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THE EFFECT OF FOUR METHODS OF RECORDING ANSWERS TO STANDARDIZED TEST ITEMS ON MEAN ACHIEVEMENT AT FOUR GRADE LEVELS

A DISSERTATION

SUBMITTED TO THE GRADUATE FACULTY

in partial fulfillment of the requirements for the

degree of

DOCTOR OF EDUCATION

BY

EDGAR LAWTON PETTY

Norman, Oklahoma

THE EFFECT OF FOUR METHODS OF RECORDING ANSWERS TO STANDARDIZED TEST ITEMS ON MEAN ACHIEVEMENT

AT FOUR GRADE LEVELS

APPROVED U and

DISSERTATION COMMITTEE

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THE EFFECT OF FOUR METHODS OF RECORDING ANSWERS TO STANDARDIZED TEST ITEMS ON MEAN ACHIEVEMENT

AT FOUR GRADE LEVELS

CHAPTER I

THE PROBLEM: ITS BACKGROUND AND DEFINITION

Introduction

Today with the increased emphasis placed on the use of the standardized achievement test in the classroom, there is a trend in standardized test construction toward the use of different response modes for recording the student's test responses. Some of these test response modes are recording the response in the test booklet, on separate self-scoring or machine scoring answer sheets, on pin-punch answer pads, and on machine scoring marked or punch-out response cards. These innovations are made in an effort to economize in time for scoring, recording scores, and cost, as well as the ease of scoring. But little concern seems to be given to the effect of these different response modes on student performance and attitude toward using the different response modes.

Need for the Study

A few significant experimental studies of the effects of test response modes on test scores have either been completed or are now in progress. Yet the evidence is not conclusive that the newer test response modes do not influence the performance of students using them to record their response. The East Bay California Educational Research Council in the Spring of 1962 established test standardization criteria in which they presented the issue that one response collecting mode may be so different from another that different meanings must be attached to the same raw score obtained from the same student, using the same test booklet and equal amounts of working time.¹ Too often, school administrators, counselors, and teachers are willing to accept the newer test response modes on the basis that they offer a more effective method of scoring, economize on the time for recording test results, and the cost is much lower without considering the influence of the newer test response modes on the student's performance and attitude.

Despite all of these newer modes of responding to tests, there has been little research conducted to investigate the influence of these modes where more than two modes were considered at a time. Nor were the differences in

¹East Bay Educational Research Council, <u>Test Standard-ization Criteria</u>. Hayward, California: Alameda School Department, 1962.

student opinions toward using the varied response modes taken into consideration. Thus it was the writer's hope that the present study would supply some evidence of differences in achievement and opinion where the students used four of the more widely used response modes to record their responses.

Definitions

The four test response modes used in this study are defined as follows:

1. <u>Test booklet response mode</u>, which is denoted by the term <u>booklet</u>, involves the recording of the response in the test booklet according to directions given.

2. <u>Separate self-scoring answer sheet response mode</u>, which is denoted by the trade name <u>Scoreze</u>, involves recording the response on an answer sheet according to directions given. When the response is recorded it makes a carbon mark on a second answer sheet, which has been sealed along the edges to the original answer sheet.

3. <u>Pin-punch response mode</u>, which is denoted by the term <u>pin-punch</u>, involves the recording of the response by punching a pin hole in an answer pad according to directions given. Since the pin-punch response mode has not been adapted for use with <u>The California Reading Test</u>, the investigator modified the separate answer sheet by making a partial overlay in which the response spaces were changed to small circles with dots in the center of each. See Appendix A for

an example of this response sheet. The test booklets were modified by changing the directions to make them appropriate to this response mode.

4. <u>Separate International Business Machine response</u> <u>card mode</u>, which is denoted by the trade name Cal-card, involves recording the response on an IBM card according to directions given.

The term "reading achievement" as used in this study refers to the students obtained raw score on the <u>California</u> Reading Test.

The term "student opinion" or "opinion" as used in this study refers to the written or oral student response to an opinionnaire as to whether he did or did not like the test response mode used and why he did or did not like it. See Appendix B for examples of the opinionnaires.

Statement of the Problem

This study was concerned with the two problems: (1) What differences are there in mean achievement where varied test response modes are used to record responses? and (2) How do student opinions differ toward using the varied response modes?

More specifically it was intended to compare the mean reading achievement of students at the fourth, sixth, eighth, and eleventh grades, who recorded their test responses to the same standardized reading test using the test booklet response

mode (booklet), the separate answer sheet response mode (scoreze), the pin-punch response mode (pin-punch), and the IBM response card mode (Cal-card) and to compare their opinions toward recording test responses using these response modes.

The data used in making mean achievement comparisons were obtained from the administration of <u>The California Read-</u> <u>ing Test</u> (1957 series) which consisted of items that reflect reading vocabulary and reading comprehension. In order to facilitate the analysis of the data the following hypotheses were formulated for each of the four grade levels studied:

Hypothesis 1. There is no statistically significant difference in mean reading achievement among groups of students where varied response modes are used to record test responses.

Hypothesis 2. There is no statistically significant difference in mean reading achievement between sexes where the same response modes or varied response modes are used to record test responses.

Hypothesis 3. There is no statistically significant interaction in mean reading achievement among response modes and sex where varied test response modes are using in recording test response.

The data used in making comparisons of opinions were obtained from the administration of an opinionnaire which consisted of two questions as to likes and dislikes regarding the response mode which they used in recording their test

responses. In order to facilitate the analysis of the data the opinions were tabulated in terms of number and percentage by grade, sex, and response mode.

Limitations of the Study

1. This study was limited to data from 384 students, four classes of twenty-four students in each of four grades (fourth, sixth, eighth and eleventh) from three schools located in a middle socio-economic area in the Oklahoma City Public School district during the spring semester of the school year 1961-62.

2. This study was limited to the comparison of mean reading achievement and student opinions, where students recorded answers to a standardized reading test using the test booklet, scoreze, pin-punch, and cal-card test response modes.

3. This study was limited to the validity and reliability of the instruments used as a part of the study.

4. This study was limited in the lack of complete control of such variables as the time of day the tests were administered and the physical environment in which testing took place.

Background of Research

Experimental evidence in regard to the influence of test response modes on scores is not extensive. Two master's theses on the use of separate answer sheets with achievement tests in grades three through six were written at the University of Iowa. In one of these, Leo E. Herkelmann¹ using forms A and B of the <u>Iowa Elementary Language Tests</u> with 266 pupils in grades four to six, found no significant difference in mean scores with and without answer sheets when the tests were administered without a time limit, but there was a significant difference in the time required. In the other thesis, James F. Loper² found more time required for the use of the separate answer sheet than the test booklet in grades three and five, but no significant effect on the mean scores when enough time was given.

The most extensive study available of the effect of separate answer sheets is one reported by J. W. Dunlap,³ who conducted a series of five experiments in which the use of answer sheets was compared with underlining the correct answer. These experiments were carried out in terms of means, standard deviations, reliability, and validity. The pupils were in grades four and eight. The data indicate that answer sheets were as satisfactory as the underlining method.

¹Leo Emil Herkelmann, "A Study of the Use of the Separate Answer Sheet with Achievement Tests at the 4-6 Grade Levels" (unpublished Master's thesis, State University of Iowa, 1938).

²James F. Loper, "A Study of the Use of the Separate Answer Sheet at the Third and Fifth Grade Levels" (unpublished Master's thesis, State University of Iowa, 1939).

³J. W. Dunlap, "Problems Arising from the Use of a Separate Answer Sheet", <u>Journal of Psychology</u>, X (July, 1940), pp. 3-48.

While each test company usually conducts studies to determine the effectiveness of each test response mode as it is introduced for use with their standardized tests, these studies are usually concerned with comparing the new test response mode to one that is in use and accepted by test users. These studies are usually reported in the test manual or technical reports. An example of one such study is that conducted by Wayne E. Rosenoff.¹ This was a comparison of the punch-out response mode with the answer sheet response mode. A forty-four item exercise was prepared and adopted for use with IBM answer sheets and punch-out cards. This was administered to 347 fifth graders in six schools in one school district in California. The findings of this study are based upon the comparison of errors made when using the two forms. Essentially the same number of errors occurred in using both response modes of the exercise. However, there was a time differential in favor of the punch-out card.

