done and scholastic achievement.

In Chapter III the methods of investigating the problem are described in detail including (A) the population; (B) official sources of date; (C) the pilot studies and the development of the log-questionnaire survey method; (D) the construction of the study log and questionnaire us i in the study; (E) the administration of the study log and questionnaire to the population; (F) methods of analysis of the data; and, (G) some limitations of the method of investigation.



The presentation and analysis of the data are reported in Chapter IV in four parts: (A) data and statistical inferences; (B) summary of statistical inferences; (C) the mean student in the investigation; and, (D) the scholastic growth of the population.

The summary of findings, educational implications from the study, and the limitations of the findings with suggestions for further study, are to be found in Chapter V.

CHAPTER II

REVIEW OF THE LITERATURE

A. PURPORTED FUNCTIONS OF HOMEWORK ASSIGNMENTS

One generally accepted definition of homework assignment "is siml ply the laying out of a task and procedure for mental work." The assignment of tasks to be done outside of the classroom is a prevalent technique of teaching at the college level. Noting the dearth of objective data to support what has been termed a unanimous belief of educational methods authors in the value of homework assignments, Bossing submitted what was purported to be corroborative evidence of the essential significance of homework assignments. What was termed an "unbroken emphasis" upon the assignment of homework consisted of only five references in support of the contention of "essential significance" which were published over a period of twenty-one years. Bossing offered no explanation as to why homework assignments had not been subjected to more careful scrutiny.

The published studies of the assignment of homework which were read have revealed no experimental evidence in support of this teaching method in relation to academic achievement. Aside from the contradictory findings relative to the amount of study time spent by college students and the resulting achievement no evidence was found from which a positive correlative relationship between the amount of performance of



¹Nelson L. Bossing, <u>Progressive Methods of Teaching in Secondary</u> <u>Schools</u> (Boston: Houghton Mifflin Company, 1942), pp. 270-271.

homework assignments and achievement in college could be determined or even inferred.

B. THE QUESTIONNAIRE AS A SURVEY METHOD IN EDUCATION

Considerable precedent exists for the use of carefully designed and administered questionnaires as an historical method of research. Davis and Barrow, after analyzing the application of questionnaires to educational research, concluded that "The questionnaire will probably always be one of the chief means of gathering data on certain problems in education in spite of the fact that its critics increase year by ? year."

Support of the questionnaire as a research tool is found in Kelley's writings about questionnaires in the function of the scientific method in research and education:

Instead of a single scientific method there are no less than four methods of research. The most pervasive is that of dialectic or logic. It finds its finest expression in human life in the wonderful pronouncements of pure mathematics...

Second in definiteness and rigor is the experimental method; third, the historica : and last, the method of future estimation....

If facts of a unique nature known only to specific individuals are desired, then an oral or written questionnaire addressed to the one person knowing these facts...is surely the only method of approach. It is in fact an historical method.³

²Robert Davis and Edwin L. Barrow, "A Critical Study of the Questionnaire in Education," <u>Educational Administration and Supervision</u>, 21:144, February, 1935.

³T. L. Kelley, <u>Scientific Method:</u> <u>Its Function in Research and Ed-</u> <u>ucation</u> (Columbus: The Ohio State University Press, 1929), pp. 12, 48.

The questionnairs method of gathering data pertinent to performance of homework assignments is the only method found in the literature. Direct observation of the study habits of students could provide data under some circumstances, but since techniques for such direct observation of study habits have not been published, the questionnaire must be resorted to for the acquisition of the dataabout performance of homework known only to the students. The literature provided several criteria for the construction and administration of questionnaires which would enable the researcher to secure useable data. The researcher should assure himself that (1) he cannot collect the data except through the questionnaire, and, 4

Norton concluded, after a comprehensive survey and study of the questionnaire movement, in part, that "...this method of investigation, in spite of its abuse, has yielded far more on the credit than on the 5 debit side of educational advance."

A more constructive suggestion was made in a list of the criteria of a good questionnaire:

- 1. It should be within the comprehension of those who are to answer it.
- 2. It should demand a minimal amount of writing.
- 3. It should be directed primarily to matters of ascertainable fact and less often to matters of opinion.

⁴B. R. Buckingham, "The Questionnaire," Journal of Educational Research, 14:54-58, June, 1926.

⁵J. K. Norton, "The Questionnaire," <u>Research Bulletin of the Nation-</u> al <u>Education Association</u>, Vol. VIII, No. 1, January, 1930. p. 8.

- 4. It should elicit unequivocal replies, especially if these are later to be subjected to statistical treatment.
- 5. It should deal with matters that are worth investigating and that will seem to the recipients to be worth investigating.
- 6. Though demanding only brief replies, it should stimulate supplementary communications from the recipients.
- 7. It should promise the respondent a copy of the published results.

The researcher will find it useful to be well informed about the criticisms which are commonly made of the questionnaire method in order to provide, as far as possible, the means by which such criticisms may be minimized. Three principal criticisms were reported by Symonds as a result of a review of the methods that had been reported for surveying and inventorying student study practices:

- 1. Pupils are not trained observors of their own acts.
- 2. The questions are apt to be suggestive.
- 3. Pupils may definitely mislead.

Symonds claimed that the other methods which should yield more reliable 8 data are: (1) direct observation and (?) testing. No precedent or suggested method for utilizing these more desirable methods of investigation was found in the literature, however.

⁸Loc. cit.

⁶G. M. Whipple, "The Improvement of Educational Research," <u>School</u> and <u>Society</u>, 26:253, August, 1927.

Percival M. Symonds, "Methods of Investigation of Study Habits," School and Society, 24:152, July 31, 1926.

Another type of criticism frequently made of questionnaires was reported by Hubbard:

Stoke and Lehman concluded that the questionnaire is peculiarly vulnerable when employed for collection of personal information or when used with subjects who see (or imagine they see) an opportunity to advance their personal interests by means of the returns made by them.... Students in seven classes in college psychology were asked to report the number of times they had taken books from the reserve desk for assigned work. It was possible to check the replies at the library desk. It was found that seven in eight students overestimated the number of check-outs. Students of A and B scholarship exaggerated the least; C and D students the most?

From this data Stoke and Lehman drew the conclusion that, with regard to questionnaire reports, one could not rely upon the statements of students as to the amount of time given to study. It is not difficult to see why the investigators might make such an inference. But to state such a conclusion seems unreasonable since the study reportedly dealt with the frequency of library book check-cuts and not the amount of time studied. Whether or not proper rapport had been established during the investigation was not reported; this factor alone could account for the apparent bias of the students' reports. The investigators actually reported little basis for placing the blame for the bias upon the questionnaire instead of upon some other variables in the study.

Apparently, the validity of the data which may be obtained by questionnaires has been enhanced when factual and objective responses were elicited. Monroe noted a study by Bain which "revealed that the

⁹F. W. Hubbard, "Questionnaires," <u>Review of Educational Research</u>, 9:504, December, 1939.

more objective the fact investigated and the more within the individual's 10 first-hand experience the more dependable the information."

A simple-recall questionnaire was used by Smith for a study in which the memory factor could have accounted for some of the overstatement which was observed. The validity of responses involving judgmental and opinion responses generally seemed to be less than the validity of the factual responses. Even the factual responses involving personal accomplishments seemed to be somewhat colored by overstatement, however.

Another evaluation of the questionnaire method may be obtained by observing the consistency with which the data is elicited. Gerberich, in relating the findings of an investigation of the consistency of questionnaire responses, observed a consistency of 76 per cent for oneday intervals, 74 per cent for ten-day intervals, and the per cent of l2 consistency of women to be slightly higher than that of the men observed. Similar findings of consistency of responses were published by Cavan after submitting the questionnaires to 123 grade school pupils at an interval of one week in which complete agreement on 87 per cent of the questions was found, with the factual questions about self evoking

10w. S. Monroe, ed., <u>Encyclopedia of Educational Research</u> (New York: The Macmillan Company, 1950), p. 950.

¹¹Francis F. Smith, "The Direct Validation of Questionnaire Data," <u>Educational Administration and Supervision</u>, 21:575, November, 1935.

¹²J. B. Gerberich, "A Study of the Consistency of Informant Responses to Questions in a Questionnaire," <u>Journal of Educational Psy-</u> <u>chology</u>, 38:303, May, 1947.

87 per cent agreement, and 78 per cent agreement was found on the ques-13 tions involving attitudes toward self.

C. THE STUDY LOG AND DIARY AS A SURVEY METHOD IN EDUCATION The collection of data for the analysis of students' study performance on homework assignments by using a study log or diary was found to have precedent. Ryans computed study ratios from study logs obtained by requiring each student in the investigation to keep for one full week an all-inclusive record of the time devoted to studying for college courses. Mimeographed record blanks carrying the necessary instructions for their use printed on them were distributed and collected 14 in order to facilitate the task.

In a similar study Williamson modeled a record form after the North-15 western time sheet prepared by L. B. Hopkins. Freshmen in college recordcd for one week the actual distribution of their time by using a record form on which all of their various activities and the amount of time devoted to each could be written.

¹³Ruth S. Cavan, "The Questionnaire in a Sociological Research Project," <u>American Journal of Sociology</u>, 38:725, March, 1933.

14 D. G. Ryans, "Some Observations Concerning the Relationship of Time Spent at Study to Scholarship and other Factors," <u>Journal of Educa-</u> tional Psychology, 30:372-377, May, 1939.

¹⁵ E. G. Williamson, "The Relationship of Number of Hours of Study to Scholarship," Journal of Educational Psychology, 26:682-688, December, 1935.

Crawford collected data regarding the actual distribution of the students' time by having Yale undergraduates record what they did for 16 one full week of school.

A variation of the study log or diary was afforded by May in educational psychology classes when students were asked to estimate the number of hours per week that were given to study. The reports were made at the beginning and again at the middle of the first semester of college. The coefficient of reliability was then computed between the two series of reports as 0.86. It was possible to infer from this coefficient that the estimates may be reliable but no other validity es-17timate was reported.

D. RELATED STUDIES AT THE COLLEGE LEVEL

Williamson reported the results of a study at the University of Minnesota as being definite enough to warrant the counseling of stu-18 dents for certain study habit deficiencies. Two methods of studying the relation of the number of hours studied to resulting achievement were reported in the above study. In one method, the average number of hours of study per week by the upper, middle, and lower third levels of scholastic ability according to intelligence were computed. A decrease in the number of hours of study with an increase in level of academic intelligence was reported with this method by Jones and Ruch, according

¹⁶A. B. Crawford, <u>Incentives to Study: A Survey of Student Opinion</u> (New Haven: Yale University Press, 1929), p. 17.

¹⁷M. A. May, "Predicting Academic Success," Journal of Educational Psychology, 14:429-440, September, 1923.

¹⁸ Williamson, op. cit., pp. 682-688.

to Williamson. Jones and Ruch also reported that an increase in the number of hours of study is accompanied by a decrease in scholarship. Williamson concluded that if we assume the study records are valid, it seems that for students of inferior mentality to study more hours each week does not compensate for their handicap of lower mental capacity.

Coefficients of correlations were computed in the other principal method of determining the relationship between hours of study and achievement. Three extensive studies of this type reported by Williamson justified the conclusion that beyond a minimum number of hours of study, which will vary with each student, the hours a student studied has less significance than his academic intelligence in relation to achievement. More hours of study will be needed by students of low ability but an increase in the number of hours of study will not necessarily bring about higher scholarship. Williamson concluded:

Experience in counseling students leads one to conclude that a minimum of eighteen to twenty hours and a maximum of thirty to thirty-five hours of study a week should permit students to get the grades that their academic aptitude makes possible.

Monroe, after reviewing the work reported by Woodring and Fleming, concluded in part, "It is interesting to note that under the prevailing conditions of instruction not many differences appeared in the habits of study and methods of work of bright and dull pupils." It was also reported that students who achieve better grades do not necessarily have

19 Loc. cit.

the study habits often attributed to good students; apparently there is no pattern or set of study habits which are invariably associated with 20 academic success or failure.

The various studies of the relation between the amount of time spent doing homework and achievement, in institutions of high education, have been of a very limited nature. "Investigations of the actual study habits show conclusively that the amount of time spent on a course outside the classroom averages hardly more than the number of class hours," 21 according to Ewer. This amount of time would be considered inadequate for achievement to the upper limits of students' capacities as indicated by the results of some of the investigations.

Wade, after observing the time spent by first-year college students in study and comparing the study time with that expected by teachers in a state normal school, reported the study time to average slightly more for 22 than one hour, each one-hour recitation period. Neither Ewer nor Wade contributed any evidence to substantiate the assumption that the amount of time used for study has a positive correlative relation with the achievement with which the study time is usually associated.

²⁰ Monroe, op. cit., p. 321.

²¹B. C. Ewer, <u>College</u> <u>Study</u> and <u>College</u> <u>Life</u> (Boston: Richard G. Badger, 1917), p. 81.

²²N. A. Wade, "Comparison of the Time Spent by First-Year Students and Expected by Teachers in a State Normal School," <u>Journal of Education-</u> <u>al Research</u>, 19:183-187, March, 1929.

The lengthiest series of observations of study time and scholarship was reported by Ryans. In the study of the problem, Ryans had students report the amount of time spent on study for all of their college classes during one full week and the study time on a limited assign-The reports were correlated with achievement as ment was also reported. indicated by the course grades of the students making the reports. Each of the two variables correlated positively with achievement but neither showed apparent relationship with intelligence test scores. Ryans inforred that "The present study verifies the work of at least one previous investigator in noting study time to be a significant factor in the earning of grades. Other attempts to clarify this problem by Crawford, Jones and Ruch, sometimes have resulted in contrary findings." The conclusions drawn by Ryans from the reported series of observations were, in part, that:

As judged from the statistical treatment of available data time spent at study, while, in general, unrelated to intelligence, is an important factor in determining the success or failure of a student in his academic endeavors.²³

Unfortunately the reported attempts to analyze achievement in terms of study time have not provided data from which the extent of the contribution of students' study time to subsequent achievement can be ascertained. Although one may infer from such studies that the amount of time studied is an important factor, the predictive value of the knowledge of the amount of study time is not known.

²³Ryans, op. cit., p. 376.

E. SUMMARY

Ample precedent was discovered for using the questionnaire and study log or diary as instruments of historical research providing that certain criteria are met by the instruments and method of administration, and that the conclusions drawn from the questionnaire data take into adequate consideration the known limitations of the method. The literature indicated a definite need for more thorough-going means of application of the questionnaire method in obtaining data to assure more reliable results. Although direct observation, experimentation, and measurement are still preferred as methods of research, the questionnaire remains as the only instrument which will elicit certain data required for certain aspects of educational research.

Most of the studies of homework assignments have been reported from elementary and secondary school observations. "The gist of the research evidence is none too favorable to assigned homework," accord-24 ing to Monroe. The conclusions reported from the studies are:

(a) there is a very small relationship between the amount of time spent in home study and pupil progress; (b) homework is not significantly related to achievement as measured by teachers' marks or standardized tests; (c) homework at the elementary-school level has a positive relationship to success in high school; (d) voluntary homework has about as many values as compulsory homework; (e) the benefits of assigned homework are too small to counter-balance the disadvantages, especially for pupils in poor homes; (f) compulsory homework does not result in sufficiently improved academic accomplishments to justify the retention of the "achievement argument" as the chief justification for homestudy assignments.²⁵

²⁴Monroe, <u>op. cit.</u>, p. 380 ²⁵Ibid., pp. 380-381

Despite the generality of conclusions against the continued use of the conventional homework assignment, many teachers still assign compulsory homework regularly and then leave the expected performance of the assignments to the whims and pursuits of the students outside of the classroom. "The trend of the past several decades has been the increase of time de-26 voted to directed study in the classroom."

The published studies which provide the historical background of the investigation of the relationship between the amount of performance of homework assignments and subsequent achievement of college students have been limited to observations of amount of study time and achievement. Contradictory findings have been reported as to the kind and extent of such a relationship between the amount of study time and achievement. The extent to which the amount of performance of homework assignments contributes to achievement apparently has not been investigated at the college level.

26_{1bid.}, p. 1230.


CHAPTER III

THE METHODS OF INVESTIGATION OF THE PROBLEM

A. THE POPULATION

Respondents to the questionnaires used for the present study were members of four Biological Science lecture sections enrolled at Michigan State College, The Basic College, for the third, or spring term, March 1951 to June 1951, the final term of the course. Each of the four participating lecture sections was registered with an instructor who also met the students from his lecture section for a two-hour laboratory class period once a week in addition to two one-hour lecture sessions each week. Since no factors of selection of students for the lecture sections in the department were known to be operating, it has been assumed in this study that registration of the students in the four lecture sections was at random.

Of the respondents, 280 were males and 193 were females. Freshmen numbered 385, 54 were sophomores, 18 were juniors, two were seniors, and the balance of 14 were terminal program students in a two-year program.

