

A COMPARATIVE INVESTIGATION OF
NO-HOMEWORK AND DAILY TEST
RELATIVE TO ACHIEVEMENT IN
SECOND YEAR ALGEBRA

MEMORANDUM

WILLIAM EARL COVINGTON

To the Graduate Council:

I am submitting herewith a Thesis written by William Earl Covington entitled "A Comparative Investigation of No-Homework and Daily Test Relative to Achievement in Second Year Algebra." I recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Arts in Education, with a major in Mathematics.

William G. Stokes
Major Professor

We have read this thesis and
recommend its acceptance:

Fred A. Bunger
Minor Professor

Gene B. Smith
Third Committee Member

Accepted for the Council:

Wayne E. Stamp
Dean of the Graduate School

A COMPARATIVE INVESTIGATION OF NO-HOMEWORK
AND DAILY TEST RELATIVE TO ACHIEVEMENT
IN SECOND YEAR ALGEBRA

An Abstract
Presented to
the Graduate Council of
Austin Peay State University

In Partial Fulfillment
of the Requirements for the Degree
Master of Arts
in Education

by
William Earl Covington
August 1968

ABSTRACT

The purpose of this study was to compare the effectiveness, in terms of achievement, of daily tests or homework on the progress of students who enroll in second year algebra.

Three groups of students at Cumberland High School, Nashville, Tennessee, were involved in the study. Since it was impossible to equate the three classes on a matched basis, mean achievement scores of the students were adjusted by an analysis of covariance with mathematical ability at the beginning being used as a predictor variable. A total of eighty-eight students were involved in the experiment over a period of eighteen weeks. The investigator taught all three groups.

For the first semester of the second year algebra course, the three classes were taught in the conventional manner. At the end of that semester the Cooperative Mathematics Test, Form A, was given to determine the level of achievement of each student before the beginning of the experimental period.

At the beginning of the second semester the method of instruction for the three algebra classes was changed. The course content for all groups was the same but the method of instruction was different. Class A was designated as the no-homework group, Class B as the graded homework

group, and Class C as the daily test group. All three groups were designated as experimental groups because the three methods of instruction used in the experiment were unlike that used during the first semester.

After administration of the final test the gain of each group was computed over the experimental period. The analysis of covariance revealed that the mean differences in gain among the three groups were not significant at the five per cent level. This indicates that the conventional graded homework approach and the daily quiz approach were of no greater value, in terms of achievement, than the no-homework method.

The investigator makes the following recommendations:

- (1) Continued investigation of the effect of homework on achievement should be carried out.
- (2) Experiments involving a larger number of students of equal abilities should be conducted.
- (3) Investigations should be carried out in which a class with both graded homework and daily tests is compared to a class with no-homework.
- (4) Investigations should be made to determine the effect of homework in other areas of mathematics.
- (5) A study should be made to determine the effect of homework at the different ability levels.

ACKNOWLEDGEMENT

The writer wishes to express his appreciation to the members of his Graduate Committee, Dr. William Stokes, Dr. Fred Bunker, and Professor George Brotherton for their guidance in the preparation of this thesis. The writer extends a special thanks to the chairman of the Committee, Dr. William Stokes, for his patience and understanding throughout the many months of this study. Without his help in preparation of the research design and of the statistical analysis this thesis would not have been possible.

A COMPARATIVE INVESTIGATION OF NO-HOMEWORK
AND DAILY TEST RELATIVE TO ACHIEVEMENT
IN SECOND YEAR ALGEBRA

A Thesis
Presented to
the Graduate Council
Austin Peay State University

In Partial Fulfillment
of the Requirements for the Degree
Master of Arts
in Education

by
William Earl Covington

August 1968

TABLE OF CONTENTS

CHAPTER	PAGE
I. THE NATURE AND SCOPE OF THE PROBLEM	1
Introduction	1
Purpose of Study	1
Definitions of Terms	1
Delimitations	2
Basic Assumption	3
Basic Hypothesis	3
The Significance of the Study	3
Experimental Procedure	6
Test Validity	9
Test Reliability	10
II. RELATED LITERATURE	11
Literature Dealing with Opinions	
Against Homework	13
Literature Dealing with Opinions	
in Favor of Homework	18
Literature Dealing with Surveys	
of Practices	23
Literature Dealing with Experimental	
Studies in Different Fields	28

CHAPTER	PAGE
Literature Dealing with Experimental	
Studies in the Field of Mathematics	31
Summary	34
III. TREATMENT OF DATA	36
Initial Difference Among the Groups	36
The Effect of the No-Homework, Graded	
Homework, and Daily Quiz Methods of	
Teaching on Achievement in Second	
Year Algebra.	39
IV. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS . . .	43
Summary and Conclusions	43
Recommendations	44
BIBLIOGRAPHY.	47
APPENDIX.	51

LIST OF TABLES

TABLE		PAGE
I.	Comparison of Initial Scores on the Cooperative Mathematics Test, Form A	37
II.	Summary of Sums of Raw Scores and Squares of Raw Scores for the Pre-test (Cooperative Mathematics Test Form A)	37
III.	Analysis of Variance for Initial Differences . .	38
IV.	Comparative Gains of Scores on the Final Test (Cooperative Mathematics Test Form B).	40
V.	Summary of Sums of Raw Scores, Squares of Raw Scores, and Sum of Products for the Pre-test (Form A) and Gain Scores.	41
VI.	Analysis of Covariance for Achievement in Second Year Algebra.	42

CHAPTER I

THE NATURE AND SCOPE OF THE PROBLEM

Introduction

For many years a difference of opinion has existed regarding the effectiveness of assigned homework relative to achievement in various subjects. It is believed that no such research on this subject has taken place in regard to classes at Cumberland High School of Nashville, Tennessee. It is felt that this subject merits research relative to the students of that school.

Purpose of Study

It is the purpose of this study to compare the effectiveness, in terms of achievement of three methods of teaching second year algebra. Many studies have made the attempt to show that higher achievement is attained when homework is required. Other studies argue that the level of achievement is not affected when there is no homework required. This study attempts to answer that question, by comparing measured differences in achievement in a class where no homework is required, a class given a daily quiz, and a class where homework is checked daily.

Definitions of Terms

Conventional Method. This refers to the approach

that was taken in the development of the mathematics under consideration during the eighteen weeks prior to the beginning of this experiment. This approach consisted of discussion of previous assignments and new concepts and material with a regular daily homework assignment. It was not a standard procedure to collect and grade homework assignments regularly.

Homework. This refers to the solution of problems in second year algebra similar to those discussed during the lecture portion of the class period. This preparation is to be made outside of the regular class period.