Organization of the Report

This report consists of four chapters. Chapter I contains a statement of the need for the study, a statement of the problem, definitions, the limitations of the study, the background of research, and organization of the report.

¹Wayne E. Rosenoff, "A Comparison of the Punch-Out Response Mode with the Answer Sheet Response Mode" (A paper presented at the annual Spring Conference of the California Educational Research Association, March 9-10, 1962, Monterey, California) Monterey, California: California Test Bureau, 1962 Publication 1370.

Chapter II is a presentation of procedure. Chapter III is an analysis of the data. Chapter IV contains a summary, findings, conclusions, and recommendations of the study.

CHAPTER II

PROCEDURE OF THE STUDY

Selection of Sample

As was indicated in Chapter I, this study involved 384 students from three Oklahoma City Public Schools. The schools selected were Calvin Coolidge Elementary School, Thomas Jefferson Junior High School, and U. S. Grant Senior High School. These schools were selected because they met the following criteria.

1. They served the same student population at their respective grade levels.

2. Based on school records, most of the parents were employed in skilled and semi-skilled occupations, and the homes of the area were in the medium price range. Therefore, it might be assumed that the schools are located in a middle socio-economic area.

The mean intelligence as measured on <u>The California</u>
 <u>Test of Mental Maturity</u> for each of the three schools was
 Q. 104 for the school year 1961-62.

4. Each school had more than one hundred students enrolled at each grade level with the male and female population approximately equal.

5. The schools had four or more classes at each of the grade levels being studied. Students had been assigned to these classes at random, that is, either distributed based on pre-enrollment or assigned to equalize teacher-pupil ratio with no specific grouping in mind. From these schools four classes at each of four grade levels fourth, sixth, eighth, and eleventh were randomly selected by use of random numbers. One of the four specific response modes for recording test response was randomly assigned to each class at each grade level. Each of the classes was randomly equated by use of a table of random numbers so that there was test data for twelve boys and twelve girls.

Instruments of Measurement

Because of the obvious importance of reading as a required skill area at all grade levels of the public school, reading achievement as measured by <u>The California Reading</u> <u>Test</u>, (1957 series), was the criterion variable. This particular test was selected for the following reasons:

1. It is one of the few tests to which at least three of the four test response modes for recording test responses had been adapted. These test response modes are recording the response in the test booklet, recording the response on a separate self-scoring answer sheet, and recording the response on a separate machine scoring response card. The pin-punch response mode, where the student punches a pin

hole in the response circle on a separate response sheet, was adapted to the test by developing a partial overlay. For the self-scoring answer sheet see Appendix A.

2. It was developed for use at five levels, three of these levels include the grades which were considered in this study. These three levels are Elementary (grades 4, 5, 6), Junior High (grades 7, 8, 9), and advanced (grades 9-14).

3. It has a coefficient of reliability of r= 0.95 at each of the three levels.¹

Intelligence, as measured by <u>The California Test of</u> <u>Mental Maturity 1957 series</u>, was the associated variable. This particular test was selected for the following reasons:

 Norms were established for this instrument and The California Achievement Tests, of which The California Reading Test is a part, using the same sample of students. Therefore, they are articulated for the same grade and age levels.

2. It has a total mental factor reliability coefficient of r= 0.94 for the elementary levels and r= 0.95 for the junior high and advanced levels.²

¹Ernest W. Tiegs and Willis W. Clark, <u>Technical Re-</u> port on the California Achievement Tests, 1957 Edition (Monterey, California: California Test Bureau, 1957), pp. 21-27.

²Elizabeth T. Sullivan, Willis W. Clark, and Earnest W. Tiegs, <u>Technical Report on the California Test of Mental</u> <u>Maturity</u>, 1957 Edition (Monterey, California: California Test Bureau, 1957), pp. 20-23.

An opinionnaire was used to determine the expressed opinions of students toward using the varied response modes for recording test responses, see Appendix B. These opinionnaires were developed in the form of a question, Did you like to record your response using this test response mode. Yes or no was then to be circled in response to this question. This was followed with a space for the student to write out why he did or did not like the particular test response mode he used.

Collection of Data

The three instruments of measure were administered by the investigator to each of the classes at each grade level according to the following schedule:

 During the first testing session <u>The California</u> <u>Test of Mental Maturity</u> was administered using the separate IBM answer sheet response mode for all classes.

2. During the second testing session The California Reading Test was administered using the varied test response modes according to random assignment. Following this test session each student recorded his response to a questionnaire appropriate to the test response mode used. The only exception to the student writing his response was at the fourth grade level where the investigator interviewed each student by askn the questions orally and writing the response given on a separate opinionnaire form for each fourth grader

interviewed. This was done to take care of the difference in oral and written vocabulary at this level.

These instruments were administered to the sixteen classes during the period April 23 to May 11, 1962. The testing schedule was as follows:

- 1. April 23-25 four classes in grade 4 were tested.
- 2. April 26-May 11 four classes in grade 6 were tested.
- 3. May 2-7 four classes in grade 8 were tested.
- 4. May 8-11 four classes in grade 11 were tested.

Statistical Procedure

The raw score data of the mental maturity test were converted to mental age-chronological age ratios and the reading test data were retained in raw score form. These data arranged by test response mode, group and sex, may be found in Appendix C.

The data were arranged for each grade by test response mode, group and sex in an analysis of covariance design. Appropriate F-ratios were calculated to determine whether the mental age-chronological age ratios had any regression effect on the reading test raw scores. In those cases where the obtained F values were significant at the 0.05 level of significance the data were tested using analysis of covariance to test for no significant difference in mean achievement between test response mode groups, between sexes using the same and varied test response modes, and interaction of test response modes and sex. These are stated as hypotheses in the section statement of problem, Chapter I.

Those data where analysis of covariance F-ratios were found to be significant at the 0.05 level were then tested using the student "t" test to test the appropriate null hypotheses for difference of mean achievement (adjusted for regression effect) by sex, using the same response mode and between sex, using varied response modes. Where the "t" test obtained values were not significant at the 0.05 level when testing for no significant difference between boys and girls using the same response mode the data for boys and girls in the class were pooled. The pooled data were then used in testing the hypotheses of no significant difference in adjusted mean achievement between the varied response modes. Where the obtained F value was not significant at the 0.05 level when testing for regression effect the data for that grade were treated statistically by calculating student "t"'s for mean differences using obtained mean reading achievement to test the appropriate null hypotheses.

Student opinions as expressed in response to the questionnaires were analyzed with respect to kind and number. The results were reported in tabular form to present differences in opinion by varied test response mode, sex, and grade.

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CHAPTER III

ANALYSIS OF THE DATA

The data for this study consisted of scores obtained from the administration of a mental abilities test and reading achievement test. Opinions as expressed by students on an opinionnaire also comprise a portion of the data.

In order to more easily refer to this data, the following symbolic equivalents were assigned: Y = California Reading Test raw scores and X = California Test of Mental Maturity mental age-chronological age ratios. The scores for each student tabulated by test response mode group and sex are presented for the fourth, sixth, eighth and eleventh grades in Tables 20, 21, 22, and 23, respectively. See Appendix C. To facilitate manipulation of the data the test response mode groups in each grade were designated as booklet, scoreze, pin-punch, and cal-card groups.

As was previously stated the mean reading achievement (Y) was the variable to be analyzed through the use of covariance. Co-variance is applicable to situations where experimental control of concomitant variables may be either impossible or impractical. Tate states in his discussion on co-variance that:

It is possible to introduce control in two or more classes of experimental data by making allowance for initial differences among the classes which may have prejudiced the results of the treatment. Such control is possible in situations where there is available an associated measure for each of the final experimental measures. The analysis of differences among classes of final experimental data, taking into account differences existing among the associated data is conventionally known as analysis of covariance. It ordinarily results in a substantial reduction of within-groups or error variance and thus leads to more precise results.¹

In the treatment of these data the mental age-chronological age ratio (X) for each student was used as the associated variable for each of the criterion variables raw reading achievement scores (Y).

Lindquist² in discussing analysis of co-variance emphasizes the following conditions underlying the test of significance for experimental treatments: (1) The subjects in each treatment group were originally drawn either at random from the parent population, or selected from the same parent population on the basis of their X measures only, the selection being random with reference to all other factors for any given value of X; (2) The X measures are unaffected by all treatments; (3) The criterion measure for each treatment group are a random sample from those for a corresponding treatment population; (4) The regression of Y on X is the

¹Merle W. Tate, <u>Statistics in Education</u> (New York: The Macmillan Co., 1959), p. 515.