B. OFFICIAL SOURCES OF DATA

Records, Registration and Admissions offices' data. Certain confidential data which the Records, Registration and Admissions offices utilize frequently for administrative reports were available in a composite alphabetical list of all students who had been enrolled during the current school year which ended just prior to the beginning of the analysis of



data for this study. The amount of time which such a list saved in the compilation of data is beyond estimation and the extensive cooperation of the administrative offices which compile and utilize such a list is invaluable to the educational investigator. The fact that the list is compiled by IEM (International Business Machines) machines printing from Hollerith cards which have been verified, atteats to the accuracy of such data.

The composite list from the Records, Registration and Admissions offices was used as the source of the data listed below:

High school quartile rank; 1st., 2nd., 3rd., or 4th. Class of school from which graduated; A- 500 or more students; B- 325-799 students; C- 150-324, and D- less than 150.

<u>Biological Science departmental records</u>. Permanent Biological Science departmental records of a limited amount of confidential data pertaining to students who have been enrolled in the course provided some of the information used in this study, including:

Laboratory section number. Term grade assigned by the instructor.

Instructors assign term grades to each student based on the student's performance on tests which the instructor had constructed and administered during the term of classes. The tests are made up by the instructors to be objective and to cover the assignments which have been given to the students. The term grades are reported by the instructor to the departmental office where the grades are recorded in the permanent file of class lists of students enrolled in the course.

<u>Board of Examiners' records</u>. The Board of Examiners functions under a head responsible to the Dean of the Basic College. Examiners who have the responsibility of constructing examinations for the Basic College departments are selected on much the same basis as the staff hired in the teaching departments except that some experience and real interest in examining are required. The Board of Examiners is also responsible for the administration of psychological, reading, and other entrance examinations and for maintaining and distributing records of the results.

A comprehensive examination over the entire three terms of the Biological Science course determines the course grade for the entire year's coursework. The Biological Science examiner submits examination items to a departmental committee for criticism and editing before the examination is compiled.

Board of Examiners' records which were on file in the Biological Science departmental office furnished the following data in this study:

Comprehensive examination grade. American Council Psychological Exam Q decile (Fall, 1950). American Council Psychological Exam L decile (Fall, 1950). American Council Psychological Exam total score decile (Fall, 1950). Cooperative Test of Reading Comprehension total score decile (Fall, 1950).

The American Council Psychological Examination and the Cooperative Test of Reading Comprehension are administered by the Board of Examiners to all freshmen upon entrance to Michigan State College.

Achievement as indicated by the grades the students received from performance on the comprehensive examination is included in this study with the expectation that the correlations between the performances on homework and the comprehensive examination grade would be lower than



those between correlations of the performances on homework and the grades for one term. These lower correlations were expected because the comprehensive examination covers three terms of the course while the data on the homework performance pertains only to one term of the course. The high coefficient of reliability reported by the Board of Examiners for the comprehensive examination used in this study, r = 0.89, 1 is considered by the examiners to indicate satisfactory reliability.

Arguments have been made that pencil and paper tests can not and do not measure achievement. Nevertheless the most casual or intense observation of the typical educational institution has forced even the foes of tests and measurements to concede that tests are the most common indicators of academic achievement which exist today.

Data concerning the subject-matter knowledge of the respondents of this study upon entering the first term of the course, and upon the completion of the three terms of the course, were also obtained from the Board of Examiners.

C. THE PILOT STUDIES AND THE DEVELOPMENT OF THE LOG-QUESTIONNAIRE SURVEY METHOD

<u>Pilot questionnaire and method</u>. Since the principal problem of this study involved performance of homework in relation to achievement, it was necessary to obtain data about the homework performance from the

Board of Examiners, Michigan State College, <u>Comprehensive Exami-</u> <u>nations in a Program of General Education</u> (East Lansing: Michigan State College Press, 1949), p. 145.

students. Because of the impracticality of direct observation of students' study performance it was desirable to utilize an instrument to obtain the data. Careful study of questionnaire construction and administration provided only a meager guide for the utilization of such an instrument for research. A pilot questionnaire was multigraphed and administered in an effort to gain first-hand experience with the instrument and method. The pilot study data were elicited from 226 students regularly enrolled at Michigan State College in the Biological Science course of the Basic College as shown in Table I.

Calculation of the Pearson product-moment correlation coefficients used x as the grade received and y as: (1) the percentage of the outside assignments in the text read at least once; (2) the percentage of the library readings read at least once; (3) the percentage of the lecture syllabus assignments read at least once; (4) the percentage of the assigned laboratory guide study questions and problems completed; and, (5) the number of hours per week usually studied for the course excluding class time.

<u>Pilot questionnaire findings</u>. None of the Pearson product-moment r's computed from the raw data of the pilot questionnaires in Table I was high and only one was statistically significant according to the 2 Student t-test for the significance of r.

Frederick E. Croxton and Dudley J. Cowden, <u>Applied General Statis-</u> tics (New York: Prentice-Hall, Inc., 1939), pp. 672, 681.

TABLE I

	PILOT	STUDY	DATA	FROM	226	STUDENTS	REPORTING	ON	THE	QUES	TIONNA	IRE	S
--	-------	-------	------	------	-----	----------	-----------	----	-----	------	--------	-----	---

QUESTIONNAIRE ITEM	G T B	Number various amounts	of stud percen of the	lents re htage g: homewo	eporting roups th ork done	g in ne	Pears produ momen	ion act- at
	đ e	0-19 %	20-39 *	40-59 \$	60 - 79 \$	80-100 \$	corretion	ela-
				~^				
What % of the home-	A		2		2	2		
work assignments in	В	11	1/	6		9		0(0
the textbook have	C	23	21	<u>ر</u> >	20	20	r 🖷	069
rou real of least	D	7	16	7	9	8		
(TOE)	<u> </u>	1		. <u> </u>	2	2	-	
	<u>A11</u>	45	63	36	41	41		
What 🐔 of the as-	*	1	2	1	4	5		
signed library read-	- B	8	14	9	5	14		
inge have you read	C	29	27	17	15	25	r =	.061
at least once?	${\tt D}$	8	15	ц	12	8		
	F	2	0	2_	2	0		
	A11	hg	53	33	38	49		
That & of the lec-	A	1	1	0	1	7		
ture evilabue hore-	B	2	5	ŭ	ā	30		
work assignments	ē	a	ź	10	23	58	T 2	.011
hove you mend of	Ē	ź	5	5	7	30	•	••••
less* orce?	F	ŏ	ĩ	ó	1	<u>_</u>		
	<u>A11</u>	15	12	19	41	139		
That f of the lab-	A	0	0	1	3	6		
cratory guide stu-	В	1	1	6	7	35		
dy questions and	С	l	16	7	55	67	r 🕿	.182**
rroblems assigned	D	1	5	ġ	14	19		
se homework have	7	0	2	0	2	2		
vou for.e?	<u>A11</u>	3	57	55	78	129		
		0 hrs.	3 hrs	6 hrs	9 hrs	12 hrs		
How many hours per	A	0	5	4	1	0		
week did you usual-	B	3	25	21	1	2		
ly study for this	Ē	5	60	37	13	ĩ	r #	- 054
course excluding	D	2	25	16	2	2	-	••) ·
cless time?	F	ī	ĩ	-ŭ	ō	- -		
	ÂÌ]		114	82	17	5		

*Statistically significant at .05 level. *Statistically significant at .01 level.

***Statistically significant at .001 level.



The hypothesis which was drawn from these findings for further investigation was, "There is no significant relationship between the amount of the outside assignments which students complete and the grade which they receive in the course when analyzed on a group basis."

Certain limitations of the pilot questionnaire method were considered before a revised method was devised. The effects of bias on the data an have been unknown factor in all questionnaire methods of survey. If bias, in the form of a tendency on the part of the student to report more homework done than was actually the case, is assumed in the pilot questionnaire it has not been revealed in the raw data of Table I. The distribution of responses has not given any basis for assuming that students who received the poorer grades would not tend to report deficiencies in their performance of homework assignments. However, if it were assumed that nearly all students would not tend to report a lack of performance, this would not be substantiated by the questionnaire data either.

Since it has been generally recognized that the bias factor is not measurable, alternative schemes for emphasizing accurate reporting were investigated by a trial-and-error method.

<u>Trial revisions of the pilot questionnaire method</u>. Various methods of obtaining data through questionnaires were attempted subsequently in an effort to discover how more accurate data could be elicited from students. During one full term of classes 290 students were given questionneires each week as to the amounts of homework assignments done and the



number of hours studied for the week previous to reporting. Experience with this group suggested the possibility of supplying students with a means of recording study performance in a diary or on some kind of schedule. Conversations with the students revealed that the intent to remember and record the data as accurately as possible was frequently frustrated by an inability to remember what they had done on the assignments long enough to record the performance on the questionnaire in class. The suggestion was made to the students that the amount of the homework done could easily be recorded in notebooks from which the data could then be transferred to the questionnaire in class. Few of the students to whom this suggestion was made seemed able to organize a chart or plan, or to include the recording of their study performance as part of their study procedure.

Revision of the milot questionnairs method of survey was made to incorporate what were believed to be the best features of the various questionnairs methods reported in the literature and of the pilot questionnairs mhinh were tried. It became apparent that carefully constructed questionnaires, requiring brief responses, administered frequently to obtain information which students could readily transfer from a carefully planned study log or diary, offered the best opportunity and possibility of securing data from which valid conclusions could be drawn.



D. THE CONSTRUCTION OF THE STUDY LOG AND QUESTIONNAIPE

USED IN THE INVESTIGATION

Construction of the study log. Experience with serial questionnaires obtained during the pilot studies disclosed a need for a permanent record of homework performance which the student could have in his possession. In order to help meet this need, and in an attempt to facilitate the reporting of data by the students, a multigraphed study log was prepared and distributed to all students in the investigation reported here. The study log provided a concise and organized form on which the weekly homework assignments for the entire term of classes was recorded at the outset when the instructors gave out assignments for the term. Also included in the study log were columns in which the student could make a suitable mark to indicate that (1) the assignment had been completed, and, (?) the completion of the assignment had been reported on a weekly questionnaire. The possibility of the students! utilization of the study log as a study aid and self-appraisal device is suggested in the instructions which occupy part of the page on which the study log is multigraphed. The study log was called a "progress sheet" in the class discussions with students in an attempt to enhance the cooperative attitude desired by the investigator.

<u>Construction of the questionnaire</u>. The criteria for construction of questionnaires which were most frequently emphasized from the survey of the literature were: (1) briefness of response; (2) factual nature

A copy of the study log may be found in Appendix II.

of the information sought; and (3) information known only to the recipient of the questionnaire. These criteria, in addition to the experiences with the pilot questionnaire, resulted in the questionnaires used in this investigation being consistent in construction with the study log. Since there is no proven way of measuring the extent of the errors in the responses, any conclusions drawn from the data must take into consideration this unknown factor.

E. THE ADMINISTRATION OF THE STUDY LOG AND QUESTIONNAIRE TO THE POPULATION

Administration of the study log. At the time of the first laboratory class meeting the instructors participating in the study introduced the survey plan to the students and distributed study logs to them. As much time as was necessary was taken to answer students' questions about the research plan and the questionnaire method which was to be used. A very few students expressed some skepticism about being used as "guinea pigs" while several students expressed an apparent attitude of anticipation of benefitting from the study log as a studyguide or progress appraisal, as well as a curiosity as to their own study performance. Students were not informed that the study logs would be solicited at the end of the term's work and none of them raised a question in that regard. The participating instructors did not know that the study logs were going to be collected either, so there was no apparent reason for any instructor to attempt to push the students into

4 A copy of the weekly questionnaire may be found in Appendix II.

using them. However, from time to time these instructors were asked to notice to what extent the students appeared to be using the study log to fill in the weekly questionnaires, and the usual report was that most of the students appeared to be keeping the study log up to date and to be using the study log in filling in the questionnaires. At the end of the term students were asked to turn in the study logs and close scrutiny revealed that 78 per cent of the students had kept a detailed record of assignments made, completed, and reported for the entire term. Although the conclusions of this investigation are not based on an assumption that the study log eliminated inaccurate reporting, the combination of weekly brief-response questionnaires with the study log did seem to minimize errors due to the memory factor to a greater extent than any questionnaire method reported heretofore.

Administration of the questionnaire. The participating instructors acknowledged the possible tediousness which students might experience in filling in questionnaires about the same thing in the same class each week during an entire term of classes. Students were encouraged to ask questions and to discuss the research plan with the instructors at the first and subsequent laboratory class meetings. The study logs and sample questionnaires were distributed at the first class meeting as part of the introduction of the questionnaire plan. The operation of the study log in relation to the anticipated weekly questionnaire was explained by the instructor at the first class meeting and as much time as was necessary was used in an attempt to clarify questions which students



asked. The apparent tediousness of the weekly questionnaire was occasionally relieved by class discussions of what might be expected when the data were analyzed and of the relation between performance on homework assignments and achievement as the students viewed the problem.

The fact that all questionnaires for the entire term were handed in by 402 of the 473 students in the investigation may be interpreted as an indication that suitable rapport was maintained. However, it was recognized that the effect of the instructors' use of the weekly questionnaire to record attendance in class was no doubt reflected in the number of questionnaires turned in. Because of the cumulative nature of the weekly questionnaire, the reporting of what had been done on the assignments since last reporting, questionnaires which were not turned in during any particular week did not necessarily result in omission of the data from the study.

Participating staff members cooperated by reserving the first five minutes of each laboratory class period for filling in and collecting the questionnaires. Instructors were provided with the questionnaires well in advance of the time for weekly distribution so that the questionnaire plan would require a minimum of extra work on their part. Students were encouraged to take blank questionnaires with them to fill in as the homework was completed. However, nearly all students filled in the questionnaires during the first five minutes of the laboratory class period reserved for thet purpose. Upon arrival at class students were either handed the questionnaires to be completed at that time or found copies waiting at their seats.

Instructors reminded the students frequently that, while the data on the questionnaire absolutely would not be used in any way except for research, attendance at class would be recorded from the questionnaires handed in at class. This method of taking roll not only motivated some students to make a real effort to hand in the questionnaires but also served to compensate in part for the time taken from classwork by the questionnaire plan.

A complete schedule of the guestionnaire plan for the entire term was supplied to each cooperating instructor at the beginning of the term Supplementary instructions were typed and given to the inof classes. structors whenever the procedure deviated from the usual weekly plan. Boxes for the deposit of completed questionnaires were provided for each instructor so that, as far as could be ascertained, no questionnaire was lost in handling. As the completed questionnaires were deposited weekly by the cooperating instructors, each questionnaire was filed with the previous ones turned in by that student so that at the end of the term all of the guestionnaires turned in by any particular student had been filed together. Although this procedure required about an hour each week, the laborious process of completely sorting all of the questionnaires for the entire term of classes after the term was over was eliminated. Also, the weekly sorting made possible the examination of the completed questionnaires to determine whether or not students were complying with the directions for filling them in. In this way the improperly completed questionnaires were detected early in the term and resulted in an early consultation with the students involved so that the improperly completed questionnaires could be corrected.

⁵A copy of the questionnaire schedule may be found in Appendix II.

F. METHODS OF ANALYSIS OF THE DATA

The number of variables which were to be studied and the complexity of statistical analysis indicated the desirability of a reduction of the amount of routine labor with the utilization of Hollerith cards. A complete flow chart of all the various operations which were necessary to convert the raw data on the questionnaires into a form which could be handled by IBM methods was prepared as part of the design of the study.⁶

<u>Mechanical tabulation</u>. Mechanical devices expedite the tabulation of data for a statistical study when the study is extensive enough to $\frac{7}{7}$ warrant a mechanical reduction of labor. The use of tabulating equipzent is recommended when there are a large number of cases involved in an investigation for which numerous entries must be made. The process generally consists of the following steps:

- (1) Reducing all entries of the original data to a numerical code.
- (?) Recording these entried on a punch card (Hollerith card) by punching holes with a key punch to represent the code numbers.
- (3) Sorting the cards by means of an electrical or mechanical sorter.
- (1) Assembling the data from the sorted cards by means of a tabulator.

See Appendix III to examine the above flow chart.

(The mechanical devices mentioned may be leased from the International Fusiness Machines Corporation, 590 Madison Ave., New York, N.Y. Similar machines are available from Remington Rand Business Service, Inc., 315 Fourth Ave., New York, N.Y. Remuneration for the clerks who operated the punching, sorting, and tabulating machines and who transferred the data from the questionnaires to the data sheets and punching schedules was provided from the All-College Research funds of Michigan State College.

Clerical and tabulation procedures. The weekly sorting and filing of the questionnaires resulted in a completely alphabetized file at the end of the term of classes. Since all of the questionnaires for each respondent were filed together, the transfer of the data from the questionnaires was thereby expedited. An experienced clerk transferred the data from each questionnaire onto a composite data sheet which provided space for all entries from the questionnaires for the entire term. The composite data sheet was then verified, with the clerk reading the entries on the data sheet and the investigator checking the entries against the questionnaires from which the data were transferred. The clerk then calculated, with the use of an automatic calculator, the percentages of the homework assignments completed and the average number of hours studied as reported by the students. Each percentage and average was double-checked by the clerk, using the calculator. The calculated data, with the data from other sources, were transferred from the composite data sheet to a punching schedule after assigning numerical codes to the data. The data on the punching schedule were then verified against the composite data sheet from which the data had been transferred and coded. The punching of the Hollerith cards was then done by a key punch operator from the punching schedule. The punched

cards were verified by checking a data sheet which was printed from the punched cards.