Second Year Algebra. This refers to the course of mathematics taken after a mastery of the fundamentals of algebra is accomplished. This course is designed to give the students a sound basis for further study of mathematics and the other sciences.

Tenth Year Mathematics. This will refer to second year algebra.

Delimitations

This study was delimited to a period of eighteen weeks. This period of time represented the second semester of the second year algebra course taught at Cumberland High School, Nashville, Tennessee. It was not possible to

equate the three classes in regard to ability or environmental factors such as the time of day. The investigator did teach all three classes. Other than the variable of homework, all variables were controlled as closely as possible.

Basic Assumption

It was assumed that the instruments of evaluation, employed in this experiment, satisfactorily measure achievement in the mathematics under consideration.

Basic Hypothesis

The null hypothesis is made that there is no difference in achievement in the class that was assigned homework, the class that was given a daily quiz, and the class that was not assigned homework. The five per cent level of significance will be required.

The Significance of the Study

There has been considerable discussion in the field of education in regard to the question of homework for many years. The educational theory of homework in mathematics, as well as other fields of study, has been challenged in recent years regarding its effect upon the achievement of students, the values of kinds and amounts of

homework, and the attitude of parents, pupils, and teachers toward homework.¹

A number of studies indicate that little or no gain in academic achievement results from assigned homework. Other studies take the opposite view and contend that homework is meaningful and that achievement is increased by its use. Numerous articles are found in The Educational Readers Guide from the early 1920's to 1968 questioning the value of homework and expressing the need for further research.

In an article for The Literary Digest it is suggested by Bassett that homework be abolished. In expressing this extreme view, he says:

I believe that 'homework' should be abolished, and that the recitation hours should be so lengthened that a part of each period may be devoted to directed study of the next days work.²

Similarly Jones and Ross³ believe that there is a need to abolish homework and let supervised study take its place. They suggest that the school day be lengthened or

¹Henry J. Otto, "Homework by Pupils," Encyclopedia of Educational Research, Revised, Macmillan, 1950, pp. 380-381.

²Arthur E. Bassett, "Conservation of the School Children," The Literary Digest, CXVIII, Sept. 29, 1934:24.

³Ronald D. Jones and Calvin Ross, "Abolish Homework-Let Supervised Study Take its Place," Clearing House, 39:206-209, Dec. 1964.

so organized to include at least one hour, and probably more, of supervised study in which all classrooms should remain open with the teachers present and willing to assist the students who elect to come to that particular room for study. Students should be free to go from room to room and study under the teacher that assigned the work.

Jones believes that:

Creativity, interest, and enthusiasm for learning is crippled and teachers and schools take on the aura of reformatories. To combat the educational delinquency produced by assigned homework, teachers are forced to wear two hats--teacher and policeman.⁴

On the other hand, a large section of the public is convinced that homework does have its advantages and that students should bring work home to be completed at night. According to Corbally⁵ some of these advantages are that:

1. It requires a student to develop the techniques of organizing his own time so that he can both complete his school work and engage in other activities.
2. Homework has a tendency to bring the school into the home in that the parents can see what is being learned and the work it requires.
3. Homework develops the idea that the gaining of an education is a full-time job.

⁴Ibid.

⁵John E. Corbally, Jr., "High Standards Call for a Homework Program," Clearing House 27:421-2, Mar. 1953.

4. Homework offers flexibility to the course of study in that additional topics can be considered and completed in the evening.

There are few experimental studies mixed with the opinion articles and surveys and it is felt that this research is significant because it does involve experimental procedures. This study should stimulate similar research in other areas of the secondary school mathematics program.

Experimental Procedure

For the first semester of the school year 1966-67 three second year algebra classes of Cumberland High School were taught in the conventional manner. A total of eighty-eight students were involved and the investigator taught all three groups.

At the end of the first semester the Cooperative Mathematics Test in second year algebra, Form A, was given. This test was prepared by the Educational Testing Service and was given at this time to determine the achievement level of each student at the end of the first semester.

Beginning the second semester the method of instruction for the three algebra classes was changed. The classes were classified as follows:

1. Class A was designated as an experimental group to which no homework assignments were given.

2. Class B was designated as an experimental group and was assigned daily homework that was to be graded and returned to the student.

3. Class C was designated as an experimental group to which homework was assigned daily but was not graded. A brief test consisting of one or two problems was given to this class each day over problems assigned for that day.

The class period for Class A was divided into two sections, the first of which was used for instruction and the second for supervised study. The instructional portion of the class period consisted of discussion of general questions over the previous day's work and the development of new ideas and topics in appropriate order of sequence. The supervised study portion of the class period was used to work problems similar to those discussed in the instruction period. The students were instructed to work as many of the problems found in the textbook on this particular topic as the remaining time allowed. The higher ability and the more interested students may have worked outside of class even though no homework was assigned. If the average students needed additional time on a particular topic that time would be provided in the classroom. During the eighteen weeks of the experiment Class B was assigned homework which was collected each day and graded to be returned the next day. The homework was collected before the

problems were placed on the board.

Class C followed essentially the same procedure as Class B except the homework was not collected and graded although it was assigned. The only other difference in Classes B and C was that Class C had a short time allotted each day for a quiz which covered the concept or topic discussed the previous day.

All three experimental groups were treated identically in the following respects:

1. The investigator taught all three groups.
2. The same topics were covered in each group in the same order of sequence.
3. Each group met for five periods of sixty minutes each week for eighteen weeks.
4. The same pre-tests and final tests were administered to all three groups.

The investigator was aware of the problem of being both the investigator and instructor and tried to treat the groups differently only in the respect necessary to the development of this research.

At the end of the second semester, Form B of the Cooperative Mathematics Test was administered to each of the classes and the gain was computed over the experimental period. Since the investigator was in no position to group the students according to ability, the resulting variables

were controlled by an analysis of covariance.

In order to measure differences of achievement resulting from different methods of teaching, it is required to know whether the groups are equivalent groups or whether there are variables present which might affect the outcome of the experiment. In order to establish the equivalency of the groups an analysis of variance was employed using the initial scores of the tests given at the end of the first semester.

Although there are no significant differences in the three classes, measured differences exist. Because of this the initial scores on the Cooperative Mathematics Test were used as the predictor variable. This statistical technique makes adjustments for initial differences among the group.

Test Validity

According to Garrett, the validity of a test depends upon the "fidelity with which it measures whatever it purports to measure."⁶ In the area of content validity, the Educational Testing Service appointed an advisory committee of ten leaders in mathematics education to work with them to develop the new series of tests in 1964.⁷

⁶Henry E. Garrett, Statistics in Psychology and Education, New York, Longmans, Green and Company, 1953, p. 344.

⁷Ibid.