²E. F. Lindquist, <u>Design and Analysis of Experiments</u> <u>in Psychology and Education</u> (Boston: Houghton Mifflin Co., 1953), pp. 323-330. same for all treatment populations; (5) the regression is linear; (6) The distribution of adjusted scores for each treatment population is normal; (7) These distributions have the same variance; and (8) The mean of the adjusted scores is the same for all treatment groups.

The assumption that condition one was met was supported by the random assignment of students to groups during the regular enrollment period as stated in Chapter II. Condition two was met by securing the data of the associated variable X for each student before the achievement test was administered using the varied test response modes. The assumption that condition three was met was supported by the random selection of classes and assignment of varied test response modes.

Lindquist¹ stated that of conditions four through eight the most critical was condition four which was that the regression of Y on X was the same for all treatment populations. This assumption of homogeneity of regression was tested as described by Lindquist. The obtained F values for the fourth, sixth and eighth grade groups did not approach significance. Therefore, the assumption of homogeneous regression was accepted. The obtained F value for the eleventh grade groups for this test was significant. Therefore,

¹Lindquist, <u>loc. cit.</u>, pp. 330-331.

the assumption of homogeneous regression was rejected for this grade.

The condition of linearity of regression was assumed on the basis of inspection of the scattergrams of data. This was recommended by Lindquist because of the lack of preciseness of any statistical test for linearity of regression. It was also necessary to assume that conditions six and eight were satisfied because of lack of precise tests.

Bartlett's Test of Homogeneity of Variance was computed for the four test response mode groups at each grade to support the assumption that condition seven was satisfied.¹ The values of the variance estimates for the data as presented in Appendix D resulted in the following chi-square values: fourth grade $\chi^2 = 6.59$, sixth grade $\chi^2 = 20.44$, eighth grade $\chi^2 = 12.45$, and eleventh grade $\chi^2 = 9.21$. The value of chi-square for the sixth grade data was significant at the 0.05 level of significance. Therefore, the assumption of equality of population variance was rejected. The other chi-square values were not significant at the 0.05 level of significance. Therefore, the assumption of equality of population variance was tenable for the variances of the fourth, eighth, and eleventh grade groups.

¹Allen L. Edwards, <u>Experimental Design in Psycho-</u> <u>logical Research</u> (New York: Rinehart and Co., 1960), pp. 125-127.

To test the null hypotheses as they were presented in Chapter I the analysis of co-variance statistic for completely randomized designs was applied to those data meeting the conditions underlying the use of the statistic. The procedure used was that presented by Ostle.¹ The summary of analysis of co-variance for the fourth grade data is presented in Table 1 and that for eighth grade data is presented in Table 2.

A restatement of each null hypothesis fo the purpose of applying them to the data seems appropriate.

<u>Hypothesis 1</u>. -- There is no statistically significant difference in mean reading achievement among groups of students where varied response modes are used to record test responses. In order to attain significance the obtained Fvalue with three and seventy-six degrees of freedom had to be equal to or greater than 4.08 at the 0.01 level of significance. On the basis of the analysis the obtained values for fourth and eighth grade groups F = 6.36 and F = 4.81 respectively are greater than F of 4.08. Therefore, the null hypothesis was rejected and "t" tests among the test response mode groups to determine which mean differences are statistically significant were in order.

<u>Hypothesis 2</u>. -- There is no statistically significant difference in mean reading achievement between sexes in

¹Bernard Ostle, <u>Statistics in Research</u> (Ames, Iowa: The Iowa State College Press, 1963), pp. 437-449.

TABLE	1Summary	of	analysis	of	covariance	for	four	fourth-grade	groups	where	each
			group use	ed a	different	test	: resp	ponse mode ^a			

Source of Variation	Degrees of	Sun ar	ns of Squa nd Product	res s	$\sum y^2 - (\sum y)^2 / \sum x^2$	df	ms	F-ratio	
	Freedom	∑x ²	Σχ	Σy^2					
Between Te Response Modes (A)	st 3	631.12	1048.16	5016.36					
Between Bo and Girls	ys (B) l	184.26	-284.82	834.26					
Inter- action AB	3	1814.24	2263.20	8570.99					
Error	76	9676.87	7260.25	20453.29	15006.16	76	197.45		
Total	95	12306.49	10286.78	34874.91					
Difference Difference Difference	for tes for tes for tes	ting among ting among ting among	adjusted adjusted adjusted	A - means B - means AB - means	3766.79 1347.22 6125.42	3 1 3	1255.60 1347.22 2041.81	6.36* 6.82** 10.34	

^aEach group consisted of 12 boys and 12 girls. *Significant at the 0.05 level of significance. **Significant at the 0.01 level of significance. TABLE 2.--Summary of analysis of covariance for four eighth-grade groups where each group used a different test response mode^a

Source	Degrees	Sun ar	ns of Squar nd Products	ces 3	$\sum v^2 - (\sum v)^2 \sqrt{x^2}$	df	ms	F-ratio	
Variation	Freedom	Σx^2	Σχγ	Σy^2					
Between Te Response Modes (A)	st 3	57.83	-329.21	4498.86		· <u></u>			
Between Bo and Girls	ys (B) 1	442.04	-950.60	2044.26					22
Inter- action AB	3	720.67	-973.00	7880.49					
Error	76	9424.79	14018.65	35309.63	16848.73	76	221.69		
Total	9 5	10645.33	11765.83	49733.24					
Difference Difference Difference	for test for test for test	ing among ing among ing among	adjusted A adjusted H adjusted A	A - means 3 - means AB - means	3197.23 3298.66 9566.51	3 1 3	1065.74 3298.66 3188.84	4.81** 14.88** 14.38	

^aEach group consisted of 12 boys and 12 girls. **Significant at the 0.01 level of significance. groups where the same response modes or varied response modes are used to record test responses.

The obtained F values 6.83 and 14.88 for fourth and eighth grade groups, respectively, were significant at the 0.05 level of significance (table F value = 3.09 at the 0.05 level of significance). Therefore the null hypothesis of no statistically significant difference in mean achievement between sexes was rejected. The "t" tests were in order to isolate the mean differences that were significant.

<u>Hypothesis 3.</u> -- There is no statistically significant interaction in mean reading achievement among response modes and sex where varied test response modes are used in recording test responses. The F-value at three and seventy-six degrees of freedom had to equal or be greater than 4.08 at the 0.01 level of significance. Obtained F values 10.34 and 14.38, for fourth and eighth grade groups respectively, were greater than this value. Therefore the null hypothesis of no statistically significant mean differences in interaction between modes and sex was rejected.

Ostle¹ in his discussion of analysis of co-variance states that in addition to performing the F-test the researcher should present a table of adjusted treatment means as an aid in the interpretation of the experimental results. These adjusted reading achievement means (Υ) adjusted for the

¹Ostle, <u>loc. cit.</u>, p. 442.

effect of the mental age-chronological age ratios (\overline{X}) for fourth and eighth grade test response mode groups by sex are presented in Appendix E. These adjusted reading achievement means (\overline{Y}) were used in the following treatment and analysis of the data where appropriate.

To facilitate the analysis of differences in mean reading achievement between sexes at each grade level using the same test response mode, the following null hypotheses were stated.

<u>Hypothesis 4</u>. -- There is no statistically significant difference in mean reading achievement between sexes marking the test booklet.

<u>Hypothesis 5</u>. -- There is no statistically significant difference in mean reading achievement between sexes marking the scoreze answer sheet.

<u>Hypothesis 6</u>. -- There is no statistically significant difference in mean reading achievement between sexes pinpunching the answer pad.

<u>Hypothesis 7</u>. -- There is no statistically significant difference in mean reading achievement between sexes marking the cal-card.