The data for the variables which were to be analyzed were punched in Hollerith cards, one for each student in the study. Since an unknown number of variables may have been operating to affect homework performance and achievement, the variables of this investigation were limited to those which previous studies have indicated might be important. The data ounched in the Hollerith card for each student in the study were:

- 1. Punch card number; each student was assigned a case number which was punched as the punch card number to facilitate checking the punching with the data sheets.
- 2. Laboratory section number in which student was registered.
- 3. Term grade; A- 4, B- 3, C- 2, D- 1, F- 0.
- 4. Comprehensive examination grade; A- 4, B- 3, C- 2, D- 1, F- 0.
- 5. High school quartile rank ast. (top) quartile- 1. 2nd quartile- 2. 3rd quartile- 3. 4th quartile- 4.
- 6. Class of school admitted from, according to number of students enrolled; class A (800 or more) - 4, class B (325-799) - 3, class C (150-324) - 2, class D (less than 150) - 1.
- 7. American Council Psychological Examination Quantitative score decile rank; 1 (lowest) through 10 (highest).
- 8. American Council Psychological Examination Linguistic score decile rank; 1 (lowest) through 10 (highest).
- 9. American Council Psychological Examination Total score decile rank; 1 (lowest) through 10 (highest).
- 10. Cooperative Test of Reading Comprehension score decile rank; 1 (lowest) through 10 (highest).

⁸See Appendix III for sample Hollerith card.

- 11. Calculated percentage of homework assignments in the textbook reported done.
- 12. Calculated percentage of homework assignments in the lecture syllabus reported done.
- 13. Calculated percentage of library reading assignments reported done.
- 14. Calculated percentage of homework problems reported done.
- 15. Calculated average number of hours per week reported studied for the course.
- 16. Official student records office identification number.

The available literature describing the principles and methods of statistics is far too extensive to summarize in this study. Certain citations are included in an attempt to provide examples of the typical authoritative support which is available concerning the particular statistical methods used in this study. Coefficients of correlation were determined by the Pearson-product-moment method, the generally acceptable method of computation, an explanation of which may be found in any recognized textbook in statistical method. This method is found to be so and when relationships are linear, regardless of whether or not the distributions are normal.

Computation of correlations has come to be an accepted method of treating educational and psychological investigations, as indicated by Ezekial:



⁹T. L. Kelley, <u>Statistical Method</u> (New York: The Macmillan Company, 1973), p. 172.

Correlation and multiple correlation methods have been widely applied in educational and psychological investigations to the study of such problems as the relation of grades in one subject to grades in another, or the scores on one mental test to scores on another, or the relation of scores on mental tests to success in the schoolroom or in later life.... In most of the cases in which correlation analysis has been applied to psychological problems, it has been used primarily to measure closeness of relationship rather than to obtain a basis for estimating one variable from another. In studies of this type even a low correlation may be important, so long as it is large enough so as not to be due to random fluctuations.¹⁰

The product-moment correlation is discussed by Furfey and Daly as a research technique and is reported to be "quite widely accepted as as ll adequate measure of 'closeness of relationships'." As a research technique the product-moment correlation provides a basis for analyzing the closeness of relationships between the variables investigated in this study, performance on homework assignments, and the subsequent achievement as measured by tests over the assignments. Since the nature of this investigation is historical rather than experimental, according to Kelley's description of research, the simple correlation is suitable to discover whether or not the high correlative relationships occur.

¹⁰ Mordecai Ezekial, <u>Methods of Correlation Analysis</u> (New York: John Wiley and Sons, Inc., 1947), pp. 429, 431.

¹¹Paul H. Furfey and Joseph F. Daly, "Product-Moment Correlation as a Research Technique in Education," <u>Journal of Educational Psychology</u>, 26:206, March, 1935.

¹²T. L. Kelley, <u>Scientific Method</u>: <u>Its Function in Research and</u> <u>Education</u> (Columbus: The Ohio State University Press, 1929), pp. 12, 48.

The variables with the skewed distributions in the pilot study were plotted on four scatter diagrams using random samples from the data of the population of the four lecture sections observed in the investigation. The graphical evidence of the four scatter diagrams did not refute the assumption that the line of regression of the variables being studied is linear and the use of simple correlation is suitable for this investigation.

Statistical computation. In order to facilitate the tabulation of the data required for computation of the Pearson product-moment correlation coefficients the necessary directions were given to the tabulat-13 ing machine operator on multigraphed 4 X 6 cards. The front side of the data card provided space for (1) a brief description of the variables X and Y; (2) designation of the columns of the Hollerith cards to be tabulated for X and Y; (3) tabulated N (number of cards having all X and Y data); (4) tabulated $\{X, \{Y, \{X^2, \{Y^2, \{Y^2, \{XY\}, and, (5) \text{ computed} \}$ values of $\overline{X}, \overline{Y}, \overline{Y}, xy$, and student t-test value. These data cards are filed as a permanent record of the data and analysis in a reduced form. The reverse side of the data when substituted in the product-moment formula during the computation of the correlation for the variables in this study.

¹³See Appendix III for a sample data card.



A tabulating machine operator, using an electric sorter and computer, tabulated the punched cards for the values of N, $\langle X, \langle Y, \langle X^2, \langle Y^2, \rangle$ and $\langle XY$ for the variables designated by the investigator. The operator checked the machine for each sorting and tabulating.

The investigator, using the electric automatic calculator, computed the Pearson product-moment r's from the tabulated data and checked the computations. The Student t-test for the statistical significance of r was then computed for all r's.

G. SOME LIMITATIONS OF THE METHOD OF INVESTIGATION

Limitations of questionnaire data. Certain limitations of the logquestionnaire method of survey in this guidy must be taken into consideration when the findings are analyzed and interpreted. The amounts and effects of discrepancies between actual performance on the homework assignments and the reported performance cannot be ascertained. The method has not eliminated the possibility of bias, either intentional or unintentional, in reporting study performance. Although the design of the survey provided means by which errors in reporting could be reduced, there is no way of determining accurate degrees of error in the data reported. Such limitations suggest that a more direct observational method of obtaining data relevant to students' study habits might secure more valid information. Also, a valid observational method must be developed before a better estimate of the degree of accuracy of the log-questionnaire method can be obtained.

Minimizing errors attributable to the memory factor. The survey of the literature presented contradictory findings as to the reliability of the questionnaire method of surveying students. No reports were found which purported to investigate the validity of the questionnaire method other than by computing a coefficient of reliability as a measure of validity. Close scrutiny of the methods which have been reported as questionnaire methods disclosed the fact that respondents were required to recall the information asked for in the questionnaire. In the typical survey the respondents have not been given practice in answering the type of questions making up the survey. None of the methods examined gave respondents to questionnaires asking for attitudes and opinions adequate instructions and time for reflection. Reasonable guesses have been made to exclain very high or very low reliability coefficients for such survey methods, but no variation of the questionnaire method was found which would detect the effects of the various attempts to improve the method of administering the guestionnaires.

The log-questionnaire method of survey used in this investigation makes possible the reduction of dependency upon memory to a minimum. Every possibility for maintaining high rapport with the students was exploited. Students were supplied with details of the homework assignments for the entire term at the first laboratory class meeting. They were encouraged by instructors to utilize the study log as a study aid and to record the completion of the assignments for an accurate reporting on the weekly questionnaires. Although the discrepancy between actual performance on the assignments and the reported performance has not

been ascertained, the mechanics of the log-questionnaire method of survey make more accurate responses possible. This method did not require respondents to fill in the questionnaire from memory but encouraged, by virtue of the permissive nature of the plan, the recording of the data from the students' own records on the study logs. Since it was found that 78 per cent of the respondents had kept a complete record of performance on homework assignments, it may be inferred that the log-questionnaire method of survey reduced the effects of errors due to memory to a minimum.

Correlation coefficients from the re-take data. Two estimates of the students' ability to copy the data from the study log to the questionnaire were computed. One estimate was obtained from a written retake of the questionnaire. The second estimate was obtained from an oral re-take of the weekly questionnaire. The written re-take consisted of having all the students in the study, in attendance during the class period when the re-take was given, fill in a second copy of the regular weekly questionnaire. The re-take was administered during the last few minutes of a laboratory period with the instructions that the students were to attempt to duplicate the regular questionnaire which had already been turned in at the beginning of the class period. The students were permitted to use study logs or any other means which they chose to use in filling in the re-take questionnaires. This re-take was given unannounced to all respondents during a regular class period near the middle of the term of classes.

The data and calculated Pearson product-moment r's obtained from the regular weekly questionnaire responses and the written re-take responses have been included in Table II. The data of Table II were obtained from the original and re-take questionnaires given during a single period with items I, II, and III being the number of pages of reading assignments reported done, item IV the number of assigned problems done, and item V the number of hours reported studied for the course. The X variable, data from the regular weekly questionnaire, and the Y variable, data from the written re-take, were then substituted in the simple correlation formula.

The estimates of reliability of the students' ability to transfer data from the study logs to the questionnaires were found to be .947 or higher.

A second estimate of the reliability of the students' ability to transfer data from the study logs to the questionnaires was obtained from an oral re-take questionnaire of a random sample of 25 of the respondents in this study. The oral re-take questionnaire data was secured by personal interviews near the end of a regular laboratory class period in which the students had already turned in the usual weekly reports. Students making up the random sample subjected to the oral re-take questionnaire, were permitted to refer to study logs or any other means available for answering the questions, which were identical with those of the weekly questionnaires. The oral re-take was given unannounced to the random sample near the middle of the term. The data and the calculated Pearson product-moment r's secured from the oral re-take reports may be examined in Table III.

TABLE II

DATA FOR CALCULATION AND THE CALCULATED SIMPLE CORRELATIONS OF THE QUES-TIONNAIRE ITEMS FROM ORIGINAL AND WRITTEN RE-TAKE

		Que	stionnaire	data reported	by students	
		Item I pp. text	Item II pp. syll.	Item III pp. library	Item IV No. prob s .	Item V hrs. stud.
źx	(Original questionnaire)	2966	3416	1385	1885	761
źr	(Re-take questionnaire)	2983	3466	1425	1872	761
{x?		67913	91256	88429	29956	2450
₹ y 2		66 587	92380	89057	28830	ͻ;ϯϟϏ
{ xy		64.71	91375	88371	28898	2431
N		428	428	758	425	425
r		•9 ¹ 47**	•993**	•998**	• 9 97 **	•985**

ti *Statiscally significant at .05 level. **Statistically significant at .01 level.

*** Statistically significant at .001 level.

TABLE III

.

DATA FOR CALCULATION AND THE CALCULATED SIMPLE CORRELATIONS OF THE QUES-TIONNAIRE ITEMS FROM ORIGINAL AND ORAL RE-TAKE

	Ques	tionnaire d	ata reported	by students	
	Item I pp. text	Item II pp. syll.	Item III pp. library	Item IV No. probs.	Item V hrs. stud.
X (Original questionnaire)	165	201	147	38	51
<pre>{Y (Oral re-take questionnaire)</pre>	150	203	172	ЦО	51
{ x ²	2919	3625	5155	200	175
{Y ²	2694	3661	5812	216	175
ξXY	2694	3641	5117	206	175
N	25	25	25	25	25
r	•94**	•99**	•92**	•98**	1.00**

*Statistically significant at .05 level. **Statistically significant at .01 level. ***Statistically significant at .001 level.



The data of Table III were obtained from the regular and oral retake questionnaires given during a single class period with items I. II. and III being the number of pages of reading assignments reported done, item IV the number of assigned problems done, and item V the number of hours reported studied for the course. The X variable, data from the regular weekly report, and the Y variable, data from the oral re-take, were then substituted in the correlation formula. The estimates of reliability of the students' ability to copy data from the study logs to the questionnaires were found to be .9? or higher by the oral re-take questionnaires administered to a random sample of the respondents in this study.

Interpretations from simple correlations. The use of simple correlations in this study will result in very limited interpretations of the findings. The correlations will not show to what extent some unknown variables may be more related to the problem than those analyzed. Statistical correlations do have a definite value in research in that:

We do not discover causal connections by first surveying all possible correlations between different variables. On the contrary, we suspect an invariable connection, and then use correlations as corroborative evidence... The method of concomitant variation cannot therefore be accepted as a methed of either discovery or proof. Its value lies partly in suggesting lines of inquiry for causal relations and in helping to corroborate hypotheses of causal connection. Its chief value, however, is to help eliminate irrelevant circumstances For nothing will be regarded as the cause of a phenomenon if when the phenomenon varies that thing does not, or when the phenomenon does not, that thing does.

Morris R. Cohen and Ernest Nagel, An Introduction to Logic and Scientific Method (New York: Harcourt, Brace and Company, 1934), pp. 263-264.

Providing the requirements of the statistical method have been met in the investigation, the correlation supplies probability statements concerning the correctness of the inferences which may be drawn from the calculated coefficient.



CHAPTER IV

PRESENTATION AND ANALYSIS OF THE DATA

A. DATA AND STATISTICAL INFERENCES

The data of Table IV indicate the correlative relationships between the reported homework performance and the achievement of the students as determined by the term grade assigned by the instructors on the basis of tests given over the assignments. If there is a causal relationship between homework performance and achievement, which is the assumption underlying the typical homework assignment investigated here, a high correlative relationship may be ascertainable. Even though very high correlations are not necessarily indices of causal relationships, any assertion of cause-effect relationship must be corroborated by high correlations.

In all tables of data pertaining to homework performance the N (number of cases) for performance of library reading assignments is less than for the other homework performance variables because one of the four instructors participating in the study did not assign library readings.

The data of Tables IV, V, VI, VII, VIII, IX, X, XI, XII, and XIII were substituted in the simple correlation formula for the computation of the r's shown in the tables. In each computation of the r's, the data in the top section of each table were used.

Essentially, the data of Fable IV may be analyzed to test the assumed positive correlative relation between homework performance and achievement investigated in this study. The low correlation, .105, between the percentages of the assignments in the textbook reported read and the term grades received should not be considered as corroboration of the assumed relationship. The otner low correlations, (1) .045 between term grades and percentages of the lecture syllabus assignments reported read; (2) .094 between term grades and percentages of problems reported done; and (3) -.071 between term grades and average number of hours per week reported studied for the course, are indicative of the lack of the commonly assumed cause-effect relationship. The higher correlation of .384 between term grades and the percentages of library readines reported read may indicate some emphasis on library readings in the tests witch determined the term grades. While the low correlations do not support the assumption being tested, neither do the low correlations explain why the expected relationship appears to be non-existent. An inference which may be drawn from the data is that the factors which contribute to or cause the term grades apparently are not inherent in the homework performance data as reported by the students.

Table V includes the correlations which were computed between term grades and other variables which previous investigations have suggested as possible contributors to academic performance. Such analysis reveals correlations which have high statistical significance: (1) .201 between term grades and Cooperative Test of Reading Comprehension decile rank; (2) .142 between term grades and American Council Psychological

TABLE IV

DATA FOR CALCULATION OF SIMPLE CORRELATIONS OF HOMEWORK PERFORMANCE WITH TERM GRADES

			Questionnai	re Data	
	Per cent of text reported read	Per cent of lec- ture syllabus reported read	Per cent of li- brary readings reported read	Per cent of prob- lems reported done	Average number of hours per week re- ported studied for course
X (term grades)	925.0	925.0	697.0	925.0	925.0
<pre> {Y (study habits) </pre>	25368.4		14718.3	14946.4	1347.5
źx ²	2195.0	2195.0	1649.0	2170.0	2195.0
ξ γ ²	1843733.0	2569555•5	1161662.8	854624.8	6250.5
źry	51710.7	62601.0	30897.9	30713.3	2609.6
N	466	466	348	<u>466</u>	466
r	.105*	•045	•384***	•09jt •	071

*Significant at .05 level. **Significant at .01 level. ***Significant at .001 level.

TABLE V

DATA FOR CALCULATION OF SIMPLE CORRELATIONS BETWEEN TERM GRADES, CERTAIN INDICES OF GENERAL COLLEGE ABILITY (COOPERATIVE TEST OF READING COMPRE-HENSION DECILE RANK, AMERICAN COUNCIL PSYCHOLOGICAL EXAMINATION Q, L, AND TOTAL SCORE DECILE RANKS), AND CLASS OF HIGH SCHOOL FROM WHICH GRADUATED

	Indices o	f General C School fr	ollege Abil: om which Gra	ity and Cla advated	ass of High
	Goopera- tive Test of Read- ing Com- prehension decile rank	American Council Psycho- logical Examina- tion Q score decile rank	American Council Psycho- logical Examina- tion L score decile rank	American Council Psycho- logical Examina- tion To- tal score decile rank	Class of high school from which graduated
<pre>{X (term grade)</pre>	891.0	891.0	891.0	891.0	620.0
<pre> {Y (indices) </pre>	2430.0	2479.0	2412.0	ວກ່ວກ*ບ	951.0
ک مح	2103.0	2103.0	2103.0	2103.0	1468.0
{x ₅	16336.0	16780.0	16152.0	16142.0	3193.0
< XI	5030.0	5013.0	4946.0	4961.0	1895.0
N	<i>1</i> 119	цид	4 49	449	312
r _{xy}	•501***	•092*	.142***	.149***	.019
*Statistic **Statistic	ally Signific ally signific	cant at .05 cant at .01	level. level.		an a

***Statistically significant at .001 level.

Examination Linguistic score decile rank; and (3) .149 between term grades and American Council Psychological Examination total score de-Such low correlations cannot be considered as corroborative cile rank. evidence of the assumed relationships. The correlations of (1) .092 between the term grades and American Council Psychological Examination Quantitative score decile rank; and (2) .019 between term grades and class of high school from which graduated are so low that practically no relationship can be assumed for these variables. Although low correlations are revealed for the additional indices of academic success. the inference can be made that perhaps some combination of factors would produce a higher correlative relationship. The correlations between term grades and the psychological and reading test decile ranks are large enough, however, to permit the inference that apparently the variables measured by such tests have a higher relation with the tests whereby the term grades were assigned than with the homework performance reported by the students.