This series of tests included those used in this experiment.

Forms A and B of the Cooperative Mathematics Tests were studied by the investigator to be sure that the content validity, found by the advisory committee, agreed with that in respect to his own course content. The tests were found to be satisfactory in that sense.

Test Reliability

Garrett says that the reliability of a test depends upon "the consistency with which it gauges the abilities of those to whom it has been applied."⁸ The Educational Testing Service gives sufficient evidence, in a manual of interpretations, to insure reliability of the tests employed.

⁸Ibid., p. 332.

CHAPTER II

RELATED LITERATURE

Homework has been the subject of controversy among educators for many years. There have been many studies made related to homework and student achievement but lack of adequate research instruments, differentiated home environments, and different personalities make generalizations about homework difficult. Many articles reported in journals are opinion articles and not experimental ones.¹

Exactly how many years ago the idea of homework was first questioned is brought to light by an article by Miller² in which he points out that the catalog of Bessie Tift College, Forsyth, Georgia, for the year 1897-1898, stated that lesson preparation at home was not desirable. Miller thinks that the Bessie Tift College may have been ahead of the times in its attitude toward children and freedom. Miller quotes from the catalog:

We do not believe in over crowding children's minds. Let the children be free and happy and we will have no trouble in making them understand and enjoy their recitations.³

¹John Check, "Homework--Is It Needed?" Clearing House, 41:143-7, Nov. 1966.

²Starr Miller, "Was This Voice First to Question the Value of Homework?" The Clearing House, 29:359, #6, 1955.

³Ibid., p. 360.

Loftus⁴ states that the problem of homework began long ago in England. The English schools were boarding schools with some day students attending. It was believed by the boarding school masters that the day students would need outside work to keep up since the regular students had an evening period of supervised study to complete their work for the next day. It was felt that comparable amounts of work for the day students would provide a similar experience.

The investigator found that much of the literature concerning homework was opinion rather than experimental in nature. The literature contained in this study has therefore been divided into the following groups:

- (1) Literature dealing with opinions against homework.
- (2) Literature dealing with opinions in favor of homework.
- (3) Literature dealing with surveys of practices.
- (4) Literature dealing with experimental studies in various fields.
- (5) Literature dealing with experimental studies in the field of mathematics.

⁴Col. E. A. Loftus, "The Homework Question," Journal of Education (London), 67:713-715, Nov. 1935.

Literature Dealing with Opinions Against Homework

The arguments against homework have been basically the same for the past thirty years. To illustrate the similarity of opposition over the period from 1938 to 1968, the following arguments against homework were given by Peters⁵ in 1938:

- (1) Homework deprives a child of rest and recreation.
- (2) After six or seven hours in class his physical development requires an equal amount of exercise.
- (3) It is said that the amount of homework depends on whims, personality, and efficiency of the individual teacher, not upon the needs of the children.
- (4) Homework has little value as an educative device because it becomes mechanical.
- (5) Home conditions are seldom ideal for home study.
- (6) Study must be directed and supervised to be effective.
- (7) Homework is not necessary to enable a child of average intelligence to acquire an education.

A more recent article for the N. E. A. Research Bulletin⁶ gives its case against homework as follows:

⁵R. F. Peters, "The Pro and Con of Home Study," American School Board Journal, 97:47-48, Aug. 1938.

⁶N. E. A. Research Bulletin, 45:28-29, March 1967.

(1) Homework often leaves little time for other worthwhile activities outside the classroom.

(2) It may reduce the pupil's interest and enthusiasm for school, and may lead to dislike of school.

(3) Homework is often done by parents or copied from other pupils.

(4) Homework is usually geared to the "average" pupil, while individual differences are not taken into account.

(5) Homework necessitates additional time for planning, evaluating, and recordkeeping.

(6) Homework lacks planning, with the result that a pupil may be loaded with heavy assignments from several teachers on the same day and have no assignments on another day.

Sylvester⁷ reports that although many educators believe in the no-homework idea many high schools continue in the same way. Sylvester writes:

There are thousands of boys and girls all over America who would be far better educated for the world of tomorrow if 'homework' as we now know it were tossed bodily out of the educational window.⁸

⁷Harold D. Sylvester, "Homework Dilemma," Parent's Magazine, 25:70, Sept. 1950.

⁸Ibid.

Klein⁹ believes that the procedure of assigning homework which says, "Just a minute class. Homework for tomorrow is page 00, examples 1-5," is unfair. It is unfair because all students do not need the same assignment. This type of assignment is difficult for the teacher to check, leaves some pupils under great strain and pressure, and it also promotes copying among students. He feels that homework habitually imposed by the teachers offers no challenge, but the homework which a child chooses for himself does. Assignments could be of a remedial nature for the slower children, but the better students get enough practice during class and therefore would like to choose the type of activities more interesting for outside of class.

Maberry¹⁰ tells of a no-homework plan that succeeded. The students of Bangs, Texas, public schools went home at the close of the first day of school last year and astonished their parents by announcing to them that they would no longer be required to do their studying at home. The school system had decided to try the no-homework idea for themselves and found the following results:

⁹Rose Klein, "Self-Directed Homework," The Mathematics Teacher, 44:463-465, Nov. 1951.

¹⁰Arthur L. Maberry, "The No Home Study Plan Succeeds," Texas Outlook, 20:25, Mar. 1936.

(1) The students generally have found that they no longer have to choose between being book-worms or campus loafers. Now they may all have balanced schedules, time, and recreation.

(2) Students are taking more active parts in club and class activities.

(3) The use of the library has increased approximately four hundred per cent because students are free to read during their off periods at school.

(4) Parents are more observant since the school is run on a more business-like basis.

(5) Parents feel that children are getting more from school.

(6) Textbooks are in excellent condition because they have stayed at school.

McGill¹¹ points out that psychologists do not feel that drill is the answer. He believes that good teaching will bring good results without so much homework and that a shorter lecture with time for supervised study could be much more effective. He quotes Horn, who says:

There is no such thing as a method of teaching that is good for all subject matter at all times and at

¹¹James V. McGill, "Ecoergomachy," High Points, 34:35-38, Oct. 1952.

all places. Rather, there are methods which, in a given situation, for a definite purpose, at some specific grade level, and with such instructional equipment as is available, in a specified unit of subject matter organized in a certain way and placed in a certain sequence can be taught to students of a given kind and distribution of ability of background and experience.¹²

Arnold¹³ argues against homework for children and teachers. Teachers have homes and loved ones of their own and probably don't want to be burdened with homework themselves. He agrees that a few arguments for homework are well-known and have merit. Sometimes a gifted, enthusiastic child may be so eager for knowledge that he actually wants homework and he should have it. Even in his case it should be voluntary.