These null hypotheses were then tested by calculating "student" t's. The means and t-values for each grade are reported in Table 3. The obtained t values larger than the table value at the 0.05 level of significance were (-1.73), (-5.52), and (-2.63) for the eighth grade booklet, pin-punch,

Grade	Response	Boys	Girls	"t"
Level	Mode	Mean	Mean	
4th ^a	Booklet	74.09	83.38	-1.62
	Scoreze	68.46	75.68	-1.21
	Pin-Punch	69.23	71.79	-0.45
	Cal-Card	70.81	68.02	0.46
6th	Booklet	89.83	83.50	0.99
	Scoreze	105.58	99.75	0.85
	Pin-Punch	94.92	98.25	-0.29
	Cal-Card	94.92	90.00	0.87
8th ^a	Booklet	102.45	112.97	-1.73*
	Scoreze	99.23	101.50	-0.04
	Pin-Punch	78.69	110.20	-5.53*
	Cal-Card	87.31	101.71	-2.36*
llth	Booklet	89.42	94.00	-0.51
	Scoreze	101.25	81.77	0.54
	Pin-Punch	77.33	77.25	0.02
	Cal-Card	80.75	76.75	0.62

TABLE 3.--Comparisons of mean differences in reading achievement between boys and girls at the fourth, sixth, eighth, and eleventh grade levels where varied test response modes were used

> ^aMeans adjusted for regression effect. *Significant at the 0.05 level.

and cal-card groups, respectively, (the table t = 1.717 at the 0.05 level). Therefore null hypotheses for these three eighth grade groups could be rejected. The girls obtained the higher mean reading score in each of these groups. The other t values (see Table 3) were smaller than the table t (1.717) at the 0.05 level of significance. Thus, the four null hypotheses could not be rejected. There were no statistically significant differences in mean reading achievement between sexes in the test booklet, scoreze, pin-punch, and cal-card groups at the fourth, sixth, and eleventh grades. Also, there was no statistically significant difference in mean reading achievement between sexes in the eighth grade in the scoreze test response mode group.

The data for boys and girls were now pooled by test response mode group for the fourth and eleventh grades, because there was no statistically significant difference in mean reading achievement between boys and girls by test response mode group at these grade levels. The data for the sixth and eighth grades were treated by sex, because (1) the variances for the sixth grade data for groups by sex was heterogeneous (see Bartlett's test for homogeneity, Appendix D); and (2) there were differences in mean reading achievement between eighth grade boys and girls.

To test for statistically significant differences in mean reading achievement among test response mode groups for the four grades studied it is in order to state the following
null hypotheses and accept or reject if the obtained t value is significant at the 0.05 level of significance.

<u>Hypothesis 8.</u> -- There is no statistically significant difference in mean reading scores between the group marking the test booklet and the group marking the scoreze answer sheet.

Mean reading achievement scores and t values for the four grade levels are presented in Table 4. The obtained t values (-3.65) and (-1.95) for the sixth grade boys and girls respectively and (2.39) for the eighth grade girls were larger than the table t value (1.796) at the 0.05 level of significance. Therefore the null hypothesis could be rejected for these groups. The sixth grade boys and girls marking the scoreze answer sheets obtained significantly higher mean reading achievement scores than those groups marking the test booklet. While the eighth grade girls in the test booklet response mode group earned the higher mean reading score.

The t values for groups at the fourth and eleventh grades and boys in the eighth grade were not significant at the 0.05 level of significance. Thus, the null hypothesis was accepted. While these differences in mean achievement were not statistically significant, the mean reading achievement scores for the fourth grade group and boys at the eighth grade were higher for the group marking the test booklet. The higher mean score was obtained by the scoreze group at the eleventh grade.

Grade	Sex	Booklet Mean	Scoreze Mean	"t"
4th ^a	Boys and Girls	78.73 ^b	72.04 ^b	1.56
6th	Boys Girls	89.83 83.50	105.58 99.75	-3.65* -1.95*
8th '	Boys Girls	102.45 ^b 112.97 ^b	99.23 ^b 101.50 ^b	0.39 2.39 [*]
llth ^a	Boys and Girls	92.54	99.45	-1.18

TABLE 4.--Comparisons of mean differences in reading achievement between groups using the booklet and scoreze test response modes at fourth, sixth, eighth, and eleventh grade

^aData for boys and girls pooled, since there was no statistically significant difference in means between boys and girls.

and girls. Means adjusted for regression effect. *Significant at 0.05 level. <u>Hypothesis 9</u>. -- There is no statistically significant difference in mean reading achievement between the groups marking the test booklet and the group pin-punching the answer pad.

An analysis of the t values for the six groups as reported in Table 5 reveals the following. The obtained t values for groups at the fourth, eighth, and eleventh grades were significant. The t values of 2.02, 4.39, 2.21, and 3.13, respectively, were larger than the table value 1.796 at the 0.05 level of significance. Thus the null hypothesis could be rejected. A significantly higher mean reading achievement score was obtained by those groups marking the test booklet.

The t values for the differences in mean reading achievement for boys and girls in the sixth grade group were not significant at the 0.05 level of significance. The null hypothesis was accepted. There was no statistically significant difference in mean reading achievement between test booklet and pin-punch response mode groups. However, the higher mean reading achievement, though not statistically significant, was obtained by the group pin-punching an answer pad.

<u>Hypothesis 10</u>. -- There is no statistically significant difference in mean reading achievement between the group marking the test booklet and the group marking the cal-card.

The t values for eighth grade boys (2.49), eighth grade girls (1.84) and eleventh grade group (2.09) were

Grade	Sex	Booklet Mean	Pin-Punch Mean	"t"
4th ^a	Boys and Girls	78.73 ^b	70.59 ^b	2.02*
6th	Boys Girls	89.83 83.50	94.92 98.25	-0.51 -1.13
8th	Boys Girls	102.45 ^b 112.97 ^b	78.69 ^b 110.20 ^b	4.39 [*] 2.21 [*]
llth ^a	Boys and Girls	92.50	82.71	3.13*

TABLE 5.--Comparisons of mean differences in reading achievement between groups using the booklet and pin-punch test response modes at fourth, sixth, eighth, and eleventh grade

^aData for boys and girls pooled, since there was no significant difference in means between boys and girls. ^bMeans adjusted for regression effect. *Significant at 0.05 level. significant at the 0.05 level of significance as presented in Table 6. The null hypothesis could be rejected for these groups. Therefore the mean reading scores obtained by eighth and eleventh grade groups marking the test booklet could be accepted as significantly higher than the mean scores obtained by the groups at these grade levels marking the cal-card.

Values of t for the other tests of significance were smaller than the table t value at the 0.05 level. Thus the null hypothesis was accepted. Though the differences in means were not statistically significant, an analysis of the higher mean scores was in order. The fourth grade group marking the test booklet obtained the higher mean score. At the sixth grade level the group marking the cal-card obtained the higher mean score.

Hypothesis 11. -- There is no statistically significant difference in mean reading achievement between the group marking the scoreze answer sheet and the group pin-punching the answer pad.

The means of the four groups were compared and t-values calculated to test this hypothesis, as presented in Table 7. The t values for eighth grade boys (4.67), eighth grade girls (-1.84) and eleventh grade boys and girls (4.29 were greater than the t value required for significance at the 0.05 level of significance. Therefore the null hypothesis was rejected for these group mean differences. The eighth grade boys and eleventh grade boys and girls marking the

The second s				
Grade	Sex	Booklet Mean	Cal-Card Mean	"七"
4th ^a	Boys and Girls	78.73 ^b	73.64 ^b	1.25
6th	Boys Girls	89.83 83.50	94.92 90.00	-1.17 -0.88
8th	Boys Girls	102.45 ^b 112.97 ^b	87.31 ^b 101.71 ^b	2.49 [*] 1.84 [*]
llth ^a	Boys and Girls	92.50	78.85	2.09*

TABLE 6.--Comparisons of mean differences in reading achievement between groups using the booklet and cal-card test response modes at fourth, sixth, eighth, and eleventh grade

a Data for boys and girls pooled, since there was no significant difference in means between boys and girls. ^bMeans adjusted for regression effect. *Significant at 0.05 level.

Grade	Sex	Scoreze Mean	Pin-Punch Mean	"t"
4th ^a	Boys and Girls	72.04 ^b	70.50 ^b	0.38
6th	Boys Girls	105.58 99.75	94.92 98.25	1.20 0.11
8th	Boys Girls	99.23 ^b 101.50 ^b	78.69 ^b 110.20 ^b	4.67* -1.84*
llth ^a	Boys and Girls	99.45	82.71	4.29*

TABLE 7.--Comparisons of mean differences in reading achievement between groups using the scoreze and pin-punch test response modes at fourth, sixth, eighth, and eleventh grade

^aData for boys and girls pooled, since there was no significant difference in means between boys and girls. ^bMeans adjusted for regression effect. *Significant at 0.05 level. scoreze answer sheet obtained a significantly higher mean reading score than those at the same grade level pin-punching a response pad. The higher mean achievement for the eighth grade girls was obtained by those pin-punching a response pad.