Asterisks (*) are to be found in all tables in this study where the r is significant statistically. One asterisk next to an r (*) indicates that the level of significance of the r is at five per cent (5%); two asterisks next to an r (**) indicate that the level of significance of the r is at one per cent (1%); three asterisks next to an r (***) indicate that the level of one per cent (.001%). Levels of significance were determined by consulting the t table of Croxton and Cowden and referring to the values of t and n

Frederick E. Croxton and Dudley J. Cowden, <u>Applied General Sta-</u> tistics (New York: Prentice-Hall, Inc., 1939), p. 875.

(n = N - 2). The t table, upon proper application of t and n, indicates "how many times in 100 a sample drawn from a population with zero correlation would result in a correlation coefficient as high as that actually obtained. If this chance is very low, the correlation is assumed to be significant."² If, upon application of the t-test for the significance of an r, the t table indicates that there would be five (5) or less chances in 100 that a sample drawn from a population with zero correlation would result in a correlation coefficient as high as the r actually obtained, the r is termed "statistically significant."

Some correlations, even though statistically significant, are too small for a reasonable prognostic value:

Relation of the Correlation Coefficient to the Per cent of Forecasting Efficiency

r	E
.10	•5
•50	2.0
• 30	5.0
. 40	8.0
• 50	13.0
.60	20.0
•70	29.0
• 8 0	ло•о
•90	56.0
• 95	69.0
•98	80.0
1.00	100.0 3

Croxton and Cowden, op. cit., p. 681.

⁵Clark L. Hull, "The Correlation Coefficient and its Prognostic Value," Journal of Educational Research, 15:335, May, 1927. Holzinger offers the following interpretation of correlation coefficients:

As an example, it may be noted that a correlation coefficient of .80 gives a value of $l_p = 40$ [Note that E = 40 according to Hull], which means that the regression forecast with a single score is here only 40 per cent better than a random guess.⁴

Analysis of the data of Table VI shows that the assumed correlative relationships between the comprehensive examination grades and the reported homework performance are not corroborated by this study. Such low correlations of the comprehensive examination grades. -.059 with percentages of lecture syllabus assignments reported read, .021 with the percentages of textbook assignments reported read, .063 with percentages of library readings reported read, -.163 with percentages of assigned prob-lems reported done, and .026 with the average number of hours per week reported studied for the course, may be due to the fact that the homework performance was reported for only one term while the comprehensive examination covers the three terms of the course.

When the comprehensive examination grades are studied in relationship to the same additional indices of academic achievement as were the term grades, certain differences are very apparent. Of all the factors analyzed which might contribute to the comprehensive examination grades, the psychological and rending test deciles were the best indicators according to the correlations of the comprehensive examination grades, .437 with the Cooperative Test of Reading Comprehension decile rank, .243 with

Karl J. Holzinger, <u>Stutistical Methods for Students in Education</u> (Boston: Ginn and Company, 1927), p. 167.

the American Council Psychological Examination Quantitative score decile rank, .379 with the American Council Psychological Examination Linguistic score decile rank, and .413 with the American Council Psychological Examination (hereafter, abbreviated to ACE in this report) Total score decile rank. Apparently the comprehensive examination grades have a higher relation with the psychological and reading test deciles than do the term grades. The correlations (1) of .437 between the comprehensive examination grades and the reading test decile rank, and (2) of .379 between the comprehensive examination grades and the ACE Linguistic score decile rank. reveal a definite trend for the comprehensive examination grade to be an indicator of reading and linguistic ability. The inference can be made that the comprehensive examination is more of a reading and linguistic ability test than the term tests to the extent that the higher correlations indicate higher relationships between performance on the comprehensive examination and reading and linguistic deciles than between the term tests and the reading and linguistic deciles. The higher correlations between the reading and linguistic deciles and the comprehensive examination grades, when compared with the correlations between comprehensive examination grades and the Quantitative score deciles, indicate that the comprehensive examination is more of a measure of reading and linguistic ability than of quantitative ability which is purported to be more significant for the prediction of success in scientific and technical curricula than reading and linguistic ability as measured by the ACE tests. Since the comprehensive examination for the Biological Science course is constructed to measure student achievement in terms of the stated course

objectives an inference can be made that the coursework, as well as the examination of the coursework, is more dependent upon reading and linguistic ability than upon quantitative ability.

Although the correlations of Tables VI and VII do not prove that certain skills, particularly the reading and linguistic skills, are the principal variables for determining grades received on the comprehensive examination, the conclusion that the data do not support the assumed cause-effect relationships between homework performance and subsequent performance on tests over the homework, seems reasonable.

Since the principal problem under investigation concerns the assumed positive correlative relation between homework performance and achievement, analysis of other variables is the next step. The quantitative analysis of achievement on the tests given by instructors as represented by term grades and the achievement on the comprehensive examination as represented by the comprehensive grades deals with the quantitative aspects of the performances on the homework assignments as reported by the students. No data is available from which qualities of the instructoral tests can be ascertained except the instructors reports that they attempted to cover the assignments in the tests they gave to students. The limited information concerning the qualities of the comprehensive examinations seems to indicate that the comprehensive examinations do a better job of examining students over the coursework because of the way test construction criteria are used to construct and $\frac{5}{2}$

⁵Board of Examiners, Michigan State College, <u>Comprehensive Examina-</u> tions in a Program of General Education (East Lansing: Michigan State College Press, 1949), pp. 14-16.
TABLE VI

DATA FOR CALCULATION OF SIMPLE CORRELATIONS OF HOMEWORK PERFORMANCE WITH COMPREHENSIVE EXAMINATION GRADES

	Questionnaire Data								
	Per cent of text reported read	Per cent of lec- ture syllabus reported read	Per cent of li- brary readings reported read	Per cent of prob- lems reported done	Average number of hours per week re- ported studied for course				
X (comp. grades)	1007.0	1007.0	762.0	1007.0	1007.0				
{Y (study habite)	24200.7	30928.0	14771.0	14704.3	1295.0				
{x ²	2531.0	2518.0	1923.0	25 31. 0	2531.0				
ξ γ ²	1843783.1	2438525+9	1168015.9	946889.4	6159.4				
źxy	55009.6	66764.1	33003.3	29981.5	2951.0				
N	445	46 2	349	462	445				
r xy	.021	059	.063	163***	•026				

Statistically significant at .01 level. *Statistically significant at .001 level.

TABLE VII

DATA FOR CALCULATION OF SIMPLE CORRELATIONS BETWEEN COMPREHENSIVE EXAM-INATION GRADES AND COOPERATIVE TEST OF READING COMPREHENSION DECILE RANK, AMERICAN COUNCIL PSYCHOLOGICAL EXAMINATION Q, L, AND TOTAL SCORE DECILE RANK, AND CLASS OF HIGH SCHOOL FROM WHICH GRADUATED

	Coopera- tive Test of Reading Comprehen- sion decile rank	American Council Psycholog- ical Exam. Quantita- tive score decile rank	Questionna American Council Psycholog- ical Exam. Linguis- tic score decile rank	ire Data American Council Psycholog- ical Exam Total score decile rank	Class of high school from which graduated
<pre>{X (comp. grades)</pre>	976.0	976.0	976.0	976.0	677.0
<pre>{Y (indices)</pre>	2375.0	2405 . 0	2351.0	2360.0	902•0
₹x ²	2448•0	5778°C	5jtjt&•0	5778°0	1727.0
ξ <mark>γ</mark> ²	16092.0	16600.C	15922.0	15869.0	3164.0
Ex y	5741.0	5648.0	5658.0	5683.0	2052.0
N	432	432	432	432	296
r _{xy}	•437***	.243***	•379***	• ¹⁴ 13***	040

*Statistically significant at .05 level. **Statistically significant at .01 level. ***Statistically significant at .001 level. The data of Tables VIII, IX, X, XI, XII and XIII pertain to some of the variables which may be affecting homework performance as reported by students. The variables studied by means of computing simple correlation coefficients are:

- 1. Cooperative Test of Reading Comprehension decile ranks.
- American Council Psychological Examination Quantitative score decile ranks.
- 3. American Council Psychological Examination Linguistic score decile ranks.
- 4. American Council Psychological Examination Total score decile ranks.
- 5. Quartile rank in high school graduation class.
- 6. Class of high school from which graduated.

The correlation coefficients of Tables VIII, IX, X, XI, XII, and XIII are the bases for a series of interpretations concerning the relations between the various aspects of homework performance reported by students and the variables listed above. The negative and very low correlations between the percentage of the textbook assignments reported read and the above indices indicate that no relationship exists between them. In particular, the amount of the outside assignments in the textbook reported to have been read by the students bears no relationship to reading ability, general college ability, quartile rank in high school graduation class, and the class of high school from which graduated.

The data also support the contention that linguistic ability may not be associated to any extent with the amount that is actually read. The very low and negative correlations found between the percentage of the homework assignments in the lecture syllabus reported read and the indices analyzed indicate little or no apparent relationship. Reading

TABLE VIII

DATA FOR CALCULATION OF SIMPLE CORRELATIONS OF HOMEWORK PERFORMANCE WITH DECILE RANK AS DETERMINED BY THE COOPERATIVE TEST OF READ-ING COMPREHENSION SCORES

	Questionnaire Data								
	Per cent of text reported read	Per cent of lec- ture syllabus reported read	Per cent of li- brary readings reported read	Per cent of prob- lems re- ported done	Average number of hours per week reported studied for cours				
X (reading dec.)	2445-0	2445.0	1805.0	<u> 2</u> µµ5•0	Spr 2.0				
X (study habits)	24748.7	30455.2	14313.6	14225.1	1328.6				
{ x ²	1637 6 .0	16405.0	12041.0	16405.0	16405.0				
ξ <mark>r</mark> ²	1831602.7	2511590.8	1135676.1	912445.9	6227.7				
<pre>xx</pre>	13004.5	159218.4	75444.3	74003 . R	7645.2				
N	453	453	335	453	453				
r _{xy}	- 090	134**	045	072	.173***				

TABLE IX

DATA FOR CALCULATION OF SIMPLE CORRELATIONS OF HOMEWORK PERFORMANCE WITH DECILE RANK AS DETERMINED BY THE AMERICAN COUNCIL PSYCHOLOGICAL EXAMINATION Q SCORE

	Questionnaire Data							
	Per cent of text reported read	Per cent of lec- ture syllabus reported read	Per cent of li- brary readings reported read	Per cent of prob- lems re- ported done	Average number of hours per week reported studied for the course			
X (Q decile)	5 7 88°0	2488.0	1843.0	2488.0	2488.0			
X (study habits)	24748.7	30455.2	14313.6	14225.1	1328.6			
٤x²	16922.0	16922.0	12605.0	16922.0	16922.0			
ξr ²	1831602.7	2511590.8	1135676.1	912 ¹¹⁴ 5•9	6227.7			
ξ Σ Υ	132336.7	163663.1	80624.4	71764.5	7619.9			
N	453	453	334	453	453			
r	091	0 93*	.046	189***	.117*			



TABLE X

DATA FOR CALCULATION OF SIMPLE CORRELATIONS OF HOMEWORK PERFORMANCE WITH DECILE RANK AS DETERMINED BY THE AMERICAN COUNCIL PSYCHOLOGICAL EXAMINATION L SCORE

		Questionnaire Data								
	Per cent of text reported read	Per cent of lec- ture syllabus reported read	Per cent of li- brary readings reported read	Per cent of prob- lems reported done	Average number of hours per week reported studied for the course					
X (Idecile)	2420.0	2420.0	1776.0	2420.0	2420.0					
{Y (study habits)	2 4 748•7	30455.2	14313.6	14225.1	1328.6					
ξx ²	16170.0	16170.0	11822.0	16170.0	16170.0					
ξ Υ ²	1831602.8	2511590.8	1135676.1	912445.9	6227.7					
źxy	130415.5	159332.6	74151.7	73489.0	7555.8					
N	453	453	335	453	453					
r _{xy}	 046	087	049	064	.166***					
ti										

*Statiscally significant at .05 level.

**Statistically significant at .01 level.

***Statistically significant at .001 level.



TABLE XI

DATA FOR CALCULATION OF SIMPLE CORRELATIONS BETWEEN HOMEWORK PERFORMANCE AND THE AMERICAN COUNCIL PSYCHOLOGICAL EXAMINATION TOTAL SCORE DECILE RANK

			Questionna	ire Data	
	Per cent of text reported read	Per cent of lec- ture syllabus reported read	Per cent of li- brary readings reported read	Per cent of prob- lems reported done	Average number of hours per week reported studied for the course
X (ACE Total decile)	21431.0	2431.0	17 91.0	2431.0	2431.0
X (study habits)	24748.7	30455.2	14313.6	14225.1	1328.6
{x ²	16125.0	16155.0	11839.0	1 61 55.0	16155.0
ξγ ²	1831602.7	2511590.3	1135676.1	919 , 942 - 9	6227.7
ξXY	129772.5	159863.4	75766.3	71970.7	7639.0
N	453	453	335	453	453
_	079	094+	022	115*	.189***



TABLE XII

DATA FOR CALCULATION OF SIMPLE CORRELATIONS OF HOMEWORK PERFORMANCE WITH QUARTILE RANK IN HIGH SCHOOL GRADUATION CLASS

		Quest	ionnaire Da	ta	
	Per cent of text reported read	Per cent of lec- ture syllabus reported read	Per cent of li- brary readings reported read	Per cent of prob- lems reported done	Average number of hours per week reported studied for the course
X (H.S. quart.)	645.0	648.0	477.0	648.0	648.0
XY (study habits)	19764.9	24378.5	12024.9	11652.3	1026.7
٤x ²	1448.0	1 µ48•0	1046.0	1428.0	1779.0
٤¥ج	1461150.1	2000688.5	952250.4	729374.0	3107.0
{X Y	33977-9	42309.9	20107.3	19716.0	1498.4
N	365	365	272	368	365
r	103*	092	1014	073	874***

*Statistically significant at .05 level. **Statistically significant at .01 level. ***Statistically significant at .001 level.



TABLE XIII

DATA	FOR	CALCUI	ATION	\mathbf{OF}	SIMPI	LE CORRI	ELATIC	INS OF	HOMEWORK	PERFORMANCE
		WITH	CLASS	OF	HIGH	SCHOOL	FROM	WHICH	GRADUATE	D

	Questionnaire Data							
	Per cent of text reported read	Per cent of lec- ture syllabus reported read	Per cent of li- brary readings reported read	Per cent of prob- lems reported done	Average number of hours per week reported studied for the course			
X (class of H.S.)	952.0	952.0	693.0	952.0	952.0			
<pre>{Y (study habits)</pre>	17053.3	20916.9	10076.7	10147.1	852.4			
٤x ²	3126.0	3194.0	2279.0	8680.0	3194.0			
۶x ²	12 6 7737.6	1722404.8	795240.2	729374.0	3669.8			
ξxy	51189.9	63853. ^u	31026.7	45919.9	2646.7			
N	313	313	231	313	313			
r Ty	077	.075	•094	•313***	.027			

*Statistically significant at .05 level. **Statistically significant at .01 level. ***Statistically significant at .001 level.



ability, general college ability, quartile rank in high school graduation class, and class of high school from which graduated bear no important relation to the amount of the outside assignments in the lecture syllabus reported done by students.

Apparently performance on the library reading assignments as reported by the students bears no relation to reading ability, general college ability, quartile rank in high school graduation class, and class of high school from which graduated.

Some secondary school authorities have suggested that in general, the larger schools more commonly give more homework problems to students than do the smaller schools, perhaps because of pressure of larger classes. The correlation coefficient of .313 between the percentage of the assigned problems reported done by students and the class of high school from which graduated may be interpreted as a possible effect of this reported practice. However, the .313 correlation is still too emall to be of much predictive value as far as homework performance is concerned. Such a correlation does indicate a $high_A^T$ relation between performance on the assigned problems as reported by students and the class of high school from which graduated than between performance on passigned problems and any of the other indices analyzed.