Strang¹⁴ believes that to make page assignments in textbooks, unmotivated and unexplained, is unfair because it doesn't give all children satisfaction of learning. Assignments of this type do not regard individual differences within the class. She believes that the role of the teacher is one of guidance. He should encourage students

¹²Ibid., p. 37.

¹³Oren Arnold, "Should Homework be Abolished?" N. E. A. Journal, 54:22-24, Feb. 1965.

¹⁴Ruth Strang, "Guided Study and Homework," N. E. A. Journal, 44:399-400, Oct. 1955.

to set meaningful goals for themselves by helping them to discover learning aids and by making the work as challenging as possible.

Maybee¹⁵ feels that textbook assignments and practice exercises should be carried out at school under the teacher's guidance. Homework, insofar as possible and practical, should be limited to reading for pleasure, information and research, for literary writing and preparing reports, and for scientific experimentation. Every school should make periodic studies of ways in which pupils use their out of school time. The data is essential for good curriculum planning and effective home assignments.

Moler¹⁶ says that many leading educators are asking school officials to discontinue the practice of homework. Officials of the National Educational Association agree that learning goes on when children are working in groups and discussing what they are studying.

Literature Dealing with Opinions in Favor of Homework

The proponents in favor of homework have also kept basically the same view over the last thirty years. In a

¹⁵G. D. Maybee, "Homework in Junior High Schools," National Association of Secondary School Principals, 47: 16-17, Oct. 1963.

¹⁶James Moler, "Homework Works Better If," N. E. A. Journal, 43:562-563, Dec. 1954.

recent article the case for homework is presented by the N. E. A. Research Bulletin¹⁷ as follows:

(1) Homework allows students to complete unfinished class assignments and to make up work missed during absences.

(2) Homework reinforces what was learned in the classroom.

(3) It provides opportunity for study projects which supplement material studied in the classroom.

(4) Homework provides a background for classroom learning.

(5) Homework enriches the classroom experience by relating what has been learned in the classroom to everyday problem-solving situations.

(6) It helps the pupil to develop initiative, independence, self-discipline, and responsibility.

(7) Homework helps the pupil to develop permanent leisure interests in learning.

Peters¹⁸ gives similar arguments for homework as early as 1938:

(1) Congested classes and overburdened curricula

¹⁷N. E. A. Bulletin, Op. cit.

¹⁸Peters, Op. cit.

make homework necessary for the children to cover an adequate amount of material.

(2) Homework binds the child closer to his home.

(3) Homework helps to bring better relationships between the home and school.

(4) Homework helps to develop a feeling of responsibility.

(5) Homework tends to make school work a part of out-of-school situations.

Dodes¹⁹ states that homework seems to have value in mathematics but little in the field of social studies and he believes that parents need to become aware of the fact that all subjects are not taught in the same way or have the same requirements. When this is accomplished parents could understand the discontinuance of homework in areas where it is not beneficial. He says:

We may conclude that all available evidence seems to indicate that the worth or lack of worth of any method in one subject does not necessarily predict its value in another subject.²⁰

Perkins²¹ states that one of the main values of

¹⁹Irving A. Dodes, "The Homework Problem," High Points, 35:15-16, April, 1953.

²⁰Ibid., p. 16.

²¹Richard B. Perkins, "Homework," N. E. A. Journal, 42:478, Nov. 1953.

homework is the development of desirable study habits. Before these habits can be developed, Perkins suggests that quiet, comfortable places to study, uninterrupted time, good light, proper ventilation, and necessary materials are necessary.

Shaw²² replies to those who are critical of homework by arguing that if homework is constructive and reasonable then it is valuable. He reports that homework should provide experiences that help the student explore his individual needs and interests. At the high school level students need the motivation and opportunity to develop independent habits of study and discipline. The creative thinking and research which a pupil does outside his scheduled school day, and in a subject which he has chosen, promotes self-education.

Basil²³ believes that homework is essential in building of character and helps children to become independent in their work. Through homework, a student can practice what he learned in the classroom and stimulate the use of his mind instead of entirely using all his energy in physical activity. Basil feels that one of the greatest values of

²²Betty M. Shaw, "Should Homework be Abolished?" N. E. A. Journal, 54:22-24, Feb. 1965.

²³Brother Basil F.S.C., "Homework in the Elementary School," Catholic School Journal, 52:131, April, 1952.

homework is that of self-discipline, which is a major step in building character.

In an article for Better Homes and Gardens, Smith²⁴ says that parents can set the stage for their children to do homework willingly. Parents should see and approve of assignments before the work is turned in and after it has been corrected.

Morse²⁵ discussed the activities of a PTA meeting held at Glen Lea Elementary School in Virginia in which a mother defended homework because the crowded classroom situation did not allow the teacher time to supervise all the students on any given day. Therefore, she felt that parents could help with this supervision at home.

Parochial school faculties seem to have a stronger feeling in favor of homework. Loughery says:

In the education of the child, there are certain functions or duties that belong completely to the home which cannot and should not be taken over by any other agency. Likewise there are delegated functions that are solely the work of the school and the school should be left free to carry them out. However, there are certain phases of the child's education in which both home and school have an active part, and it is in these areas that close home-school cooperation is called for if the child, the mutual

²⁴C. Howard Smith, "Homework," Better Homes and Gardens, 29:160, Jan. 1950.

²⁵Nita Morse, "Is or Isn't Homework of Use to Pupils?" Virginia Journal of Education, 46:19-20, Feb. 1953.

interest of both parent and teacher, is to receive the full benefit of the education that is being given to him. This education is not simply the acquisition of facts.²⁶

Alpher²⁷ believes that parents and children speak different languages concerning homework but that they have a common goal. Parents agree on the necessity of homework but not on the quantity. She tells of the forming of a parent and teacher group for the purpose of discussing and working out the solutions to their problems concerning homework. They agreed that homework helps to develop self-reliance, that homework should be definite, interesting, not given as punishment, and that it should be given according to the ability of the group concerned.

Literature Dealing with Surveys of Practices

Wide-scale surveys have indicated that elementary school pupils learn more in fifteen minutes of supervised study at school than in sixty minutes at home. Selwyn believes that high school students accomplish more when they study one hour at school than when they put in one hour

²⁶Sister M. Bernard Francis Loughery, "Home-School Partnership," Catholic Educational Review, 52:361, June, 1954.