The t-values for the fourth and sixth grade groups were not significant at the 0.05 level of significance. The hypothesis was accepted for these differences in mean reading achievement. However, in analyzing the mean achievement comparisons in Table 7, in five of the six comparisons recorded the group marking the scoreze answer sheet obtained a higher mean reading achievement than the group pin-punching the response pad.

Hypothesis 12. -- There is no statistically significant difference in mean reading achievement between the group marking the scoreze answer sheet and the group marking the calcard.

The obtained t values, as presented in Table 8, for the sixth grade boys (3.85), eighth grade boys (2.48) and eleventh grade boys and girls (3.03) were significant at the 0.05 level of significance. Thus the null hypothesis was rejected. There was significantly higher mean reading achievement for the sixth grade boys, eighth grade boys, and eleventh grade group marking the scoreze answer sheet than for the groups at the same grades marking the cal-card.

Grade	Sex	Scoreze Mean	Cal-Card Mean	"t"
4th ^a	Boys and Girls	72.04 ^b	73.64 ^b	-0.37
6th	Boys Girls	105.58 99.75	94.92 90.00	3.85* 1.15
8th	Boys Girls	99.23 ^b 101.50 ^b	87.31 ^b 101.71 ^b	2.48* -0.27
llth ^a	Boys and Girls	99.45	78.85	3.03*

TABLE 8.--Comparisons of mean differences in reading achievement between groups using the scoreze and cal-card test response modes at fourth, sixth, eighth, and eleventh grade

^aData for boys and girls pooled, since there was no significant difference in means between boys and girls. bMeans adjusted for regression effect. *Significant at 0.05 level. The t values for the fourth grade, sixth grade girls, and eighth grade girls were not significant at the 0.05 level of significance. Thus the null hypothesis was accepted. While there was no statistically significant difference in mean achievement between these specific scoreze and cal-card groups, further study of the mean reading achievement (Table 8) revealed that the sixth grade girls in the scoreze group obtained a mean reading achievement which was 9.75 raw score points above that of the cal-card group. Thus in four out of six of the mean comparisons the higher mean reading achievement score was obtained by the group marking the scoreze answer sheet.

<u>Hypothesis 13</u>. -- There is no statistically significant difference in mean reading achievement between the group pinpunching a response pad and the group marking the cal-card.

The t values as presented in Table 9, for eighth grade boys (-1.91) was greater than the table value at the 0.05 level of significance. Thus the null hypothesis as stated could be rejected. There was a statistically significant difference in mean reading achievement between the eighth grade boys in the cal-card group and the eighth grade boys in the pin-punch group. The higher mean achievement was obtained by the eighth grade boys in the cal-card group.

An examination of the mean reading achievement and other t values in Table 9 indicates the following. The five remaining t values were not significant at the 0.05 level of

Grade	Sex	Pin-Punch Mean	Cal-Card Mean	"t"
4th ^a	Boys and Girls	70.50 ^b	73.64 ^b	0.77
6th	Boys Girls	94.92 98.25	94.92 90.00	0.00 0.81
8th	Boys Girls	78.69 ^b 110.20 ^b	87.31 ^b 101.71 ^b	-1.91* 1.39
llth ^a	Boys and Girls	82.71	78.85	0.27

TABLE 9.--Comparisons of mean differences in reading achievement between groups using the pin-punch and cal-card test response modes at fourth, sixth, eighth, and eleventh grade

^aData for boys and girls pooled, since there was no significant difference in means between boys and girls. ^bMeans adjusted for regression effect. *Significant at 0.05 level. significance. Thus the null hypothesis was accepted. The higher mean reading score for fourth grade was obtained by the cal-card group. Sixth grade, eighth grade girls, and eleventh grade groups pin-punching the answer pad obtained the higher mean.

An analysis of the comparisons of mean reading achievement for groups using the same test response mode appear to reveal:

(1) The test booklet response mode groups obtained higher mean reading scores in eleven of the eighteen comparisons and in six of these the mean reading scores were significantly higher.

(2) The scoreze response mode groups obtained higher mean reading scores in thirteen of the eighteen comparisons and in five of these the mean reading scores were significantly higher.

(3) The pin-punch response mode groups obtained higher mean reading scores in six of the eighteen comparisons and in one of these the mean reading scores was significantly higher.

(4) The cal-card response mode groups obtained higher mean reading scores in five of the eighteen comparisons and in one of these the mean reading score was significantly higher.

It is necessary at this point to present a background for the analysis of data collected using the opinionnaires.

The opinions expressed by students toward the response mode used by the group to which they were assigned were tabulated in two types of tables. The first tables (Tables 10 and 11) present the number and percentage of favorable and unfavorable opinions by mode group and sex based on "yes" and "no" responses to the question, Did you like to mark your response using this test response mode? (see opinionnaires in Appendix The second set of tables (Tables 12 through 19) presents B). the answers to the question why? following the "yes" and "no" response. These data were formulated in two tables for each of the four response modes. One of these tables shows the stated reasons as to why the response mode was favored, tabulated under one of four or five categories and reported by number for reasons why the mode was favored (Tables 12, 14, 16, and 18). The other tables (Tables 13, 15, 17, and 19) show the same tabulation by number for the reasons why it These tables were used in the analysis of was not favored. opinions which follows.

Because the number in each of the response groups was relatively small (boys n = 12 and girls n = 12) the percentages calculated were not tested for statistical significance. In spite of the small numbers in each group the numbers in most groups clearly show the direction of the majority opinion and supporting reasons expressed by students in each group.

		Fourth Grade				Sixth Grade			
Test Response	Opinion ^b	Boys		Girls		Boys		G	irls
Modes	-	n	%	n	%	n	%	n	%
Booklet	Yes No	12 0	100.0	12 0	100.0	12 0	100.0 0.0	11 1	91.7 8.3
Scoreze	Yes No	11 1	91.7 8.3	12 0	100.0 0.0	9 3	75.0 25.0	12 0	100.0 0.0
Pin-Punch	Yes No	12 0	100.0 0.0	12 0	100.0 0.0	11 1	91.7 8.3	12 0	100.0 0.0
Cal-Card	Yes No	11 1	91.7 8.3	12 0	100.0 0.0	10 2	83.3 16.7	9 3	75.0 25.0

TABLE 10.--Number and percentage of favorable and unfavorable opinions toward test response modes as expressed by students in the fourth and sixth grades by response modes and sex^a

^a12 boys and 12 girls in each test response mode group, total for each grade N=96.

^bFavorable opinion expressed as <u>yes</u> to the question, "Did you like to respond using this test response mode?"

Unfavorable opinion expressed as <u>no</u> to the question, "Did you like to respond using this test response mode?"

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			Eighth Grade				Eleventh Grade			
Test Response	b Opinion	Boys G		G	Girls		Boys		Girls	
Modes	-	n	%	n	%	n	%	n	%	
Booklet	Yes No	12 0	100.0	11 1	91.7 8.3	11 1	91.7 8.3	11 1	91.7 8.3	
Scoreze	Yes No	2 10	16.7 83.3	1 11	8.3 91.7	2 10	16.7 83.3	1 11	8.3 91.7	
Pin-Punch	Yes No	7 5	58.3 41.7	12 0	100.0 0.0	3 9	25.0 75.0	8 4	66.7 33.3	
Cal-Card	Yes No	8 4	66 .7 33 . 3	6 6	50.0 50.0	1 11	8.3 91.7	6 6	50.0 50.0	

TABLE 11.--Number and percentage of favorable and unfavorable opinions toward test response modes as expressed by students in eighth and eleventh grades by response modes and sex^a

^a12 boys and 12 girls in each test response mode group, total for each grade N=26.

^bFavorable opinion expressed as <u>yes</u> to the question, "Did you like to respond using this test response mode?"

Unfavorable opinion expressed as <u>no</u> to the question, "Did you like to respond using this test response mode?"