The amount of time utilized by students for preparation for a particular course of study has been the subject of other investigations but the reported results are contradictory. The data of this study reveal no significant correlative relationships between the amount of



time reported studied for the course and the subsequent achievement in the course as measured by term grades or comprehensive examination grades. Statistically significant correlative relationships were found between the average number of hours per week reported by students as studied for the course and the indices analyzed, with the exception of the correlation of .027 with the class of high school from which graduated.

One high correlation was obtained from the analysis of the variables which might affect homework performance. The relation between the academic achievement of the students in high school, as indicated by quartile rank in the graduation class (from top to bottom), and the amount of time reported studied for the Biological Science course was found to be .874. Such a high correlation, by comparison with the others derived in this study, is difficult to explain. For even if the assumption were made that the higher quartile rank in high school achievement is related to a higher number of hours studied for the high school courses, and that the patterm of the number of hours studied is carried over to college work, the expectation that the number of hours studied for college courses would be related to college achievement is not realized according to the data of this study. There is no apparent reason why quartile rank has such a high relation to the number of hours reported studied for the course.

A more explicit conclusion from the data pertaining to quartile rank would state that, while a high correlative relationship was found between quartile rank in high school graduation class and the average

number of hours per week students reported they studied for the Biological Science course, no apparent relationship was found between the number of hours reported studied and the subsequent achievement as determined by term grades and comprehensive examination grades.

The data of this study corroborate the findings of several investigations which have reported high school standing to have the highest prognostic value for college success of all factors which have been studied in the correlations of .343 between high school quartile rank and term grades in the course and .226 with the comprehensive examination grade. Although these are not as high as some of the reported correlations they are statistically significant.

No apparent relationship was found between the amount of time reported studied for the course and the size of high school from which the student graduated.

B. SUMMARY OF STATISTICAL INFERENCES

The correlation coefficients which were computed, analyzed, and interpreted for this study, with the exception of those reported as pilot study findings and measures of questionnaire reliability, have been arranged in summary in Tables XIV and XV. Certain statistical inferences may be drawn from the correlation data computed for the analysis of achievement in this study. A positive and statistically significant correlation was found between achievement, as measured by the term grades, and (1) percentage of homework assignments in the textbook reported read; (2) percentage of assignments in library readings reported

TABLE XIV

SUMMARY OF CORRELATION COEFFICIENTS COMPUTED FOR THE ANALYSIS OF ACHIEVEMENT

Wandahlaa analmaad	Achievement					
Variabies analyzed	Term grade	Comprehensive exam- ination grade				
Percentage of assignments in textbook reported read	.105*	.021				
Percentage of assignments in lecture syllabus reported read	•045	059				
Percentage of assignments in library readings reported read	•38H***	.063				
Percentage of problems reported done	•094 •	163***				
Average number of hours per week reported studied for the course	071	.026				
Cooperative Test of Reading Comprehension decile rank	•20 1***	•43 7***				
ACE Quantitative score decile rank	•092*	•243 ***				
ACE Linguistic score decile rank	.142***	• 3 79 ***				
ACE Total score decile rank	.149***	•413 ** *				
Quartile rank in high school graduation class	.343***	•22 6***				
Class of high school from which graduated	.019	040				

TABLE XV

SUMMARY OF CORRELATION COEFFICIENTS COMPUTED FOR THE ANALYSIS OF HOMEWORK PERFORMANCE

		Homework Performa					
	Per cent of text reported read	Per cent of lec- ture syllabus reported read	Per cent of li- brary readings reported read	Per cent of prob- lems reported done	Average number of hours per week reported studied for the course		
Term grade	.105*	.045	. 384***	•094*	071		
Comp.exam.grade	.021	059	.063	163***	.026		
ACE Quantitative score decile rank	091	093*	•оле	189***	.117*		
ACE Linguistic score decile rank	046	087	049	064	.1 66 ***		
ACE Total soore decile rank	079	094	022	115*	.139***		
Cooperative Test of Reading Compre- hension decorpar	 090	134**	045	072	•173 ***		
Quartile rank in high school grad- uation class 4	103*	092	104	 078	874***		
Class of high school from which graduated	077	.075	•094	.313***	.027		

The negative r's for the quartile rank with these same variables, as shown in Table XII, were negative because of the coding; the relationships were positive, however, since the highest quartile rank was coded 1 and the lowest 4.

*Statistically significant at .05 level.

**Statistically significant at .01 level.

***Statistically significant at .001 level.

read; (3) percentage of homework problems reported done; (4) Cooperative Test of Reading Comprehension decile rank; (5) ACE Quantitative score decile rank; (6) ACE Linguistic score decile rank; (7) ACE Total score decile rank; and (8) quartile rank in high school graduation Positive and statistically significant correlations were found class. to exist between achievement, as indicated by the comprehensive examination grades, and (1) Cooperative Test of Reading Comprehension decile rank; (?) ACE Quantitative score decile rank; (3) ACE Linguistic score decile rank; (4) ACE Total score decile rank; and (5) guartile rank in high school graduation class. A negative and statistically significant correlation was obtained between achievement, as measured by the comprehensive examination grade, and the homework performance reported as the percentage of assigned problems done by the students. The coefficients of correlation between guartile rank in high school graduation class and (1) term grade; and (2) comprehensive examination grade were positive and statistically significant.

The statistical inferences which can be made from the analysis of homework performance, by computing correlations with variables previously reported as being important, are that statistically significant relationships are: (1) positive between percentages of the homework assignments in the textbook reported read and quartile rank in high school graduation class: (2) negative between percentage of the homework assignments in the lecture syllabus reported read and ACE Quantitative score decile rank and the Cooperative Test of Reading Comprehension decile rank; (3) negative between percentage of homework problems

reported done, ACE Total score decile rank, and ACE Quantitative score decile rank, and positive between class of high school from which graduated and ACE Total score decile rank; and (4) positive between average number of hours per week reported studied for the course and quartile rank in high school graduation class, ACE Quantitative score decile rank, ACE Linguistic score decile rank. ACE Total score decile rank, and Cooperative Test of Reading Comprehension decile rank.

The survey of literature and the data of this study do not corroborate the assumed relation between homework performance and achievement unless we interpret the correlations which are low but statistically significant as indications of some degree of cause-effect relationships. However, due recognition must be made of a multiplicity of variables which may obscure the meaning of whatever correlative relationships are found between two observed variables. The absence of correlation coefficients high enough to be considered corroborative evidence of a causeeffect relation between homework performance and achievement. for example, does not disprove the existence of such a relationship. The most that can be stated in general terms from the data of the investigation is that while no trend or apparent pattern of any degree of correlative relationship between the homework performance investigated and achievement was found, a consistent positive trend and apparent pattern of relationships between achievement and psychological and reading tests were noticeable. A derivation of causes for the lack of the assumed relationships and for the occurrence of other relations cannot be made from the data of this study.



The intercorrelation of .413 between performance on the lecture syllabus assignments and performance on the textbook assignments, as shown in Table XVI would be expected since the teachers and students generally believe the lecture syllabus to be the most important reading source in the course. The intercorrelations between reading and problem performance data indicate that the students' homework performance is consistent with the course structure, in which the library readings and problems receive much less emphasis than the other homework.

The negative intercorrelations in Table XVI between the amount of time spent in study and the various other aspects of homework reported done may reflect the typical emphasis, by both teachers and students, on the idea that so many hours of study are to be done for so many hours of credit in the course, and little concern is shown for what is actually accomplished during the study time. Perhaps the most important inference to be drawn from the table of intercorrelations is that even though erroneous and fictitious data cannot be identified and eliminated from the survey, the students actually reported no relation between the time spent doing the homework and the amount of homework accomplished. Negative intercorrelations suggest the possibility of fictitious reporting of data by the students.





TABLE XVI

INTERCORRELATIONS OF HOMEVORK PERFORMANCE

	Per cent of text reported read	Per cent of lec- ture syllabus reported read	Per cent of li- brary readings reported read	Per cent of prob- lems reported done	Average number of hours ber week reported studied for the course
Per cent of text reported read		.418***	• 2 ⁴ 3***	.105*	122**
Per cent of lec- ture syllabus reported read			•566***	.125**	~.1 93**
Per cent of li- brary readings reported read	±- ±		17 ay 18 49 ay	092	~. 011
Per cent of problems re- ported done		€8 an ≪ ∞ ∞			061

*Statistically significant at .05 level.

Statistically significant at .01 level. *Statistically significant at .001 level.



C. HOMEWORK PERFORMANCE OF THE MEAN STUDENT OF THE INVESTIGATION

The analysis of the data includes the statistical means by which the behavior of the "typical student" may be inferred. Even an assumption that students exaggerate considerably in reporting the type of information solicited by the questionnaires of this study does not prevent certain interpretations of the statistics derived from the data. This is especially so when the means reveal that, even with the presumed operation of exaggeration and its unknown effects, the student is found to be deficient in the performance of assignments when the expectations of the instructors are used as the criteria. Instructors, in the very act of making up assignments and then distributing them to students are giving overt expression to the expectation that all students will at least read all the assignments. Deficient performance on the homework assignments is apparent from the data of the means and medians in Figure 1.

The performance of the student, during the nine weeks of the term of classes during which the data of this study was reported by students and up to but not including the week of the assignment of the term grades by the instructors and the comprehensive examinations, appears to be considerably less than is expected by the instructors making the assignments. If such performance can be assumed to represent a reasonably accurate account of what actually is done by students, an investigation of all relevant factors seems to be a prerequisite of the forming of any judgments of the value of homework assignments.

Figure 1

THE MEAN STUDENT OF THE INVESTIGATION

Characteristic	Statistica	l Mean
Percentage of homework assignments in the textbook reported read	54.51	
Percentage of homework assignments in the lecture syllabus reported read	67.08	
Percentage of assigned homework problems reported done	31.67	
Percentage of assigned library readings reported read	42.85	
Average number of hours per week reported studied for the course	2.89	
Class of high school from which graduated	B	(median)
Quartile rank in high school graduation class (from top)	1.77	(median-2)
Cooperative Test of Reading Comprehension decile rank	5.40	
American Council Psychological Quantitative score decile rank	5•50	
American Council Psychological Linguistic score decile rank	5•34	
American Council Psychological Total score decile rank	5•37	
Term grade	1.99	(slightly under C)
Comprehensive examination grade	2•22	(about C+)

D. SCHOLASTIC GROWTH OF THE POPULATION

Even though the students' performance of homework assignments has no apparent relation to the grade earned on tests over the assignments, can the inference also be made that no learning occurred as a result of experience in the course? Evidence is available from columns 2 and 3 of Table XVII from which the amount of learning or the inference of scholastic growth for the respondents of this study can be made directly.

In the spring term of 1950, contrary to usual practice, the comprehensive examination items were so arranged that the two halves, Part I and Part II, were alike in the subject matter covered and in the types of knowledge and ability required to answer the questions. Thus each half of the examination was a fairly representative sample of the entire examination. The change in procedure from the usual practice was done so that half of the examination (Part I) could be used the following fall as a pre-test or placement test.

The grades of the students writing the examination in the spring were, of course, based on their scores for the whole examination since they had completed the three terms of the course. The scores of these third term students on Part I of the examination were also equated with the grade distribution for the entire examination to serve as a basis for comparison of future scores when Part I was used as a pre-test, as in the fall term of 1950.

Table XVII shows the grade equivalents of the scores (1) made by a group of students who had completed three terms of the course and who wrote the examination which was arranged in the two similar halves as

TABLE XVII

Grade	Third-Term Students Spring 1950 %	Entering Freshmen Fall 1950	Third-Term Students Spring 1951 %
A	5.1	0.0	5.1
в	26.7	0.1	25.9
с	49.1	ታ " ታ	49.8
D	15.8	15.5	15.6
F	3.4	80 . 0	3.6

GRADE EQUIVALENTS OF SCORES MADE BY STUDENTS ON A BIOLOGICAL SCIENCE PRE-TEST AND ON COMPREHENSIVE EXAMINATIONS*

*Note the similarity of the distributions of the grades for the comprehensive examinations, spring 1950 and spring 1951.



_

explained above; (2) made by entering freshmen the following fall on the pre-test made up from Part I of the spring comprehensive examination as explained above; and (3) made by the same students who had taken the pre-test and then took a regular comprehensive examination in the follow-6 ing spring after completing three terms of the course.

Although the grade equivalents in Table XVII give a comparison of the performance of different groups of students on the same test in columns 1 and 2, the examiners believe that the entrance examination scores of the students show that they are comparable groups. The data show, for example, that only 4.4 per cent of the entering freshmen made scores as high as those of students who received C on the comprehensive examination. If the assumption is valid that the two groups of students in columns 1 and 2 are comparable, then the scholastic progress associated with three terms of coursework becomes apparent.

Data for the same students on different tests, pre-test for entering freshmen, fall 1950, believed by the examiners to be comparable to the regular comprehensive these freshmen took in the spring of 1951 after completing three terms of the course, are reported in columns 2 and 3 of Table XVII. If the assumption that the pre-test and the spring 1951 comprehensive are comparable is correct, then the inference is that students can perform much better on tests over the coursework after completing three terms of coursework than they can before doing the coursework. But the part or parts of the coursework which contribute the most cannot be ascertained from such data.



^bData for Tables XVII and XVIII were obtained from the Board of Examiners, Michigan State College, East Lansing, Michigan.

Table XVIII contains data from the pre-test scores of entering freshmen and scores made by a different but comparable group on the same test after completing the three terms of coursework. The medians and means of the two groups, one taking the test before taking the course and the other group taking the same test after completing the three terms of work show a marked difference in performance. Such differences support the inference that students learn something during the three terms of coursework and that this learning represents scholastic achievement. Here again, the data do not indicate which course activity accounts for most of the change.

The conclusions are that while no relation apparently exists between what the respondents did on homework assignments in the course and subsequent achievement, they made definite progress in subject matter or scholastic achievement which was probably due in large part to the classroom experiences during the three terms of coursework.



TABLE XVIII

MEASURES OF CENTRAL TENDENCY AND DISPERSION OF PRE-TEST SCORES OF EN-TERING FRESHMEN AND SCORES OF A GROUP OF STUDENTS ON THE SAME TEST AFTER COMPLETING THE COURSE

Measure	Entering Freshmen Fall 1950	Third-Term Students Spring 1950
Range	0-116	48-129
Mean	57.8	88•7
Median	58.3	95•9
Standard deviation	17.3	12.8
N	2230	2063



CHAPTER V

SUMMARY OF FINDINGS, EDUCATIONAL IMPLICATIONS, AND LIMITATIONS OF THE FINDINGS, WITH SUGGESTIONS FOR FURTHER STUDY

A. SUMMARY OF FINDINGS

Homework assignments in the investigation. During this investigation of the relation between the amount of performance of homework assignments and subsequent achievement, the prevalence of homework assignments in schools and colleges was noted as well as the inherent assumption of a cause-effect relationship between the amount of homework assignments done and the grade or mark achieved. This practice and assumption seems to have been undisputed and uninvestigated at the college level, except for a few studies of hours of study time and degrees of achievement which produced contradictory findings.

The survey of fifty educational methods textbooks, which was done by the writer, indicated that the authors of the texts, as well as the teacher training institutions which use the texts, sontinue to include homework assignment as a suggested teaching method in spite of the weight of the research findings from elementary and secondary school investigations which have discovered the value of homework to be questionable, at best.

The homework assignment under investigation is exemplified by the classroom situation in which all students are given the identical assignment by the instructor, and, after what is supposed to be an adequate

time interval for performance of the assignment, are given an identical test over the assignment by the instructor, from which grades or marks are assigned.

Homework performance in the investigation. The investigation of the relation between the amount of performance on homework assignments, as reported by students through a log-questionnaire survey method, and subsequent achievement, used data pertaining to students in a college science course. The data from the survey do not corroborate the assumed positive correlative relationship between the amount of homework done and achievement.

An anlysis of homework performance based on such qualitative variables as psychological examination deciles, reading ability deciles, quartile rank in high school graduation class, and class of high school from which graduated, revealed that the extent to which such variables indicate quantitative and linguistic ability has no apparent relation to the amount of homework performance. Some relationship was indicated by a low positive correlation between the percentage of homework problems reported done and the size of the high school from which graduated. A high positive correlation between quartile rank in high school graduation class and the number of hours per week studied for the college science course may indicate a consistency in the pattern of study time for high school and college.

The typical student in the investigation, as interpreted from mean performance, was found to be deficient in performance of the homework

assignments when compared with the expectations of the instructors. Mean performance varied from a low of 32 per cent of the assigned problems reported done to the highest mean of 67 per cent of the lecture syllabus assignments reported done. The mean of the reported average time spent for study of the course was 2.89 hours per week for the three-credit (per term of classes) course requiring two hours of lecture and two hours of laboratory classes each week.

Relation of the amount of homework reported done and achievement. No correlations large enough to have predictive value were found between achievement in the college science course observed and the reported amount of the homework assignments done by students. Nor did the amount of time studied for the course have any predictive value for achievement in the course.

The data of the investigation corroborate the findings of reported studies of the relation of homework to achievement which were done at the elementary and secondary school levels. The findings of this investigation at the college level may be added to the weight of evidence which does not support the assumed relation between work on assignments and achievement. The exceptions were a few studies at institutions of higher learning which produced contradictory findings. The summation of the reported findings, together with the findings of this study, does not corroborate to any extent the cause-sffect relationship heretofore assumed to exist between the amount of homework done and achievement.