²⁷Naomi Alpher, "Parents Can Be Partners: Working Together on the Homework Problem," High Points, 34:39-42, Oct. 1952.

on each subject at home.²⁸

Otto²⁹ summarized research evidence for the 1950 Encyclopedia of Educational Research by saying:

- (1) There is a very small relationship between the amount of time spent in home study and pupil progress,
- (2) Homework is not significantly related to achievement as measured by teachers' marks or standardized tests,
- (3) Homework at the elementary school level has a slight positive relationship to success in high school,
- (4) Voluntary homework has about as many values as compulsory homework,
- (5) The benefits of assigned homework are too small to counterbalance the disadvantages, and
- (6) Compulsory homework does not result in sufficiently improved academic accomplishments to justify the retention of the "achievement argument" as the chief justification for home-study assignments. He concluded by saying:

The gist of the research evidence is none too favorable to assigned homework. Questionnaires to pupils, parents, and educators have shown that pupils and parents are in favor of homework but that educators do not believe so strongly in it.³⁰

²⁸Amy Selwyn, "No More Homework?" Reader's Digest, 59:145, Sept. 1951.

²⁹H. J. Otto, "Homework by Pupils," Encyclopedia of Educational Research, Revised, Macmillan, 1950, pp. 380-381.

³⁰Ibid.

Schiller³¹ reported a questionnaire study of junior high school students' reactions to homework assignments. Forty-three per cent of the student population in the survey gave their approval of homework. Mathematics homework received the highest response as being helpful, but it was also cited by a smaller per cent as being the most enjoyable. Reports of this nature do not seem to provide conclusive support either for or against homework.

Holmes³² reported a survey of student opinion conducted in the schools of Mt. Vernon, New York in which the students suggested having a longer day so that all school work could be completed before leaving school. The students suggested fewer subjects and coordinated teacher planning in assigning homework.

Robbins³³ reports that parents complained that homework was too heavy in the junior high school in Stillwater, Minnesota. Homework was dropped for a short period while plans were being made for the future. With only moderate

³¹Belle Schiller, "A Questionnaire Study of Junior High School Students' Reaction to Homework," High Points, 36:23-36, June, 1954.

³²William H. Holmes, "Homework Is School Work Out of Place," American Childhood, 15:5-7, Oct. 1929.

³³G. D. Robbins, "Cutting Home Study," The Clearing House, 15:409-411, March, 1941.

assignments for the next two years, there was no difference in the grades of pupils. However, it was felt that supervised study was used to a better advantage.

Literature Dealing with Experimental
Studies in Different Fields

There have been fewer controlled experiments reported in journals than opinion articles or those concerning surveys. Abramowitz³⁴ conducted an experiment involving three Spanish classes. Two had regular homework and the third class had homework assignments, but they were not required to hand in any of the work. When the same midterm test was given to all three classes and the results were only slightly in favor of the regular homework class, it was concluded that the negligible difference does not seem to warrant the extra expenditure of time and effort on homework.

Schneider³⁵ conducted an experiment in two high school economics classes approximately equal in size and in intellectual capacity. The first group consisting of twenty-eight students had homework given in the usual way.

³⁴N. Abramowitz, "Homework in Foreign Language Class," High Points 19:72-74, April, 1937.

³⁵Samuel Schneider, "An Experiment on the Value of Homework," High Points, 35:18-19, April, 1953.

The other group consisting of twenty-four pupils had no homework but used the same text as the other group.

Lack of homework did not appreciably affect the achievement of this class on their midterm test. The range of scores was 98-48 for the homework group and 95-67 for the no-homework group. According to Schneider, the class with no homework might have felt that the work in this subject was less important than did the other class, but he felt that this could be overcome by constant motivation and frequent testing. The students in the no-homework situation have a greater opportunity for supervised study but a class with homework has more time for student research.

Anderson³⁶ reported his research involving eighth-grade classes in an Oklahoma junior high school. Achievement gains in English, social studies, and mathematics were compared in classes that did have homework and those that did not. The purpose of this experiment was to determine the effect of pupil preparation of assignments at home upon scholastic success in their junior high school subjects.

Two sections of an eighth grade class, each containing

³⁶William E. Anderson, "An Attempt Through The Use of Experimental Techniques to Determine the Effect of Home Assignments Upon Scholastic Success." Journal of Educational Research, 40:1410143, Oct. 1946.

twenty-nine pupils, were used as the experimental and control groups of this study. Students were grouped on the basis of scores of a test administered to determine mental ability. Both groups of pupils had the same teachers in three subjects used in the experiment.

A breakdown of the scores on the unit test revealed that the pupils in the homework group maintained proportionately the same level of achievement in English, mathematics, and social studies. The no-homework group, on the other hand, had varying levels of achievement in the three subjects.

The general conclusions were:

(1) Homework is equally valuable to pupils of average intelligence in English, mathematics, and social studies.

(2) Homework properly assigned and evaluated is an aid to improving scholarship.

(3) On the basis of this experiment no-homework pupils are sporadic in their achievements.

(4) The brighter pupils in the no-homework group as a whole did not gain as much as those in the homework group.

(5) The average and dull pupils of the no-homework group were much less successful than those in the homework group.

During the school year 1934-35, Rosenstengel and

Turner³⁷ conducted an experiment in an elementary school of Columbia, Missouri. The purpose of the study was to determine the difference in progress of pupils of equal ability, when one group was taught by the supervised study method and not required to study at home while the other group was expected to do home study. A control group of twenty-six sixth graders were paired with an experimental group of like ability. Both groups were taught by the same teacher, and the subject matter was two units of health work. Objective tests were given at the beginning and end of the study.

There was a possible score of fifty points on the test for the first unit and thirty-five points on the second. The control group made a total gain of six hundred eighty-two points. The experimental group made a total gain of eight hundred sixty-five points. The results of this study would indicate that supervised study at school is of more benefit to elementary pupils than homework without supervision.

Vincent³⁸ conducted an experiment on the value of

³⁷W. E. Rosenstengel and Charles Turner, "Supervised School Study vs. Home Study," American School Board Journal, 92:42, April, 1936.

³⁸H. D. Vincent, "An Experimental Test of the Values of Homework in Grades 5 and 6," National Elementary Principal, 16:199-203, Feb. 1937.

homework over a period of twenty weeks. Groups were formed in English, geography, and arithmetic and were equated on the basis of teacher rating, sex, chronological age, and mental age. The same teacher taught all groups and the only difference in the groups was the presence of homework in one and the lack of it in the other. It was concluded that homework was of no value in geography classes or in English, but seemed to have positive value in arithmetic.

Crawford and Carmichael³⁹ conducted an experiment in the El. Segundo Grammar School located in California. This experiment was over a six year period when homework was required during the first three years and abolished during the next three years. The Stanford Achievement Tests showed a gain which was not significant at the elementary level but the high school pupils who were accustomed to homework seemed to gain less during the no-homework period. The investigators felt that the school could get better results without homework by having a longer school day, more teaching in the school, and special instruction in how to study.