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		Favorable Opinions by C			
Grade	Group	Ease	Less Time	Mechanics	Other
4th	Boys	7	3	1	3
	Girls	9	0	4	1
	Total	16	3	5	4
6th	Boys	6	3	2	1
	Girls	8	2	1	1
	Total	14	5	3	2
8th	Boys	8	3	3	0
	Girls	10	4	3	0
	Total	18	7	6	0
llth	Boys	8	8	3	0
	Girls	10	4	2	0
	Total	18	12	5	0

TABLE 12.--Kind and number of favorable opinions expressed by fourth, sixth, eighth, and eleventh grade boys and girls toward using the test booklet response mode

^aThese categories represent the following kinds of opinions:

<u>Ease</u>: It is easier to use than a separate answer sheet. It is simple. I understand it. It is not as confusing. More relaxed while taking it.

Less Time: It is quicker than using a separate answer sheet. Don't lose time while looking for place to mark your answer. It saves time.

<u>Mechanics</u>: You don't get behind. You don't make as many mistakes this way. You don't lose your place. You don't forget your answer while looking where to mark. Less mistakes when answers are next to the question.

Other: It is more fun. I like everything about it. I just like it.

		Unfavorable Opinions by Category ^a					
Grade	Group	Difficult	More Time	Poor Mechanics	Other		
4th	Boys	0	0	0	0		
	Girls	0	0	0	0		
	Total	0	0	0	0		
6th	Boys	0	0	0	0		
	Girls	1	0	0	0		
	Total	1	0	0	0		
8th	Boys	0	0	0	0		
	Girls	0	1	0	0		
	Total	0	1	0	0		
llth	Boys	0	1	0	0		
	Girls	0	0	0	1		
	Total	0	1	0	1		

TABLE 13.--Kind and number of unfavorable opinions expressed by fourth, sixth, eighth, and eleventh grade boys and girls toward using the test booklet response mode

^aThese categories represent the following kinds of opinions:

Difficult: It is harder for me.

More Time: Because you didn't have enough time to write them out.

Poor Mechanics: None.

Other: It is just so dull. I don't really know why.

		Fa	avorable Op	pinions by Categ	ory ^a
Grade	Group	Ease	Less Time	Mechanics	Other
4th	Boys	7	1	1	3
	Girls	4	1	1	6
	Total	11	2	2	9
6th	Boys	4	1	0	4
	Girls	10	2	3	2
	Total	14	3	3	6
8th	Boys	1	0	1	0
	Girls	0	0	0	1
	Total	1	0	1	1
llth	Boys	2	0	1	0
	Girls	0	0	2	0
	Total	2	0	3	0

TABLE 14.--Kind and number of favorable opinions expressed by fourth, sixth, eighth, and eleventh grade boys and girls toward using the scoreze test response mode

^aThese categories represent the following kinds of opinion:

<u>Ease</u>: It was easier. It was clearer. It was easier to move the sheet around to mark.

Less Time: It didn't take as much time. It was quicker.

<u>Mechanics</u>: I like the way it is printed. You can use the booklet again. More room to write your answer. It can be graded easier.

Other: It was fun. I just like all of it.

TABLE 15.--Kind and number of unfavorable opinions expressed by fourth, sixth, eighth, and eleventh grade boys and girls toward using the scoreze test response mode

Grade Gi		Unfavorable Opinions by Category ^a					
	Group	Difficult	More Time	Poor Mechanics	Other		
4th	Boys	0	0	0	1		
	Girls	0	0	0	0		
	Total	0	0	0	1		
6th	Boys	1	2	2	0		
	Girls	0	0	0	0		
	Total	1	2	2	0		
8th	Boys	6	4	1	1		
	Girls	9	5	0	0		
	Total	15	9	1	1		
llth	Boys	5	5	1	0		
	Girls	7	4	2	0		
	Total	12	9	3	0		

^aThese categories represent the following kinds of opinions:

<u>Difficult</u>: Not as easy as the test booklet. Harder to keep straight.

More Time: Takes more time. Takes too long to find your place.

Poor Mechanics: I like to answer in the booklet. Not as much to fool with when the booklet is used.

Other: I don't care which way I mark my response.

		Favorable Opinions by Category ^a					
Grade	Group	Ease	Less Time	Mechanics	Fun	Other	
4th	Boys	5	2	4	5	0	
	Girls	7	2	1	4	2	
	Total	12	4	5	9	2	
6th	Boys	8	6	3	6	1	
	Girls	10	4	0	5	2	
	Total	18	10	3	11	4	
8th	Boys	2	2	0	4	0	
	Girls	3	0	0	2	8	
	Total	5	2	0	6	8	
llth	Boys	1	1	2	0	2	
	Girls	2	2	0	1	5	
	Total	3	3	2	1	7	
opinion	^a These ca	ategories	represent	t the followi	ng kind	s of	

TABLE 16.--Kind and number of favorable opinions expressed by fourth, sixth, eighth, and eleventh grade boys and girls toward using the pin-punch test response mode

opinions: <u>Ease</u>: It is easier. Easier than marking your response with a pencil. <u>Less Time</u>: It saves time by punching a hole. It seems quicker. <u>Mechanics</u>: I didn't have to use a pencil. I didn't have to erase. You can do it with either hand. It is not as messy. <u>Fun</u>: I like to punch holes. It is fun to punch holes. <u>Other</u>: Just because. It is different. It is more interesting.

- -

		<u></u>				
Grade	Group	Unfavorable Opinions by Category ^a				
		Difficult	More Time	Poor Mechanics	Other	
4th	Boys	0	0	0	0	
	Girls	0	0	0	0	
	Total	0	0	0	0	
6th	Boys	0	0	2	0	
	Girls	0	0	0	0	
	Total	0	0	2	0	
8th	Boys	2	1	0	1	
	Girls	0	0	0	0	
	Total	2	1	0	1	
llth	Boys	6	2	2	1	
	Girls	1	1	2	0	
	Total	7	3	4	1	

TABLE 17.--Kind and number of unfavorable opinions expressed by fourth, sixth, eighth, and eleventh grade boys and girls toward using the pin-punch test response mode

^aThese categories represent the following kinds of opinions:

<u>Difficult</u>: Not as easy as writing in the test booklet. I get mixed up. Harder to keep up with. It is distracting.

<u>More Time</u>: It takes more time than the other ways. It slows you down to punch with a pin.

Poor Mechanics: You could get hurt with the pin. Could be dangerous. You can't erase.

Other: I don't like the separate answer sheet. I have no reason.

Grade	Group	Favorable Opinions by Category ^a				
		Ease	Less Time	Mechanics	Other	
4th	Boys	5	0	6	2	
	Girls	4	0	3	3	
	Total	9	0	9	5	
6th	Boys	8	1	1	3	
	Girls	4	0	4	1	
	Total	12	1	5	4	
8th	Boys	5	1	3	0	
	Girls	5	0	1	2	
	Total	10	1	4	2	
llth	Boys	2	0	0	2	
	Girls	3	0	0	2	
	Total	5	0	0	4	

TABLE 18.--Kind and number of favorable opinions expressed by fourth, sixth, eighth, and eleventh grade boys and girls toward using the cal-card test response mode

^aThese categories represent the following kinds of opinions:

Ease: It is easier. It is easier to keep your place. <u>Less Time</u>: It is easier to handle the card while turning pages. It is quicker. It doesn't take as much time. <u>Mechanics</u>: Doesn't take up as much room on your desk. Not as easy for others to copy from the small card. Neater. It was little, and I like little things. It is nice to have it made of heavy material. The order of the card was better.

Other: It was more fun. It was different.

Grade	Group	Unfavorable Opinions by Category ^a				
		Difficult	More Time	Poor Mechanics	Other	
4th	Boys	0	0	1	0	
	Girls	0	0	0	0	
	Total	0	0	1	0	
6th	Boys	1	0	0	0	
	Girls	4	0	0	0	
	Total	5	0	0	0	
8th	Boys	3	1	0	0	
	Girls	6	1	0	0	
	Total	9	2	0	0	
llth	Boys	7	3	0	1	
	Girls	5	2	1	0	
	Total	12	5	1	1	

TABLE 19.--Kind and number of unfavorable opinions expressed by fourth, sixth, eighth, and eleventh grade boys and girls toward using the cal-card test response mode

^aThese categories represent the following kinds of opinions:

Difficult: Not as easy as the answer sheet. I get mixed up. Easier to make a mistake. Harder to keep up with the card and book.