<u>Analysis of achievement</u>. The literature and data of this study support the contention that the amount of work done on homework assignments cannot be used for prediction of achievement in the course.

Achievement, as shown by the data of this investigation, appears to have a higher relation to reading ability first, general college ability second, and, to a less extent, library reading assignments reported done, than with the other variables of homework performance investigated.

The data of this study corroborate to some extent the findings of Seder that:

Correlation between Q-scores and achievement test scores in the sciences are lower than correlations between L-scores and science. Although sciences are ordinarily regarded as closely related to mathematics in high school courses they are quite verbal in nature. Perhaps the scores of students in scientific curricula in colleges might show more correspondence with Q-scores than with L-scores.¹

Although Seder's findings were based on pupil performance in high school grades nine through twelve, the data of this investigation of homework performance show the L scores to have a higher relation to achievement in the college science course observed than do the Q scores. The data indicate that the suggestion which Seder makes concerning college science curricula is not applicable to the science course observed in this study

The findings of this investigation of homework performance support the conclusions of Segel and Gerberich:



M. Seder, "The Reliability and Validity of the ACE Psychological Exam." Journal of Educational Research, 34:100, October, 1940.

It may be concluded that the American Council (Psychological Examination) test should not be used for differential prediction purposes when college marks are the criteria, since its power for such use is negligible.²

The correlations between achievement of students in this investigation and the ACE decile ranks varied from a low of .092 to the highest obtained which was .413. None were high enough to warrant prediction of achievement from the ACE deciles on an individual basis.

<u>Counseling of students about homework</u>. The literature and the data of this study do not support a counseling policy of recommending that a student found deficient in scholastic achievement should devote more time to study outside the classroom. The conclusion most nearly consistent with the literature and findings of this study is that the quantitative aspects of homework performance, i.e., the amount of time spent in study and the amount of the assignments done, are probably of minor importance to achievement in comparison with the quality of the homework performance, which remains to be investigated.

The low correlations obtained in this study correspond with the conclusions published by MacPhail:

Inferences made in the manual for the ACE Psychological Examination for College Freshmen pertaining to the use of the Q and L scores for counseling and sectioning purposes can not be safely assumed to be applicable to the situation in a particular institution and,... any given institution would do well to discover the local pertinence of these scores before putting them to any such use.³

²D. Segel and J. R. Gerberich, "Differential College Achievement Predicted by the American Council Psychological Examination," <u>Journal</u> of <u>Applied Psychology</u>, 17:645, December, 1933.

³A. H. MacPhail, "Q and L Scores on the ACE Psychological Examination," <u>School and Society</u>, 56:250, September, 1942. Scholastic growth and homework performance. There is evidence that the students in the investigation demonstrated learning and scholastic growth during the time spent in the course, although the evidence does not show what aspect of the learning situation was the most important contribution to such growth. But apparently the scholastic growth has no relation to the amount of homework done as analyzed in this study. Since some degree of scholastic growth is apparent, the inference may be made that classroom experiences, together with the variable effects of quantitative, linguistic, and reading ability, are more closely related to achievement than the amount of homework done.

B. EDUCATIONAL IMPLICATIONS OF THE INVESTIGATION

Many teachers are familiar with the explanation of low scholarship by students who say, "I just can't understand why my grades are so low. I try so hard and study all the time; but it doesn't seem to do any good." Such statements are frequently received with much skepticism by teachers and faculty counselors, not because the student is deliberately dishonest, but because the teacher believes the student cannot make a valid estimate as to what amount and kind of studying is actually done. Many teachers have noticed that students tend to overestimate the number of hours studied and to underestimate the hours they give to extra-curricular activities and leisure.

Some of the faculty are often operating under a much different opinion. Faculty members may attribute scholastic difficulties to either lagrardliness or lack of intelligence. Some staff members

frequently feel that students actually attend classes very few hours during the week and believe that students can always be found in nearby eating places, places of recreation, public lounges on or near the campus, and very seldom in the library or at a study desk.

The findings of this study, which show the students to be considerably deficient in performance of homework when compared with the expectations of the teachers, may have certain implications for staff members. Staff members tend to believe that achievement is related to the amount of homework done, but permit the typical student with deficient homework performance to achieve a passing grade. There seems to be an inconsistency in a practice which involves the making of homework assignments, the making of tests over the homework assignments, and then the subsequent passing of students having deficient homework performance, as shown by this study.

The weight of the evidence from the literature and the findings of this study indicate that poor achievement cannot be assumed to result from laggardliness or lack of intelligence. Teachers would do well to re-examine the assumption that homework assignments have a place in educational methodology. Perhaps one idea that is reinforced by the entire investigation of the relation between work on homework and subsequent achievement is that no teaching or administrative method or policy should be exempted from continuous evaluation in terms of its purported objectives or results.

The findings of the study seem to show that students achieve scholastic growth in the course observed even though the relation of the

grade received with the amount of homework done is negligible. One implication, which may be of much value, is that the classroom experiences may be more closely related to scholastic growth and achievement than any of the other variables analyzed.

C. LIMITATIONS OF THE FINDINGS WITH SUGGESTIONS FOR FURTHER STUDY

Detailed elaboration of statistical refinement has not been employed to demonstrate the scientific reliability of each step in this study of the assumed correlative relation between work done on assingments and achievement. The design of the study was derived from precedent reported in the literature for using ouestionnaire data and simple correlations in the investigation of aspects of student performance on assignments in relation to achievement. Competent statistical authority was consulted which supported the assumption that for purposes of this initial investigation at the college level the simple correlations would provide evidence from which it could be ascertained whether or not a more refined analysis was desirable in future studies.

While the log-questionnaire survey method developed and utilized for gathering data of this study may have elicited more or less accurate reports from the students, the absolute validity of the method of survey cannot be demonstrated. The reliability with which the students could copy the data from their study logs to the questionnaires was found to be high. The accuracy of the reports of the students cannot as yet be ascertained. However, the recommendation should be made that a future

study could investigate the validity of the reports with the log-questionnaire method by giving some examination over some part of the assignments made and reported as done by students to ascertain whether the test performance was consistent with the reported homework performance.

The study log was constructed with a column in which the weekly blocks of homework assignments were to be written. Students were directed to place a mark next to the block of assignments on the study log as the assignments were completed and to make a second mark to indicate that the completion of the assignment had been reported on the weekly questionnaire. Since the weekly questionnaires revealed that stidents indicated occasionally that they had spent time studying but reported no assignments completed, there is a possibility that some part of the assignment may have been done; but since the assignment was not actually completed, the part that was done might never have been reported. The extent to which the possibility of not reporting, when part but not all of the assignment was done, has affected the correlations is unknown. The negative intercorrelations of Table XVI may be partly the result of this loophole in reporting. Future studies in which a study log is to be used as a record of the amount of the assignments done should provide for the students recording of the number of pages done rather than require them to report blocks of pages done after completion of the assigned block of pages, or require them to do both.

The apparent seriousness with which the respondents took the investigation, and the degree of dependability of the data obtained, must rest to a large degree upon the cumulative effects of careful planning and development of the survey method and the subsequent solicitation of information. However, such mute testimony cannot be distilled and exhibited as evidence of the validity of the data. The findings of this study are based not only upon the experience of the pilot studies and the careful development of the log-questionnaire method but also upon the more tangible evidence that the questionnaire data is an accurate reproduction from the study log.

Although the problem of investigating the occurrence of correlative relationships between achievement and homework performance has been initiated here, the corollary problem of explaining why such relationships were or were not found remains to be studied. The contention may be raised that the low correlations between the amount of homework done and achievement are due to mutually exclusive variables. For example. a student with a high ACE decile rank would be expected to achieve a high grade regardless of the amount of homework done, according to such a contention. Examination of the distribution of reported homework of all respondents in the ACE tenth decile (high) and all of those in the ACE first decile (low), as shown in Tables XIX and XX, suggest that when the intelligence variable is held constant a very low correlation might be found between achievement and performance of homework. If the contention of mutually exclusive variables were correct, then the achievement of the ACE tenth decile students would always be high and the

achievement of the ACE low decile students would always be low. A random sample of 178 of the 473 respondents, used for the distribution of ACE deciles and grades with the amount of study time held constant, is shown in Table XXI. An inference which may be made from the distribution is that a small correlation exists between ACE deciles and achievement when study time is held constant. Acain, if the contention of mutually exclusive variables were correct, then the correlation between ACE deciles and achievement would be extremely high.

The study of homework performance might produce more valuable reaults if it were extended to investigate the effects of different methods of making assignments, of different types of assignments, of the reasons why students do or don't do homework, and of the social implications of coercive homework assignments.

If the performance of the students is found to be deficient when compared with the expectations of the teachers or administrators, an investigation is indicated to discover what variables are producing such a situation.

Future studies of relationships between homework performance and achievement could subject experimental sections to various kinds of homework assignments and the subsequent homework performance and achievement analyzed to determine the extent of the relation of homework performance to achievement.
TABLE XIX

DISTRIBUTION OF TERM GRADES AND HOMEWORK PERFORMANCE FOR THE 28 RESPONDENTS IN THE AMERICAN COUNCIL FSYCHOLOGICAL EXAMINATION TENTH DECILE GROUP

Terr	n Aseign-		Ec	mework perfe	ormance interval	ls	
Grad	de ments	0-19% done	20-39% dor	ne 40-59% don	ne 60-79% dene	80-	100%
	Textbook		1	1			1
	Syllabus			1			2
A	Library	l		<u> </u>			
	Froblems	1		, <u>1</u>	1		
	Hrs./wh	0-1.9 brs	2-3.9 hrs 1	4-5.9 hrs	6-7.3 hrs	3∔	hrs
****** ***	Manthaale			·	· · · · · · · · · · · · · · · · · · ·	• • • •	
	Svllabue	1	ŗ	3	1		2
Е	Library	<u>ل</u>	1		1		-'
	Problems	5	1	1	-		1
		0-1.9 hrs	2-7.9 hrs	-5.3 hrs	5-7.9 Mars	54	hre
	Hrs./whe.						
	Textbook	7	<u></u>		1		4
	Syllebus	Ľ.		2	5		2
0	Library	10	1		1		<u>_</u>
	Froblems	ò	1].	3		
		0 ⊷1. 9_hrs	0-7-9 brs	u−5.9 drs	6-7.9 bre	₽	hrs
	Hrs./wk.	3	<u> </u>	1			
	Textbook	2					
	Syllabus				l		1
Γ	Litrery	1					1
	Problems				ć - c ,		
	Hre / Hr	Om L. H I IS	S⊶?•3 rus	······································	h-/.i.tre	84	hre 2
	1.4 0 ¢ / HR. •						L .
	Textbook			_	1		
-	Syllebus			1			
F.	Library	1					
	Frontens	1 0_1 0 hhm	2-7 0 hrs	ling of an		91	1
	Hrs./wh.	-1.j DIS				*+	NT8

TABLE XX

DISTRIBUTION OF TERM GRADES AND HOMEWORK PERFORMANCE FOR THE 30 RESPONDENTS IN THE AMERICAN COUNCIL FSYCHOLOGICAL EXAMINATION FIRST DECILE GROUP

Te r m	Assign-	Homework performance interval								
Grade	ments	D-19% dore	20-39% done	40-59% done	60-79%done	70-100%				
	Textbook									
	Syllabus									
A	Library									
	Problems									
	_	0-1.9 hrs	2-3.9 hre	1-5.9 hrs	f-7.9 hrs	8+ hrs				
	Hrg./wk.									
	Textbook	1				2				
	Syllabua					3				
Б	Library	2			1					
	Problems	1			_	5				
	,	0-1.9 hrs	2-7.9 hrs	4-F.9 178	f-7.9 hrs	8th hrs				
	Hrs./wh.	1	1	1		-				
	Textbook	1	î	3	2	3				
	Syllabus		\overline{C}	1	1	7				
C .	Library	E C			2	Ц				
	Problems	4	2	1	4	l				
		0-1,9 h.rs	2-3.9 hrs	4-5.9 hrs	6-7.9 hrs	St hre				
	Hrs./wk.	6	44 		-					
	Textbook	l	2	4	24	5				
	Syllabus	2	1	3	1	10				
Ĵ.	Library	10	2	-	1	24				
	Problems				3	2				
	<u> </u>	U-1.y hre	8-9-9 BIS	4-2.4 urs	h-/.9 hrs	8+ hrs				
	HFB. / WE.	<u> </u>	<u> </u>							
	Textlook									
	Syllebus									
F	Library									
	Problems				,					
		O-1.9 hrs	2-3-3-12-12-19	4-5. 5 hrs	6-7.9 hrs	8+ hrs				
	Hrs./wh.									
	and the second secon				And a second sec					

TABLE XXI

DISTRIBUTION OF TERM GRADES AND AMERICAN COUNCIL PSYCHOLOGICAL EXAMINA-TION DECILES OF A RANDOM SAMPLE OF 178 OF THE RESPONDENTS ACCORDING TO THE NUMBER OF HOURS PER WEEK OF STUDY

Hrs	Term													
per week stud- ied	grade	ACE Deciles												
		1	2	3	4	5	6	7	g	9	10			
0-1.9	A B C D F	1 1 3	1 1 5 2	1 1 1 8	1 6 4 3	2 3 2 1	1 3 1 1	2 1 1 1	1 3 5 1	3 3 4	3 2 1			
2 -3. 9	▲ B C D F	3 1	1 2 2 2	2	2 1 1	3 3	1 3	2 3 5 2	2 1 3	1 1 1	1			
4-5.9	▲ B C D F	1 1			l		1 1 1			1 1 2 1				
6-7.9	A B C D F		1 1				3	1 3	2		1			
8+	A B C D F		1	1	ħ	2 1	1 1	1 3	2 1	1	1			

Two major questions arise from the nature of this investigation and the limitations of the findings. Are the low correlations found between the amount of homework done and achievement in the college science course a valid analysis of the homework performance-schievement relation, or are the data erroneous? The investigation was designed with the assumption that valid data would be obtained by the log-questionnaire method although the degree of validity has not been ascertained. If the data is assumed to be reasonably valid then many problems for future study can be derived from this study. Ample evidence of scholastic growth of the respondents was found in spite of the apparent lack of relation between achievement and the amount of homework done.

The second question which arises from the study is, what is the nature and extent of the contribution of classroom experiences to the achievement or scholastic growth of students?

The findings of this study do not disprove the existence of a correlative relationship between performance on homework assignments and a characteristic performance on tests over the assignments, but neither do the data corroborate such an assumed relation for the group investigated. An obvious recommendation to be made to all teachers who make a practice of assigning homework is that nearly all of the reported investigations cast considerable doubt on any assumption of a correlative relationship between homework done and achievement. Every teacher practicing the assignment of homework might do well to examine the type of assignment, the method of assignment, and the effects of the assignment in the particular classroom situation where the homework assignment is employed as a regular teaching method.

APPENDIX

I.	Table	
II.	Log-Questionnaire	Materials

III. Clerical and Tabulating Materials

ę

APPENDIX I

TABLE

NUMBERS OF PAGES IN EDUCATIONAL METHODS TEXTBOOKS AND NUMBERS OF PAGES INDICATED BY THE INDEXES AS CONTAINING DISCUSSIONS OF ASSIGNMENTS

		ومحورها متعاليات جدائوا الجواجين وتجاري ويتجاد محصور متعارية تحديا والتحاطية تكرد
Educational methods textbooks, authors, and sources	Total number of pages	Number of pages indexed as discussing Assignments
Almack, John C. and A. R. Lang, <u>The</u> Beginning <u>Teacher</u> (Chicago: Houghton Mifflin Co., 1928)	478	6
Avent, Joseph E., <u>Excellence</u> and <u>Errors</u> in <u>Teaching Methods</u> (Knoxville: Joseph E. Avent, 1931).	563	31
Avent, Joseph E., <u>Beginning Teaching</u> (Knoxville: University of Tennessee, 1927).	596	14
Bagley, William C. and John A. Keith, <u>An Introduction to Teaching</u> (New York: The Macmillan Company, 1927).	400	2
Bagley, William C. and Marion E. Mac Donald, <u>Standard Practices in Teaching</u> (New York: The Macmillan Company, 1938).	189	11
Blackhurst, J. Herbert, <u>Directed Ob-</u> servation and <u>Supervised Teaching</u> (Bos- ton: Ginn and Co., 1925).	420	9
Bossing, Nelson, L., Progressive Methods in Teaching in Secondary Schools (Beston: Houghton Mifflin, 1942).	779	39
Brink, William G., <u>Directing Study Ac-</u> tivities (New York: Doubleday, Doran and Co., Inc., 1937).	738	46

APPENDIX I, TABLE, Cont'd.