³⁹C. C. Crawford and J. A. Carmichael, "The Value of Home Study," Elementary School Journal, 38:194-200, Nov. 1937.

Literature Dealing with Experimental Studies
in the Field of Mathematics

Hines⁴⁰ studied the effect of homework on achievement in plane geometry in two high school classes in Urbana, Illinois. Pairs of students were matched initially by mental ability and previous performance in algebra. Initial standard achievement tests in algebra and plane geometry showed equivalent algebra achievement of the two groups, and negligible knowledge of plane geometry by either group. The same textbook was used for the two groups, and the experiment lasted the entire year. There were eight unit tests, seven cumulative review tests, an objective semester examination, and finally a re-administration of the initial achievement test in plane geometry. Scores on every one of these seventeen criteria favored the homework group over the no-homework group.

Koch⁴¹ reported a study that was used to examine whether or not daily practice at home, in addition to the regular lessons in class, would increase achievement in arithmetic. Also examined was the question of whether a long daily assignment (thirty minutes) or a shorter one

⁴⁰V. A. Hines, "Homework and Achievement in Plane Geometry," The Mathematics Teacher, 50:27-29, Jan. 1957.

⁴¹Elmer A. Koch, Jr., "Homework in Arithmetic," The Arithmetic Teacher, 11:9-13, Jan. 1965.

(fifteen minutes) would have more influence on achievement for these pupils.

Three sixth grade classes in one school were selected to participate in this study. They were taught the regular arithmetic curriculum by their teacher's usual methods of instruction. All three classes used the same textbook and covered the same material for a period of ten weeks. During this time one class received the long daily homework assignment, one class received the short daily homework assignment, and one class received no homework.

The data obtained from this experiment are not sufficient to say with assurance that homework will increase achievement in arithmetic, although some of the data seem to favor a conclusion in this direction. It would seem that daily homework assignments of a reinforcing nature are a significant factor in raising the achievement level of learning in the area of arithmetic computation. The conclusion that homework does tend to increase achievement in computation is based primarily upon the gains made by the class doing the long homework assignments.

Rogers⁴² carried out an experiment in the University of Chicago High School with two classes of algebra and two chapters of material. During the experimental period,

⁴²J. F. Rogers, "Home Study," Hygeia, 14:809, Sept. 1936.

Section A, which was assigned homework but no supervised study, responded to a test with an average mark of sixty-two and eight tenths, while Section B, which had supervised study but no homework averaged sixty-five and five tenths. Section A averaged eighty-one and four tenths and Section B seventy-nine and four tenths on the final examination of the preceding semester. The next chapter was covered in six lessons. During this period, Section A worked under supervision and Section B did homework. In the test that followed the average grade of the A group was seventy-seven and five tenths and the B group eighty-six and five tenths. The marks achieved on the second test seemed to argue for homework.

Wilson⁴³ conducted an experiment in mathematics in the Franklin K. Lane Senior High School in New York City. He first divided his pupils into high, low, and medium ability groups. He then placed half of each group in the experimental group and the others into a control group. One group was given four home assignments per week but the other had only two. Those doing four assignments per week had a higher rank.

⁴³Sinclair J. Wilson, "Home Study," School Review, 35:487-489, June 1927.

Foran and Weber⁴⁴ conducted an experiment in seven parochial schools with two hundred ninety-two students in the seventh grade. The experiment lasted the entire year and Group A had homework during only the second term, Group B only during the first. The net gain of the homework group was slightly above the no-homework group. However the gain was not sufficient to indicate that homework is an important factor in achievement in arithmetic at this level.

Summary

The subject of homework has been a matter of concern to students, parents, and educators for many years. Homework began in the boarding schools of Europe when day students needed extra work to enable them to keep pace with the regular students of the schools. Crowded classrooms and extensive curriculums seem to have given homework a permanent place in our society.

There are those in our society who believe that homework is of no particular value in increasing achievement of children. They contend that conditions in the home are not satisfactory for study, it deprives the child of time needed for rest and recreation, and that study must be

⁴⁴T. G. Foran and M. M. Weber, Sr., "An Experimental Study of the Relationship of Homework to Achievement in Arithmetic," The Mathematics Teacher, 32:212-214, May, 1939.

supervised and directed in order to be of value.

Others think that homework is beneficial. Their arguments include such values as character building, reinforcement of material learned in the classroom, and development of initiative, independence, and self-discipline.

There have been a number of articles concerning surveys of practices and opinions. Some of these indicate that homework is desirable while others do not.

There have been fewer controlled experiments reported in journals than either opinion articles or surveys. The results of these experiments are inconclusive, but several articles seem to imply that supervised study might be more beneficial than homework.

CHAPTER III

TREATMENT OF DATA

Upon completion of the administration of the pre-tests, an analysis of variance was employed to determine whether there were significant initial differences in the three groups. The pre-test given at this time also gave a measure of the achievement level of each group before the method of instruction was changed.

Initial Difference Among the Groups

The test scores made on the Cooperative Mathematics Test, Form A, were used to compare the means of the three groups by an analysis of variance. The Cooperative Mathematics Test, Form A, was used as the initial test for all three groups and it was administered at the end of the first eighteen weeks of the semester.

Table I gives comparative data in regard to the initial administration of the Cooperative Test. Class A had a mean score of 16.60 and a standard deviation of 4.99. Class B had a mean score of 15.53 and a standard deviation of 3.95. The third group, Class C, had a mean score and standard deviation of 15.74 and 5.27 respectively.

Table II organizes the scores on the pre-test for use in the analysis of variance. The variable X was used

to represent the initial scores on Form A of the Cooperative Mathematics Test. The sums of the squares of the raw scores on this test were also needed in this analysis. The number of students involved in Groups A, B, and C were 35, 26, and 27 respectively.

TABLE I
COMPARISON OF INITIAL SCORES ON THE
COOPERATIVE MATHEMATICS TEST,
FORM A

Group	A	B	C
Mean	16.60	15.54	15.74
Standard Deviation	4.99	3.95	5.27

TABLE II
SUMMARY OF SUMS OF RAW SCORES AND SQUARES OF RAW SCORES
FOR THE PRE-TEST (COOPERATIVE MATHEMATICS TEST FORM A)

	No-Homework Experimental Group	Graded Homework Experimental Group	Pop Quiz Experimental Group
n	35	26	27
ΣX	581	404	425
ΣX^2	10,487	6,662	7,407

The analysis of variance using the data in Table II showed no significant differences in the mathematical ability of the three groups as measured by Form A of the Cooperative Mathematics Test at the beginning of this experiment. The results of this analysis are summarized in Table III.