More Time: Takes a longer amount of time to find your place. Takes too much time.

Poor Mechanics: Spaces to mark are too small. Too small and kept sliding off my desk. Other: I used it because I had to.

In analyzing the favorable and unfavorable opinions only those expressed by 50 per cent of more of the group were reported in the written analysis. This percentage was chosen, because to be a majority opinion it should be expressed by more than half of the students in a group.

The analysis of the data collected by use of the opinionnaire shows that:

(1) The test booklet response mode was favored by 91 per cent and 100 per cent of the boys and girls in each of the groups where this mode was used. They favored this mode for two major reasons -- the ease with which it can be marked and the shorter time needed to mark the response.

(2) The scoreze answer sheet response mode was favored by 91 per cent of the boys and 100 per cent of the girls in the fourth grade scoreze group and 75 per cent of the boys and 100 per cent of the girls in the sixth grade scoreze group. The main reason stated for favoring this mode was the ease with which it can be marked. Eighty-three per cent of the boys and 91 per cent of the girls in each of the eighth and eleventh grade scoreze mode groups expressed unfavorable opinions. Their most frequently stated reasons for these unfavorable opinions were the difficulty in marking the separate sheet and the confusion in looking from the booklet to the answer sheet.

(3) The opinions expressed concerning the use of the pin-punch response mode were varied from 75 per cent unfavorable

opinions at the eleventh grade to 100 per cent favorable response at the fourth and sixth grades. An analysis of Tables 10 and 11 show the following: The fourth and sixth grade groups using the pin-punch mode expressed a 91 per cent and 100 per cent favorable opinion toward the use of the pinpunch mode. "It is easy to do", "It saves time to punch a hole", and "It is fun to punch holes", were given as the major reasons for favoring its use by groups at both fourth and sixth grades. The eighth grade group favored its use because it was different and interesting with 100 per cent of the girls and 58 per cent of the boys expressing a favorable There was a marked difference in opinion in the opinions. eleventh grade where 75 per cent of the boys expressed an unfavorable opinion. The main reason expressed was the ease with which one could be confused in punching holes in the answer sheet. Sixty-six per cent of the girls in this same group favored the pin-punch mode mainly because it was different and interesting.

(4) The cal-card test response mode was given a favorable opinion by 91 per cent of the boys and 100 per cent of the girls in this mode group at fourth grade, while 83 per cent of the boys and 75 per cent of the girls in the sixth grade and 66 per cent of the boys and 50 per cent of the girls in the eighth grade cal-card response groups expressed yes, to the question, "Did you like marking your answer on the card?" The ease with which it could be used was given most

frequently as the reason for favoring the use of the card response mode. The unfavorable opinion expressed by 50 per cent of the eighth grade girls was because of difficulty in using the card. The boys in the eleventh grade cal-card group were 91 per cent unfavorable in their opinions toward the card response mode and the girls equally divided 50 per cent favorable and 50 per cent unfavorable. They listed as their main reasons for not favoring the card that it is easier to make mistakes and it is harder to look from your booklet to the small card. The favorable opinions expressed by 50 per cent of the eleventh grade girls using the card mode were supported by the reasons that it was easier and different.

CHAPTER IV

SUMMARY, FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

Summary

This study was designed to investigate the differences in mean reading achievement where four different test response modes were used by students in the fourth, sixth, eighth and eleventh grades in three Oklahoma City Public Schools. Specifically, it was to compare the mean reading achievement between four groups of students at each of the four grade levels where each group responded to a reading test using one of the following test response modes (1) writing the response in the test booklet, (2) marking the response on a self-scoring answer sheet, (3) punching the response on an answer pad, and (4) marking the response on an IBM response card.

The data for this study were collected during the spring semester of the school year 1961-62. Subjects for the study were 384 students enrolled in schools in a middlesocio-economic area of Oklahoma City. The students had been randomly assigned to classes during the regular enrollment period at the three schools. Four classes at each grade level were selected by a table of random numbers and the

number of students in each class was equated by use of a table of random numbers so there were twenty-four students in each class -- twelve boys and twelve girls. The four different test response modes were randomly assigned to the four classes at each of the grade levels.

In order to assess the differences in mental ability of the students the <u>California Test of Mental Maturity</u> was administered to each student during the first testing session. During the second testing session each student responded to the criterion instrument, the <u>California Reading Test</u>, using one of the four test response modes as randomly assigned. Following the second testing session the student filled out an opinionnaire to indicate whether he did or did not like the test response mode used. The student was then asked to write out reasons as to why he did or did not like to use the test response mode.

The adjusted mean reading achievement raw scores for the four test response mode groups were analyzed by use of analysis of co-variance for fourth, and eighth grades. The sixth and eleventh grade groups did not meet the underlying assumptions necessary before applying analysis of co-variance. The co-variance procedure permitted the adjustment of mean reading achievement scores by removal of any regression effect of mental age-chronological age ratios. An F-ratio was formed to test the significance of differences in mean among test response mode groups, between sexes using the same and

different response modes, and interaction between test response mode and sex for the fourth, and eighth grades.

Since the F values in the analysis of co-variance were significant at the 0.05 and/or 0.01 levels of significance "student" t's were calculated to test for statistically significant differences in mean reading achievement between sexes using the same test response mode and between groups using different test response modes. The sixth and eleventh grade groups differences in unadjusted mean reading scores were tested for statistical significance using the "t" tests.

Favorable and unfavorable opinions expressed by each group toward the response mode used in responding to the test were tabulated and analyzed as to number, percentage and kind of reason expressed for favoring or not favoring the response mode.

Findings

On the basis of the analysis of data the following findings appear tenable:

1. There were statistically significant differences in mean reading achievement scores between eighth grade girls and boys in each of the following response mode groups test booklet, pin-punch, and cal-card. The girls in each group obtained the higher mean score.

2. There was a statistically significant difference in mean reading achievement scores between sixth grade groups

where the test booklet and scoreze response modes were used. The group using the scoreze response mode obtained the higher mean score.

3. There was a statistically significant difference in mean reading achievement scores between eighth grade girls where the test booklet and scoreze response modes were used. The girls using the test booklet response mode obtained the higher mean score.

4. There was a statistically significant difference in mean reading achievement scores between fourth grade groups where the test booklet and pin-punch response modes were used. The group using the test booklet response mode obtained the higher mean score.

5. There was a statistically significant difference in mean reading achievement scores between eighth grade groups where the test booklet and pin-punch response modes were used. The group using the test booklet response mode obtained the higher mean score.

6. There was a statistically significant difference in mean reading achievement scores between eleventh grade groups where the test booklet and pin-punch response modes were used. The group using the test booklet response mode obtained the higher mean score.

7. There was a statistically significant difference in mean reading achievement scores between eighth grade groups \checkmark where the test booklet and cal-card response modes were used.

The groups using the test booklet response mode obtained the higher mean scores.

8. There was a statistically significant difference in mean reading achievement scores between eleventh grade groups where the test booklet and card response modes were used. The group using the test booklet response mode obtained the higher mean score.

9. There was a statistically significant difference in mean reading achievement scores between eighth grade boys where the scoreze and pin-punch response modes were used. The boys using the scoreze test response mode obtained the higher mean score.

10. There was a statistically significant difference in mean reading achievement scores between eighth grade girls where the scoreze and pin-punch response modes were used. The girls using the pin-punch test response mode obtained the higher mean score.

11. There was a statistically significant difference in mean reading achievement scores between eleventh grade groups where the scoreze and pin-punch response modes were used. The group using the scoreze test response mode obtained the higher mean score.

12. There was a statistically significant difference in mean reading achievement scores between sixth grade boys where the scoreze and cal-card test response modes were used. The boys using the scoreze test response mode obtained the higher mean score.

13. There was a statistically significant difference in mean reading achievement scores between eighth grade boys where the scoreze and cal-card test response modes were used. The boys using the scoreze test response mode obtained the higher mean score.

14. There was a statistically significant difference in mean reading achievement scores between eleventh grade groups where the scoreze and cal-card response modes were used. The groups using the scoreze test response mode obtained the higher mean score.