Source	Total number of pages	Number of pages indexed as discussing assignments
Brubacher, A. R., <u>Tenching</u> : <u>Pro-</u> <u>fessions and Practice</u> (New York: Century Co., 1927).	301	2
Burton, W. H., <u>Supervision and the</u> <u>Improvement of Teaching</u> (New York: D. Appleton Century Co., 1922).	510	11
Burton, W. H., The Guidance of Learn- ing Activities (New York: D. Appleton Century Co., 1944).	601	13
Butler, Frank A., The Improvement of Teaching in the Secondary Schools (Chicago: University of Chicago Press).	3 39	23
Carr, W. G., and J. Waage, <u>The Lesson</u> <u>Assignment</u> (Stanford University, Calif- ornia: Stanford University Press, 1931).	ာရွ	98
Colvin, Stephen, <u>Introduction to High</u> <u>School Teaching (New York: The Macmillan</u> Co., 1917).	451	7
Crawford, Claude C., <u>How To Teach</u> (Los Angeles: Southern California School Book Depositry, 1933).	511	10
Dearborn, Ned H., <u>An Introduction to</u> <u>Teaching</u> (New York: D. Appleton Century Co., 1925).	337	1
Douglass, H. R., <u>Modern Methods in High</u> <u>School Teaching</u> (Boston: Houghton Mif- flin Co., 1925).	577	15
Fontaine, E. Claske, <u>Ways</u> to <u>Better</u> <u>Teaching in the Secondary School</u> (Bos- ton: Ginn and Co., 1928).	271	24

APPETDIX I, TABLE, Cont'd.

an a		
Source	Total number of pages	Number of pages indexed as discussing assignments
Ford, Frederick A., <u>The Instruc-</u> tional Program (New York: Prentice- Hall, Inc., 1933).	271	۶r
Foster, Herbert H., <u>Principles of</u> <u>Teaching in Secondary Education</u> (New York: Charles Scribner's Sons, 1921).	367	6
Gilmore, Marquis E., <u>Exemplifying</u> Good Classroom <u>Methods and Proce-</u> dures (Boston: The Christopher Pub- lishing House, 1941).	232	l
Goetting, M. L., <u>Teaching in the Sec-</u> ondary <u>School</u> (New York: Prentice-Hall, Inc., 1942).	519	3
Hell-Quest, A. L., <u>Supervised Study</u> , (New York: The Macmillan Company, 1915).	473	32
Heer, Amos L., <u>Steps to Better</u> <u>Teaching</u> (New York: W. W. Norton and Co., 1937).	319	17
Holley, Charles E., <u>High School Teach-</u> ers' <u>Methods</u> (Champaign, Ill: The Garrard Press, 1937).	514	17
Knudsen, Charles W., <u>Evaluation and</u> <u>Improvement of Teacling</u> (New York Doubleday, Doran and Co., Inc., 1932).	538	Ц
Lancelot, W. H., <u>Permanent Learning</u> (New York: John Wiley and Sons, Inc., 1944).	221	Ŗ
Maxwell, C. R., and W. C. Reusser, Observation and Directed Study (New York: Frentice-Hall, Inc., 1939).	737	11

APPENDIX I, TABLE, Cont'd.

.

Source	Total number of pages	Number of pages indexed as discussing assignments
Miller, Harry L., <u>Directing Study</u> (New York: Charles Scribner's Sons, Inc., 1922).	377	μı
Monroe, W. S. <u>Directing Learning</u> in the High School (New York: Double- day, Page, and Co., 1929).	577	7
Morrison, Henry C., The Practice of Teaching in the Secondary School (Chi- cago: University of Chicago Press, 1926).	661	0
Mursell, James L., <u>Successful Teaching</u> (New York: McGraw-Hill Book Co., Inc., 1946).	338	74
Nutt, Hubert W., The Supervision of In- struction (Boston: Houghton Mifflin Co., 1920).	775	1)+
Parker, Samuel C., <u>Methods of Teaching</u> (Boston: Ginn and Co., 1920).	529	2
Reagan, G. W., <u>Fundamentals of Teach-</u> ing (New York: Scott, Foresman and Co., 1930).	554	15
Reeder, Edwin H., <u>Simplifying Teach-</u> ing (New York: Laidlaw Brothers, 1929).	192	11
Reeves, Charles E., <u>Standards</u> for <u>High</u> <u>School Teaching</u> (New York: D. Appleton Century Co., 1952).		31
Risk, Thomas M., Principles and Frac- tices of Teaching in Secondary Schools (New York: American Book Co., 1941).	728	16
Ruediger, William C., <u>Teaching Proce</u> - dures (Boston: Houghton Mifflin Co., 1932).	472	56

APPENDIX I, TABLE, Contid.

and and an and the second s		
Source	Total number of pages	Number of pages indexed as discussing assignments
Russell, Charles, <u>Teaching for To-</u> morrow (New York: Prentice-Hall, Inc., 1937).	477	11
Stewart, W. F., <u>Methods</u> of <u>Good</u> <u>Teaching</u> (Columbus: The Ohio State University Press, 1950).	250	2
Stormgand, Martin, Progressive Methods of Teaching (Boston: Houghton, Mifflin Col, 1927).	381	11
Thayer, V. T., The Passing of the Reci- tation (Boston: D. C. Heath and Co., 1927).	220	<u>ז</u> ר
Thomas, F. W., <u>Principles</u> and <u>Tech-</u> niques of <u>Teaching</u> (Chicago: Houghton Mifflin Co., 1927).	1410	S
Waples, Douglas, Procedures in <u>High</u> School Teaching (New York: The Macmillan Courtany, 1497).	346	16
Wilson, H. B., and G. M. Wilson, <u>The</u> <u>Motivation of School Work</u> (New Yorr: Houghton Vifflin Co., 1921).	273	0
Wilson, H. B., G. C. Hyte, and H. G. Lull, <u>Modern Methods in Teaching</u> (New York: Silver Burdett and Co., 1924).	236	21
Wrinkle, William L., and Winfield D. Argentrout, <u>Directed Observation and</u> <u>Teaching in Secondary Schools</u> (New York: The Macmillan Co., 1932).	: 399	24

an a		
Source	Total number of pages	Number of pages indexed as discussing assignments
Wynne, John P., <u>The Teacher and the</u> <u>Curriculum</u> (New York: Prentice-Hall, Inc., 1937).	утугО	34
Yoakum, Geral A., The Improvement of the Assignment (New York: The Macmil- lan Company, 1932).	298	298
TOTALS	21433	1079

APPENDIX II

LOG-QUESTIONNAIRE MATERIALS

BIOLOGICAL SCIENCE STUDENT'S TERM PROGRESS SHEET AND STUDY LOG

(1) Data for the investigation of the relation between performance of outside assignments and achievement must be solicited from students. You are asked to contribute to the study of this problem by reporting on weekly questionnaires the amounts of the various assignments which you do. Only through your cooperation is such an investigation possible.

(2) The information you report on the weekly questionnaire in the laboratory class will not be used in any way whatsoever to determine or influence your grade in this course or in any other course.

(3) The value of your contribution to the investigation will be determined largely by the accuracy of your reporting on the questionnaires; since the researcher is the only one who will compile the data and his primary interest is in the entire group results, your cooperation will be much appreciated.

(4) The investigation involves an appraisal of the homework assignments made by instructors, the work done on the assignments by students, and achievement of the students as measured by grades or marks.

STUDY LOG*

Week	Textl	000	k	Lec.S	y 1	lat	us Libr	.R	dng.	Stud.P	rol	08.	Hrs.Stud	ied
of	Assign- ed pages	R o a d	R P T t d	Assign- ed pages	R 8 8 8	H H H H H H H H H	Assign- ed pages	R e a d	R p r t d	Assign- ed probs.	D o n e	R P r t d	No.of hr	e R p r t d
Ap r 2														
9			┥╷											
<u>16</u>														
23														
30														
May 7														
<u>14</u>									+					
21	-													
28														

*May be used as a study aid when the assignments are recorded to be done; by noting the completion of the assignment at the time studied the reporting of the data will be more accurate.

APPENDIX II, Cont'd.

QUESTICNNAIRE SCHEDULE

Week of	Approx. time	Procedure
Ap r. 2	10-30 min.	Establish rapport concerning investigation; distribute and discuss term progress sheet and study log.
9	5 min.	Distribute and collect 1st weekly questionnaire.
16	5 min.	Distribute and collect 2nd weekly questionnaire.
-3	5 min.	Distribute and collect proceeding usetionnaire.
30	10 min	 Distribute and collect 4th weekly questionnaire. Distribute and collect written "Re-take" question- naire printed in green; use last 5 min. of class period.
May		
7	5 min.	Distribute and collect 5th weekly questionnaire.
14	5 min.	Distribute and collect 5th weekly questionnaire.
21	5 min.	Distribute and collect 7th weekly questionnaire.
23	5 mir.	Distribute and collect 8th weekly questionnaire.

Emlanations:

- A. The regular weekly reporting on the questionnaires will require little class time if forms are at students' seats when they arrive; students may be encouraged to take the questionnaire blanks with them to fill in during the week as they study. Use of the questionnaire for taking of roll is suggested to save time and to assure regular reporting of data.
- B. The "Re-take" report (5th week) must be carefully handled and sufficient time should be allocated to permit accurate reporting. The re-take consists of asking the students for the same information they have already reported at the first of the hour. The re-take data will be used to determine an estimate of reliability.

APPENDIX II, QUESTIONNAIRE SCHEDULE, Cont'd.

C. Whenever you feel that interest in reporting is lagging seriously, you may take as much time as you feel necessary to encourage class discussion of the investigation and what the students think the results will be.

Your cooperation is very much appreciated as will be any criticism or suggestion you may wish to make as the survey progresses. Thank you.

AFFENDIX II, Cont'd.

BIOLOGICAL SCIENCE 123 STUDENT'S WEEKLY PROGRESS REPORT

Please refer to your study record on your TERM PROGRESS SHEET AND STUDY LOG in answering the questions below; place a check mark on your progress sheet to indicate the reporting of the information which you place on this report.

Question	#1:	How many pages of the assignments in the text have you read since last reporting?
Question	#?:	How many pages of the assignments in the lecture syllabus have you read since last reporting?
Question	#3:	How many pages of the assigned library readings have you read since last reporting?pages.
Question	#11:	How many of the assigned laboratory guide "Study Questions and Problems" have you completed <u>since</u> <u>last reporting</u> ?pages.
Question	#5 :	How many hours have you studied for this course

since last reporting (excluding class time)?..... hours.

Note: In order for the research involved to be of any value it is necessary for you to cooperate in making your data as accurate as possible. Thanks.

APPENDIX III

CLERICAL AND TABULATING MATERIALS

FLOW CHART OF THE CLERICAL AND TABULATING PROCEDURES

1.

Questionnaires were deposited with the investigator by the cooperating instructors.

2.

Questionnaires were sorted and filed alphabetically by the investigator

3.

Stens 1 and 2 resulted in a composite file of all questionnaires in the survey with all questionnaires for each respondent filed together.

4.

Data were transferred by a clerk writin entries as the investigator enecked against the questionnaires.

5.

Data sheet was verified by clerk reading entries as the investigator checked against the questionnaires.

5.

Steps 4 and 5 resulted in a verified composite data sheet for calculations of percentages. 7.

Clerk calculated the percentages of assignments completed and average number of hours per week reported studied; each calculation was checked.

8.

Calculated data, with data from other sources, was transferred by the clerk to a punching schedule.

9.

Data on the bunching schedule was verified by the investigator reading the entries against sources of data on the composite data sheet.

10.

Steps 7 through 10 resulted in a sunching schedule verified for all data to be analyzed.

11.

Key punch operator punched the Hollerith cards from the punching schedule.

12.

Punched cards were verified by the investigator reading from a data sheet printed from the cards and the clerk checking the punching schedule. APPENDIX III, FLOW CHART, Cont'd.

13.

Steps 11 and 12 resulted in verified punch cards.

14.

IBM computing machine operator obtained data for substitution in correlation formula; machine checked at each step.

15.

Investigator computed the correlations from the IBM data; each computation double-checked.

16.

Investigator computed and applied Student t-test for significance of r. SAMPLE HOLLERITH CARD



APPENDIX III, Cont'd.

DATA CARD USED FOR THE COMPUTATION OF THE CORRELATION (COEFFICIENTS IN THIS STUDY



BIBLIOGRAPHY

- Abelson, Harold H. The Art of Educational Research. New York: World Book Company, 1933. 332 pp.
- Allison G., and A. Bernett. "Freshman Psychological Exam Scores as Related to Sizes of High School," Journal of Applied Psychology, 24:651-652, October, 1940.
- Almack, John C., and A. R. Lang. <u>The Beginning Teacher</u>. Chicago: Houghton Mifflin Company, 1923. 478 pp.
- Anderson, I. H., and W. F. Dearborn. "Reading Ability as Related to College Achievement," Journal of Psychology, 11:387-396, April, 1941.
- Armsby, Henry H. "Colleges Teach and Practice Democracy," Journal of <u>Higher Education</u>, 4:196-199, May, 1943.
- Astmore, B. "High School Teachers' Marks as Indicators of College Success." American Association of College Registrars' Journal, 21: 219-230, January, 1946.
- Avent, Joseph, E. <u>Beginning Teaching</u>. Knoxville: University of Tennessee, 1927. 599 pp.
- ville: Joseph E. Avent, 1931. 569 pp.
- Bagley, William C., and John A. Keith. An <u>Introduction to Teaching</u>. New York: The Macmillan Company, 1927. 400 pp.
- Bagley, William C., and Marion E. MacDonald. <u>Standard Practices in</u> Teaching. New York: The Macmillan Company, 1938. 189 pp.
- Bain, Reed. "Stability in Questionnaire Response," <u>American Journal</u> of <u>Sociology</u>, 37:445-453, November, 1931.
- Barnard, J. D. "Group Process in Science Education," <u>Science Educa-</u> <u>tion</u>, 33:267-269, October, 1949.
- Bird, C., and D. M. Bird. Effective Study Habits. New York: D. Appleton Century Co., Inc., 1945. 275 pp.
- Blackhurst, J. Herbert. <u>Directed Observation and Supervised Teaching</u>. Foston: Ginn and Company, 1925. 100 pr.

- Board of Examiners, Michigan State College. <u>Comprehensive Examinations</u> <u>in a Program of General Education</u>. East Lansing: Michigan State College Press, 1949. 165 pp.
- Bossing, Nelson L. <u>Progressive Methods of Teaching in Secondary Schools</u> Boston: Houghton Mifflin Company, 1942. 779 pp.
- Breed, F. S. "How Make Teaching Democratic?" <u>School Review</u>, 57:531-539, December, 1949.
- Brink, William G. <u>Directing Study Activities</u>. New York: Doubleday, Doran and Company, Inc., 1937. 738 pp.
- Broom, M. E. "The Importance of Reading for College Study," <u>Educational</u> <u>Administration and Supervision</u>, 20:189-192, March, 1934.
- Brubacher, A. R. Teaching: Profession and Fractice. New York: Century Company, 1977. 301 pp.
- Buckingham, B. R. "The Questionnaire," Journal of Educational Research, 14:54-55, June, 1926.
- Burton, W. H. <u>Supervision and the Improvement of Teaching</u>. New York: D. Appleton and Company, 1990. 510 pr.
 - . The Guidance of Learning Activities. New York: D. Appleton-Century Company, 1911. 592 pp.
- Butler, Frank A. The Incrovement of Teaching in the Secondary Schools. Chicaro: The University of Okloago Press, 1933. 339 pp.
- Byrns, R. "Predicting College Success by High School Grades," <u>Nations</u> Schools, 10:24-30, July, 1978.
- Carr, William G., and John Waage. The Lesson Assignment. Stanford University: Stanford University Press, 1931. 98 pp.
- Cavan, Ruth S. "The Questionnaire in a Sociological Research Project," <u>American Journal of Sociology</u>, 34:721-727, March, 1973.
- Charles, D. C. "College Ferformance of Top-Quarter High School Gradustes," Journal of Educational Psychology, 39:32-91, February, 1943.
- Charters, W. W. Corriculum Construction. New York: The Macmillan Company, 1324. 352 pp.

ŧ

- Clark, E. H. "High School Standing and College Grades," <u>American Asso-</u> ciation of College Registrars' Journal, 16:276-279, April, 1941
- Clark, E. L. "High School Average Versus High School Class Rank as a Means of Predicting College Grades," <u>School and Society</u>, 34:765-766, December 5, 1931.
- Cohen, Morris R., and Ernest Nagel. An Introduction to Logic and Scientific Method. New York: Harcourt, Brace and Company, 1934. 467 pp.
- Cole, L. W., and J. M. Ferguson. <u>Students' Guide to Efficient Study</u>. New York: Rinehart and Company, Inc., 1931. 70 pp.
- Cole, Luella. The Background for College Teaching. New York: Farrar and Rinehart, Inc., 1940. 516 pp.
- Colvin, Stephen. <u>Introduction to High School Teaching</u>. New York: The Macmillan Company, 1917. 451 pp.
- Condit, P. M. "The Prediction of Scholastic Success by Means of Classification Examinations," Journal of Educational Research, 19:331-335, May, 1929.
- Corey, S. M. "Signed Versus Unsigned Questionnaires," Journal of Educational Psychology, 23:144-148, May, 1937.
- Crawford, A. B. Incentives to Study: <u>A Survey of Student Opinion</u>. New Haven: Yale University Press, 1929. 194 pp.
- Crawford, C. C. The Technique of Research in Education. Los Angeles: University of Southern California, 1928. 320 pp.
 - . <u>How To Teach</u>. Los Angeles: Southern California Book Depository, 1938. 511 pp.
- Croxton, Frederick E., and Dudley J. Cowden. <u>Applied General Statis-</u> <u>tics</u>. New York: Prentice-Hall, Inc., 1939. 944 pp.
- Careton, E. E. "Note on the Validity of the ACE Psychological Exam," Journal of Applied Psychology, 23:306-307, April, 1939.
- Davis, Robert, and Edwin L. Barrow. "Critical Study of the Questionnaire in Education," <u>Educational Administration and Supervision</u>. 71:137-144, February, 1935.
- Dearborn, Ned Harland. <u>An Introduction to Teaching</u>. New York: D. Apoleton and Company, 1925. 337 pp.