TABLE III
ANALYSIS OF VARIANCE FOR INITIAL DIFFERENCES

Source	df	SS	MS(V)	F
Between Means	2	18	9	
Within Classes	84	1,946	23.16	.391
Total	86	1,964		

The F-test for significance is the ratio of the mean square between the groups to the mean square within the groups. Therefore, the value of F was found by finding the mean square between and within the groups using data from Table III.

The critical value of F for 2 and 84 degrees of freedom at the five per cent level of significance is 3.11. The F value of .391 found in this analysis is less than 3.11.

The results of this statistical procedure indicate

that there was no significant initial difference among the three groups which will be designated as the no-homework, graded homework, and the daily test groups. The decision to designate Class A as the no-homework group, Class B as the graded homework group, and Class C as the pop quiz group was made at random.

The Effect of the No-Homework, Graded Homework,
And Daily Quiz Methods of Teaching
On Achievement in Second Year Algebra

Upon completion of the eighteen weeks of the experimental period the investigator administered Form B of the Cooperative Mathematics Test as the final instrument of evaluation for all three groups. When the scores on the final test were computed the gain over the experimental period for each of the experimental groups was found and analyzed for significance by analysis of covariance.

Table IV shows the comparative gains made by the experimental groups over the period of the experiment. The scores in this table are those made on Form B of the Cooperative Mathematics Test. The scores are reported in terms of means of raw scores on the final test and the mean gains over the experimental period.

On the Cooperative Mathematics Test, the class of students with no homework had an initial mean of 16.60 and

a final mean of 19.40 or a mean gain of 2.80 over the experimental period. The class with graded homework had an initial mean of 15.54 and a final mean of 20.69 or a mean gain of 5.15. The class designated as the daily quiz group had an initial mean of 15.74 and a final mean of 20.93, resulting in a mean gain of 5.19.

TABLE IV

COMPARATIVE GAINS OF SCORES ON THE FINAL TEST
(COOPERATIVE MATHEMATICS TEST FORM B)

		No-Homework Group	Graded Homework Group	Daily Quiz Group
Initial Test	Mean	16.60	15.54	15.74
	<i>o</i>	4.99	3.95	5.27
Final Test	Mean	19.40	20.69	20.93
	<i>o</i>	5.60	5.49	6.16
Gain	Mean	2.80	5.15	5.19
	<i>o</i>	3.92	4.34	4.60

In the analysis of covariance, initial differences between groups are taken into account by adjusting the final scores on the basis of the pre-test scores. The following table summarizes the raw scores, sums of scores, and sums of squares of raw scores for the pre-test and gain from the initial test to the final test. In this table, X represents the initial scores on Form A of the Cooperative Mathematics Test which was given at the beginning of the experimental

period. The gain scores are represented in the table as the variable Y. The sums of the squares of the initial scores, the sum of squares of the gain scores, and the products of these two scores are also reported in Table V.

TABLE V

SUMMARY OF SUMS OF RAW SCORES, SQUARES OF RAW SCORES,
AND SUM OF PRODUCTS FOR THE PRE-TEST (FORM A)
AND THE GAIN SCORES

	No-Homework Experimental Group	Graded Homework Experimental Group	Pop Quiz Experimental Group	Sum
n	35	26	27	88
ΣX	581	404	425	1,410
ΣX^2	10,487	6,662	7,407	24,556
ΣY	98	134	140	372
ΣY^2	798	1,152	1,276	3,226
ΣXY	1,476	2,040	2,064	5,580

The data in Table V were used to adjust the scores on the basis of the pre-test scores. The results of this analysis of covariance is summarized in Table VI.

The critical value of F for 2 and 84 degrees of freedom at the five per cent level of significance is 3.11. The F value of 2.98 found in this analysis is slightly less than 3.11. Therefore the mean differences are not significant.

The null hypothesis is therefore accepted. From this study there is no experimental evidence to indicate that any one method is superior to the other.

TABLE VI

ANALYSIS OF COVARIANCE FOR ACHIEVEMENT
IN SECOND YEAR ALGEBRA

Sources	df	SS _x	SS _y	SS _{xy}	SS _{yx}	MS _{yx} (V _{yx})	F
Among Means	2	18	122	-46	105	52.5	
Within Groups	84	1,946	1,264	-334	1,475	17.6	2.98
Total	86	1,964	1,386	-380	1,580		

CHAPTER IV

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary and Conclusions

This study was designed to compare the effectiveness, in terms of achievement, of daily tests and assigned homework on the progress of students enrolled in second year algebra. The results fail to show that one method of teaching is superior to the other two methods.

The investigator employed techniques to determine the relative effectiveness of the no-homework approach and daily quiz approach as opposed to the more conventional method in an eighteen week experimental study. Since it was not possible to equate the three classes or to organize the classes on a matched basis, an analysis of covariance was employed to adjust the scores at the end of the experiment to allow for any initial differences in mathematical achievement at the beginning.

There was a measured difference in the mean gain in favor of the two homework groups but the statistical analysis applied to the data showed no significant statistical difference among the three groups. This would indicate that the more conventional graded homework approach and the daily quiz with ungraded homework approach were of no greater value, in terms of achievement, than the no-

Recommendations

Based on the results of this experiment and statistical techniques used to analyze the observed data, the following recommendations are made:

(1) Continued investigation of the effect of homework on achievement should be carried out. These investigations should include experiments concerning the value of supervised study as a part of the class period in comparison to classes with assigned homework.

(2) Further and better controlled experiments involving a greater number of second year algebra students of equal ability should be carried out.

(3) The mean gain for both classes involving homework was superior to that of the no-homework group. Therefore, investigations should be carried out in which a class with both graded homework and daily tests is compared to a class with no homework.

(4) Since the mean gain scores for the graded homework and the daily quiz groups were so nearly equal, experiments should be repeated to verify further the results of this study.

(5) Investigations should be made to determine the extent to which similar no-homework methods of teaching

would affect achievement in other areas of mathematics.

(6) A study should be made to determine the effectiveness of the no-homework approach to the teaching of second year algebra at the different ability levels.

(7) If homework is to be a continued practice teachers should work out a policy regarding:

- a. the amount of homework,
- b. sufficient discussion of an assignment before it is made,
- c. the making of individual assignments when possible, and
- d. the practice of teachers working together so that extensive homework assignments will not all be due the same day.