- Douglas, H. R. <u>Modern Methods in High School Teaching</u>. Boston: Houghton Mifflin Co., 1926. 544 pp.
- Dressel, Paul L. "The Effects of the High School on College Grades," Journal of Educational Psychology, 30:612-617, November, 1939.
- Dwyer, P. S. "Some Suggestions Concerning the Relationship between Size of High School Attended and Success in College," Journal of Educational Research, 32:271-281, December, 1938.
- Ellis, Max E., and Arthur J. Riopiece, "An Efficient Punched-Card Method of Computing X, X², XY and Higher Moments," <u>Psychometrika</u>, 13: 73-85, June, 1948.
- Ever, B. C. <u>College Study and College Life</u>. Boston: Richard G. Bodger, 1917. 228 pp.
- Ezekial, Mordecai. <u>Methods of Correlation Analysis</u>. New York: John Wiley and Sons, Inc., 1947. 531 pp.
- Finch, F. H., and C. L. Nemzek. "Prediction of College Achievement from Data Collected during Secondary School Period," Journal of Applied Psychology, 18:454-460, June, 1939.
- Fisher, Robert P. "Signed Versus Unsigned Personal Questionnaires," Journal of Applied Psychology, 30:220-225, March, 1346.
- Fontaine, E. Clarke. Ways to Better Teaching in the Secondary Schools. Boston: Ginn and Company, 1928. 271 pp.
- Ford, Frederick A. The Instructional Program. New York: Prentice-Hall, Inc., 1938. 458 pp.
- Foster, Herbert H. Principles of Teaching in Secondary Education. New York: Charles Scribner's Sons, 1921. 367 pp.
- Furfey, Paul H., and Joseph F. Daly. "Product-Moment Correlation as a Research Technique in Education," Journal of Educational Psychology, 26:206-211, March, 1935.
- Gates, A. I., and Jessie La Salle. "The Relative Predictive Values of Certain Intelligence and Educational Tests Together with a Study of the Effect of Educational Achievement Upon Intelligence Scores," Journal of Educational Psychology, 14:517-539, June, 1923.
- Gerberich, J. B. "Study of the Consistency of Informant Responses to Questions in a Questionnaire," Journal of Educational Psychology, 38:299-306, May, 1947.

- Gerberich, J. B., and John M. Mason. "Signed Versus Unsigned Questionnaire," Journal of Educational Research, 42:122-126, October, 1943.
- Gillis, F. M. "Correlates of Intelligence in College Students," <u>School</u> and <u>Society</u>, 34:265-270, August 22, 1931.
- Gilmore, Marquis E. <u>Exemplifying Gold Classroom Methods and Procedures</u>. Boston: The Christopher Publishing House, 1931. 282 pp.
- Goetting, M. L.. <u>Teaching in the Secondary School</u>. New York: Prentice-Hall, Inc., 1942. 519 pp.
- Good, Carter V. <u>How To Do Research in Education</u>. Baltimore: Warwick and York, Inc., 1929. 298 pp.
- Gordon, H. P. "Study Habit Inventory Scores and Scholarship," Journal of Applied Psychology," 25:101-107, February, 1941.
- Greene, E. G. "Effectiveness of Various Rates of Silent Reading of College Students," Journal of Applied Psychology, 15:214-227, April, 1931.
- Hell-Quest, A. L. Supervised Study. New York: The Macmillan Company, 1915. 473 pp.
- Hemilton, E. P. "The Textbook from the Publisher's Point of View," The Wiley Bulletin, XXXV, #1, Spring, 1952.
- Hartman, G. W. "The Interview as a Research and Teaching Device," Journal of Applied Psychology, 17:215-211, April, 1932.
- Hawks, L. J. Certain Relationships Between Scholarship in High School and in College. Baltimore: John Hopkins University, 1931. 58 pp.
- Heer, Amos L. Steps to Better Teaching. New York: W. W. Norton and Commany, Inc., 1937. 318 pp.
- Holley, Charles E. <u>High School Teachers' Methods</u>. Chempaign: The Garrard Press, 1937. 514 pp.
- Holzinger, Karl J. <u>Statistical Methods for Students in Education</u>. Boston: Ginn and Company, 1928. **372** pp.
- Hubbard, F. W. "Questionnaires," <u>Review of Educational Research</u>, 9:502-507, December, 1939.
- Hill, Clark L. "The Correlation Coefficient and its Prognostic Value," Journal of Edicational Research, 15:307-338, May, 1927.

- Humber, W. J. "The Relationship Between Reading Efficiency and Academic Success in Selected University Curricula," <u>Journal of Edu-</u> cational Psychology, 35:17-26, January, 1944.
- Kelley, T. L. <u>Statistical Method</u>. New York: The Macmillan Company, 1921. 390 pp.

<u>Scientific Method: Its Function in Research and Educa-</u> tion. Columbus: The Ohio State University Press, 1929. 195 pp.

- Kilpatrick, William H. Foundations of Method. New York: The Macmillan Company, 1925. 383 pp.
- Knudsen, Charles W Evaluation and Improvement of Teaching. New York: Doubleday, Doran and Company, Inc., 1932. 533 pp.
- Koos, L. V. The <u>Questionnaire</u> in <u>Education</u>. New York: The Macmillan Company, **1928**. 175 pp.
- Krathwohl, W. C. "Effects of Industrious and Indolent Work Habits on Grade Prediction in College Mathematics," <u>Journal of Educational</u> Research, 43:32-40, September, 1349.
- Krech, David, and Richard S. Crutchfield. <u>Theory and Problems of Social</u> <u>Psychology</u>. New York: McGraw-Hill Book Co., Inc., 1948. 539 pp.
- Lancelot, W. H. <u>Permanent Learning</u>. New York: John Wiley and Sons, Inc., 1929. 193 pp.
- Landry, T. M. "Relative Predictive Value of Certain College Entrance Criteria," Journal of Experimental Education, 5:255-260, March, 1937.
- MacPhail, A. H. "Q and L Scores on the ACE Esychological Exam," <u>School</u> and <u>Society</u>, 55:243-251, Septmeber 19, 1949.
- Maxwell, C. R., and W. C. Reusser. <u>Observation</u> and <u>Directed Teaching</u>. New York: Prentice-Holl, Inc., 1939. 434 pp.
- Mar, M. A. "Predicting Academic Success," Journal of Educational Psychology, 14:409-440, September, 1973.
- McGehee, W. "Freshman Grades and the American Council Psychological Exam," <u>School and Society</u>, 47:222-224, February 12, 1938.
- Mendenhall, R. M., and R. Warren. "Compating Statistical Coefficients from Funched Cards," Journal of Educational Psychology, 21:53-62, January, 1930.

- Miller, Harry L. <u>Directing Study</u>. New York: Charles Scribner's Sons, 1922. 377 pp.
- Monroe, Welter S. <u>Directing Learning in the High School</u>. New York: Doubleday, Page and Company, 1929. 577 pp.
 - e and D. B. Stuit. "Correlation Analysis as a Means of Studying Contributions of Causes," Journal of Experimental Education, 3:155-165, May, 1935.
- . "Note on the Interpretation of Coefficients of Correlation," Journal of Educational Psychology, 27:551-553, October, 1936.
 - , ed. Encyclopedia of Educational Research. New York: The Macmillan Company, 1950, 1520 pp.
- Morrison, Henry C. The Practice of Teaching in the Secondary School. Chicago: University of Chicago Fress, 1926. 661 pp.
- Mursell, James L. <u>Successful Teaching</u>. New York: McGraw-Hill Book Company, Inc., 1946. 338 pp.
- Norton, J. K. The Questionnaire. National Education Association Research Bulletin, VIII, #1, January, 1930.
- Nutt, Hubert W. The Supervision of Instruction. Boston: Houghton Mifflin Company, 1920. 277 pp.
- Olson, W. C. "The Waiver of Signatures in Personal Data Reports," Journal of Applied Psychology, 20:442-450, June, 1936.
- Orr, H. K. "College Achievement; comparison of the records made in college by students from fully accredited high schools with the conof students having equivalent ability, from 2nd, and 3rd class high schools," Journal of Educational Research, 42:353-364, Janmary, 1949.
- Parker, Samuel C. <u>Methods of Teaching in High Schools</u>. Boston: Ginn and Company, 1920. 529 pp.
- Featman, John G., and Israel Greenspan. "Reliability of a Questionnaire on the Superstitious Beliefs of Elementary School Children," <u>Journal of Abnormal and Social Psychology</u>, 30:208-221, July, 1935.
- Powers, S. R. "An Evaluation of Science Teaching in Senier High School," <u>The Scientific Monthly</u>, Vol. 74, #5, 273-275, May, 1952.

- President's Commission on Higher Education. <u>Higher Education for American</u> <u>Democracy</u>. New York: Harper and Brothers, 1947. Vol I, 103 pp.
- Raup, R. Bruce, George E. Axtelle, Kenneth D. Benne, and Othan Smith. <u>The Improvement of Practical Intelligence</u>. New York: Harper and Brothers, 1947. 303 pp.
- Feagan, G. W. Fundamentals of Teaching. New York: Scott, Foresman and Company, 1932. 554 pp.
- Reeder, C. W. "Study Habits," <u>School and Society</u>, 42:413-415, September 21, 1937.
- Reeder, Edwin H. Simplifying Teaching. New York: Laidlaw Brothers, 1929. 192 pp.
- Reeves, Charles E. <u>Standards for High School Teaching</u>. New York: D. Appleton-Century Co., 1932. 558 pp.
- Requa, D. "Does High School Rank Determine College Success?" <u>American</u> <u>Association of College Registrars</u>' Journal, 16:299-305, April, 1941.
- Riff, Melvin. "The Relation of College Achievement Tests to Grades and to Intelligence," Journal of Educational Psychology, 30:397-400, May, 1939.
- Risk, Thomas M. Principles and Fractices of Teaching in Secondary Schools. New York: American Book Co., 1941. 728 pp.
- Ruediger, William C. <u>Teaching Procedures</u>. Boston: Houghton Mifflin Company, 1932. 472 pp.
- Russell, Charles. <u>Teaching for Tomorrow</u>. New York: Prontice-Hall, Inc., 1937. 477 pt.
- Ryans, D. G. "Some Observations Concerning the Relationship of Time Spent at Study to Scholarship and Other Factors," <u>Journal of Edu-</u> <u>cational Psychology</u>, 30:372-377, May, 1939.
- Saupe, Mildred W. "Size of High School as a Factor in College Success of Average and Superior Graduates," <u>American Association of College</u> <u>Registrars</u> Journal, 17:45-47. October, 1941.
- Schneider, G. G., and R. F. Berdie. "Educational Hierarchies and Scholastic Survival," <u>Journal of Educational Psychology</u>, <u>33:199-208</u>, March, 1947.

- Seder, M. "Reliability and Validity of the ACE Psychological Exam, 1938 ed.," Journal of Educational Research, 34:90-101, October, 1940.
- Segel, D., and J. R. Gerberich. "Differential College Achievement Predicted by the American Council Psychological Exam," <u>Journal of Ap-</u> <u>plied Psychology</u>, 17:637-645, December, 1933.
- Selle, S. B. "Observational Methods of Research; Questionnaires," Review of Educational Research, 18:436-438, December, 1948.
- Seyler, E. C. "Value of Rank in High School Graduation Class for the Prediction of Freshman Scholarship," <u>American Association of College Registrers' Journal</u>, 15:5-22, October, 1939.
- . "The Value of Rank in High School Graduation Class for Predicting Scholastic Achievement in College," <u>American Association</u> of College Registrars' Journal, 16:123-133, January, 1941.
- Shuttleworth, F. K. "Study of the Questionnaire Technique," Journal of Educational Psychology, 22:652-658, December, 1931.
- Smith, Francis F. "Direct Validation of Questionnaire Date," <u>Educa-</u> tional Administration and <u>Supervision</u>, 21:561-575, November, 1935.
- Stith, T. V., and Eduard C. Lindeman. The Democratic Way of Life. New York: The New American Library of World Literature, Inc., 1951. 159 pp.
- Stewart, W. F. <u>Methods of Good Teaching</u>. Columbus: The Ohio State University Press, 1950. 200 pp.
- Stormzand, Mertin J. Progressive Methods of Teaching. Boston: Houghton Mifflin Commany, 1927. 381 pp.
- Symonds, Percival M. "Methods of Investigation of Study Habits," <u>School</u> <u>And Society</u>, 21:145-152, July 31, 1926.
- Thayer, V. T. The Passing of the Recitation. Boston: D. C. Heath and Company, 1978. 331 pr.
- Thomas, F. W. Principles and Techniques of Teaching. Chicago: Houghton Mifflin Company, 1927. 410 pp.
- Thornberg, L. H. "College Scholarship and Size of High School," <u>School</u> and Society, 30:189-192, August 9, 1924.
- Tours, Herbert A. "Validating the Quistionnaire Method," Journal of Ecroprel Research, 2:153-160, August-September, 1923.

- Trebilcock, W. E. "Many of the Lowest Third of our Graduates are College Material," <u>Clearing House</u>, 12:544-546, May, 1938.
- Triggs, Frances O. "Reading at the College Level," Journal of Higher Education, 20:65-70, February, 1949.
- Tschuprow, A. A. <u>Principles of the Mathematical Theory of Correlation</u>. New York: Nordeman Publishing Co., Inc., 1939. 194 pp.
- Tuttle, G. P. "The Predictive Value of Rank in High School Graduating Class," <u>Bulletin of the American Association of College Registrars</u>, 12:111-118, January, 1937.
- Wade, N. A. "Comparison of the Time Spent by First-Year Students and Expected by Teachers in a State Normal School," <u>Journal of Educa-</u> <u>tional Research</u>, 19:183-187, March, 1929.
- Wallace, W. L. "Fredictive Value of the ACE Psychological Examination," School and Society, 70:23-25, July 9, 1949.
- Waples, Douglas. Procedures in High School Teaching. New York: The Macmillan Company, 1927. 346 pp.
- Natson, I. "Significance of High School Marks for Predicting College Success," <u>High School Teacher</u>, 10:257, November, 1934.
- Weinland, J. O. "How Successful College Students Study," <u>Journal of</u> <u>Educational Psychology</u>, 21:521-526, October, 1930.
- Wetzel, William A. <u>Biography of a High School</u>. New York: American Book Company, 1937. 327 pp.
- Whipple, George M. "The Improvement of Educational Research," <u>School</u> and <u>Society</u>, 26:249-250, August 27, 1927.
- Whitney, F. P. "The Destionnaire Craze," Education Review, 68:139-140, October, 1924.
- Wiley, L. E., and H. J. Sheridan, "Study of College Grades," <u>American</u> <u>Association of College Registrers' Journal</u>, 17:28-34, October, 1941.
- Williamson, E. G. "Relationship of Number of Hours of Study to Scholarship," Journal of Educational Psychology, 25:682-685, December, 1935.
- Wilson, H. B., and G. M. Wilson. The Motivation of School Work. New York: Houghton Mifflin Company, 1991. 773 pp.

- Wilson, H. B., G. C. Kyte, and H. G. Lull. <u>Modern Methods of Teaching</u>. New York: Silver, Burdette and Company, 1924. 286 pp.
- Wittenborn, J. R., R. P. Larson, and R. L. Mogil. "Empirical Evaluation of Study Habits for College Courses in French and Spanish," Journal of Educational Psychology, 36:449-474, November, 1945.
- Woodring, M. N., and C. W. Flemming. "Directing Study Through the Assignment," Teachers College Record, 33:673-695, May, 1932.
- Wrenn, C. G., and W. J. Humber. "Study Habits Associated with High and Low Scholarship," Journal of Educational Psychology, 32:511-516, November, 1941.
- Wrinkle, William L., and Winfield D. Armentrout. <u>Directed Observation</u> and <u>Teaching in Secondery Schools</u>. New York: The Macmillan Company, 1932. 393 pp.
- Wylie, A. T. "To What Extent May We Rely Upon the Answers to a School Questionnaire?" Journal of Educational Method, 6:252-257, February, 1927.
- Wynne, John P. The Teacher and the Curriculum. New York: Prentice-Hall, Inc., 1937. 440 pp.
- Yoakum, G. A. The Improvement of the Assignment. New York: The Macmillan Company, 1932. 298 pp.