BIBLIOGRAPHY

BIBLIOGRAPHY

- Abramowitz, N., "Homework in Foreign Language Class," High Points 19:72-74, Apr. '37.
- Alpher, Naomi, "Parents Can Be Partners: Working Together on the Homework Problem," High Points 34:39-42, Oct. '52.
- Anderson, William E., "An Attempt Through the Use of Experimental Techniques to Determine the Effect of Home Assignments Upon Scholastic Success," Journal of Educational Research, 40:141-143, Oct '46.
- Arnold, Oren, "Should Homework Be Abolished?" NEA Journal, 54:22-24, Feb. '65.
- Basil, Brother, F.S.C. "Homework in the Elementary School," Catholic School Journal 52:131, Apr. '52.
- Bassett, Arthur E., "Conservation of the School Children," The Literary Digest, CXVIII, Sept. 29, 1934.
- Check, John, "Homework--Is It Needed?" The Clearing House 41:143-7, Nov. '66.
- Corbally, John E., Jr., "High Standards Call for a Homework Program," Clearing House 27:421-2, Mar. '53.
- Crawford, C. C. & J. A. Carmichael, "The Value of Home Study," Elementary School Journal, 38:194-200, Nov. '37.
- Dodes, Irving A., "The Homework Problem," High Points 35:15-16, Apr. '53.
- Foran, T. G. & M. M. Weber, Sr., "An Experimental Study of the Relationship of Homework to Achievement in Arithmetic," The Mathematics Teacher 32:212-214, May '39.
- Garrett, Henry E., Statistics in Psychology and Education, New York, Longmans, Green and Company, 1953, p. 344.
- Herrington, Eugene E., "Parents and Homework" NEA Journal 36:633, Dec. '47.
- Hines, V. A., "Homework and Achievement in Plane Geometry," The Mathematics Teacher, 50:27-29, Jan. '57.

- Holmes, William H., "Homework vs. School Work Out of Place," American Childhood, 15:5-7, Oct. '29.
- Jones, Ronald D. and Calvin Ross, "Abolish Homework--Let Supervised Study Take its Place," Clearing House, 39: 206-209, Dec. '64.
- Klein, Rose, "Self Directed Homework," The Mathematics Teacher, 44:463-465, Nov. 1951.
- Koch, Elmer A., Jr., "Homework in Arithmetic," Arithmetic Teacher 14:9-13 Jan. '65.
- Loftus, E. A., "The Homework Question," Journal of Education (London) 67:713-715, Nov. '35.
- Loughery, Sister M. B. Francis, "Home-School Partnership" Catholic Education Review 52:361, June '54.
- Maberry, Arthur L., "The No Home Study Plan Succeeds," Texas Outlook, 20:25, Mar. '36.
- Maybee, G. D., "Homework in Junior High Schools," National Association of Secondary School Principals 47:16-17, Oct. 1963.
- McGill, James V., "Ecoergomachy," High Points 34:35-38, Oct. '52.
- Miller, Starr, "Was This Voice First to Question the Value of Homework?" The Clearing House 29:359, June 1955.
- Moler, James, "Homework Works Better If," NEA Journal 43: 562-563, Dec. '54.
- Morse, Nita, "Is or Isn't Homework of Use to Pupils?" Virginia Journal of Education 46:19-20, Feb. '53.
- N. E. A. Research Bulletin 45:28-29, Mar. '67.
- Otto, Henry J., "Homework by Pupils," Encyclopedia of Ed. Res., Revised, Macmillan, 1950, pp. 380-381.
- Perkins, Richard B., "Homework," NEA Journal 42:478, Nov. 1953.
- Peters, R. F., "The Pro & Con of Home Study," American School Board Journal 97:47-48, Aug. '38.

- Robbins, G. D., "Cutting Home Study," The Clearing House 15:409-411, Mar. '41.
- Rogers, J. F., "Home Study," Hygeia 14:809, Sept. '36.
- Rosenstengel, W. E., and Charles Turner, "Supervised School Study vs. Home Study," American School Board Journal 92:42, Apr. '36.
- Schiller, Belle, "A Questionnaire Study of Junior High School Students' Reaction to Homework," High Points 36: 23-36, June '54.
- Schneider, Samuel, "An Experiment on the Value of Homework," High Points 35:18-19, Apr. 1953.
- Selwyn, Amy, "No More Homework," Reader's Digest 59:145, Sept. '51.
- Shaw, Betty M., "Should Homework be Abolished?" NEA Journal 54:22-24, Feb. '65.
- Smith, C. Howard, "Homework," Better Homes and Gardens 29: 160, Jan. 1950.
- Strang, Ruth, "Guided Study and Homework," NEA Journal 44: 399-400, Oct. 1955.
- Sylvester, Harold D., "Homework Dilemma," Parents' Magazine, 25:70, Sept. 1950.
- Vincent, H. D., "An Experimental Test of the Values of Homework in Grades 5 & 6," National Elementary Principal, 16:199-203, Feb. '37.
- Wilson, Sinclair J., "Home Study," School Review 35:487-489, June 1927.
- Wright, Horace W., "No Homework for Mathematics Pupils," The Mathematics Teacher 14:334-336, Oct. 1921.

APPENDIX

APPENDIX

SUMMARY OF SCORES ON THE INITIAL TEST (COOPERATIVE METHEMATICS TEST), FORM A, SCORES ON THE FINAL TEST (COOPERATIVE MATHEMATICS TEST), FORM B, AND THE GAIN SCORES

No-Homework Group			Graded Homework Group			Daily Quiz Group		
Initial	Final	Gain	Initial	Final	Gain	Initial	Final	Gain
21	26	5	18	26	8	16	21	5
19	21	2	14	23	9	22	32	10
9	12	3	19	28	9	14	16	2
14	13	-1	14	22	8	18	24	6
22	19	-3	12	16	4	20	27	7
19	16	-3	21	30	9	20	23	3
12	18	6	15	17	2	10	21	11
23	27	4	13	18	5	20	26	6
22	22	0	14	11	-3	28	32	4
17	21	4	16	19	3	13	16	3
9	14	5	12	15	3	11	25	14
21	13	-8	12	24	12	14	22	8
20	26	6	18	29	11	8	18	10
21	28	7	8	19	11	21	27	6
11	11	0	17	15	-2	13	13	0
18	26	8	14	19	5	10	15	5
21	20	-1	11	18	7	18	29	11
12	13	1	18	21	3	12	14	2
10	13	3	15	14	-1	11	18	7
10	19	9	17	20	3	12	12	0
21	25	4	20	26	6	25	26	1
14	23	9	11	22	11	8	10	2
13	19	6	22	30	8	17	16	-1
14	16	2	23	24	1	13	21	8
19	21	2	20	22	2	23	20	-3
15	10	-5	10	10	0	15	14	-1
20	24	4				13	27	14
22	28	6						
19	19	0						
14	22	8						
11	13	2						
10	14	4						
17	18	1						
12	18	6						
29	31	2						