15. There was a statistically significant difference in mean reading achievement scores between eighth grade boys where the pin-punch and cal-card response modes were used. The boys using the cal-card test response mode obtained the higher mean score.

16. Over ninety per cent of the students in each group using the test booklet response mode favored its use. The main reasons for those favorable opinions were ease and quickness in marking the response.

17. The scoreze response mode was favored by 75 to 100 per cent in each group of the fourth and sixth grades using it. Ease with which it could be marked was the leading reason given.

18. The eighth and eleventh grade groups using the scoreze response mode expressed unfavorable opinions toward this mode. In these groups 83 per cent of the boys and

91 per cent of the girls registered unfavorable opinions. Difficulty in marking and confusion in looking from the booklet to the answer sheet were the most frequent reasons for its disfavor.

19. Over 90 per cent of the students in the fourth and sixth grade groups using the pin-punch response mode favored its use. This favorable opinion was expressed by all of the boys and 58 per cent of the girls in the eighth grade group. Their most frequent reasons were ease of use, time saved, a different way of taking tests, and fun.

20. The eleventh grade group was divided in opinions with 75 per cent of the boys unfavorable and 66 per cent of the girls favorable toward the pin-punch mode. Those not favoring the mode gave as the main reasons difficulty and confusing to make response this way, while those favoring the mode gave interesting and different as the main reasons for liking this mode.

21. The cal-card response mode was favored by over 90 per cent of the boys and girls in the fourth grade group, while 83 per cent of the boys and 75 per cent of the girls in the sixth grade group favored it. In the eighth grade group 66 per cent of the boys and 50 per cent of the girls expressed favorable opinions toward using this mode. The main reasons for favoring the mode was the ease with which it could be used.

22. Over 90 per cent of the boys in the eleventh grade using the cal-card mode were unfavorable toward it. The girls were equally divided in opinion regarding the use of this mode. The main reasons for the mode being unfavorably received were ease with which mistakes could be made and difficulty in looking from the booklet to the card in looking for the response.

23. The differences in mean reading achievement at the fourth, sixth, eighth and eleventh grades seems to favor those groups using the test booklet and scoreze response modes.

24. The opinions of the fourth and sixth grade students appear to be more frequently favorable toward the use of all response modes. But at the eighth and eleventh grades more of the opinions were favorable toward the booklet response mode than toward the other response modes.

25. Girls in the eighth and eleventh grade groups appear to express more favorable opinions than boys toward the pin-punch and cal-card response modes. Interesting and a different way of taking tests were the reasons given by the girls, while the boys found these modes difficult and time consuming.

Conclusions

The findings appear to suggest the following conclusions:

(1) Students using the test booklet mode and scoreze answer sheet mode appear to do equally well in terms of obtained mean achievement scores. However, in terms of expressed opinion, marking the answer in the booklet is by far the most favored, because it is easier and requires less time.

(2) Students using the pin-punch and cal-card test response modes appear to obtain lower mean reading achievement scores and express less favorable opinions, than students using the test booklet and separate answer sheet test response modes. This could be due to the longer time required, the complications of looking from the booklet to a separate answer sheet or card, and the required use of special devices for recording responses.

(3) Students in the fourth and sixth grades seem to favor the use of all methods, for recording answers even though mean achievement does not agree with expressed opinions. The lack of experience in recording answers to standardized test items could be one of the reasons for this interest expressed toward all test response modes. The unfavorable opinions expressed by the eighth and eleventh grade students reflect an attitude of taking the way which requires least effort and time.

(4) The findings of this study while not conclusive appear to concur with the studies of Dunlap, Herkelmann, and Loper, who found no significant effect on the mean scores where the answers were recorded in the test booklet and on separate answer sheets.

Recommendations

Although the findings of this study are inconclusive, there appear to be aspects of the study of differences in mean achievement and opinions toward test response modes where varied response modes are used, which need further investigation. Among those suggested are:

1. Investigating differences in mean achievement and opinions toward the varied response modes with groups at difference grade levels, mental abilities, socio-economic classes, and previous testing experiences being considered.

2. Studying differences in mean achievement and opinions between students in the same group where varied test modes are adapted to different forms of the same test.

3. Further studies of differences in mean achievement and opinion where larger samples of boys and girls are included to compare differences by sex where the varied response modes are being considered.
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Tiegs, E. W. and Clark, W. W. <u>Technical Report on the</u> <u>California Achievement Tests</u>, 1957 Edition. Monterey: California Test Bureau, 1957. APPENDIX A

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EXAMPLE OF PIN-PUNCH OVERLAY FOR SEPARATE ANSWER SHEET

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$\begin{array}{c} 1 \\ 2 \\ 3 \\ 4 \\ 16 \\ - \\ 17 \\ - \\ 2 \\ 2 \\ 2 \\ 2 \\ - \\ 2 \\ 2 \\ - \\ 2 \\ 2$	$44 \stackrel{2}{\odot} \stackrel{3}{\odot} \stackrel{4}{\odot} \stackrel{4}{\odot} \stackrel{1}{\odot} \stackrel{2}{\odot} \stackrel{3}{\odot} \stackrel{4}{\odot} \stackrel{4}{\odot} \stackrel{1}{\odot} \stackrel{2}{\odot} \stackrel{3}{\odot} \stackrel{4}{\odot} \stackrel{1}{\odot} \stackrel{2}{\odot} \stackrel{3}{\odot} \stackrel{4}{\odot} \stackrel{1}{\odot} \stackrel{2}{\odot} \stackrel{2}{\odot} \stackrel{3}{\odot} \stackrel{4}{\odot} \stackrel{1}{\odot} \stackrel{2}{\odot} \stackrel{2}{\odot} \stackrel{3}{\odot} \stackrel{4}{\odot} \stackrel{1}{\odot} \stackrel{2}{\odot} \stackrel{2}{\odot} \stackrel{3}{\odot} \stackrel{4}{\odot} \stackrel{1}{\odot} \stackrel{1}{\odot} \stackrel{2}{\odot} \stackrel{2}{\odot} \stackrel{3}{\odot} \stackrel{4}{\odot} \stackrel{1}{\odot} \stackrel{1}{\odot} \stackrel{2}{\odot} \stackrel{3}{\odot} \stackrel{4}{\odot} \stackrel{1}{\odot} \stackrel{1}{\odot} \stackrel{2}{\odot} \stackrel{2}{\odot} \stackrel{3}{\odot} \stackrel{4}{\odot} \stackrel{1}{\odot} \stackrel{1}{\odot} \stackrel{1}{\odot} \stackrel{2}{\odot} \stackrel{3}{\odot} \stackrel{4}{\odot} \stackrel{1}{\odot} \stackrel{1}{\odot} \stackrel{1}{\odot} \stackrel{1}{\odot} \stackrel{2}{\odot} \stackrel{1}{\odot} \stackrel$	$\begin{array}{c} 3 \\ 76 \\ 0 \\ - \\ 0 \\ 2 \\ 0 \\ 2 \\ 0 \\ 2 \\ 0 \\ 0 \\ 0 \\ 0$	$102 \bigcirc 0 & 0 & 0 & 0 \\ 103 \bigcirc 0 & 0 & 0 & 0 \\ 103 \bigcirc 0 & 0 & 0 & 0 \\ 104 \bigcirc 0 & 0 & 0 & 0 \\ 105 \odot & 0 & 0 & 0 \\ 105 \odot & 0 & 0 & 0 \\ 106 \odot & 0 & 0 & 0 \\ 107 \odot & 0 & 0 & 0 \\ 108 \odot & 0 & 0 & 0 \\ 108 \odot & 0 & 0 & 0 \\ 109 \odot & 0 & 0 & 0 \\ 100 \odot & 0 & 0 & $	$\begin{array}{c} 1 \\ 1 \\ 3 \\ 2 \\ 0 \\ 0 \\ 1 \\ 3 \\ 3 \\ 0 \\ 0 \\ 0 \\ 1 \\ 3 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0$
$\begin{array}{c} 1 \\ 2 \\ 3 \\ 4 \\ 16 \\ - \\ 0 \\ 2 \\ 2 \\ 17 \\ - \\ 17 \\ - \\ 18 \\ 0 \\ 2 \\ 2 \\ 0 \\ - \\ 2 \\ 19 \\ - \\ 2 \\ 0 \\ - \\ 2 \\ 0 \\ - \\ 2 \\ 0 \\ - \\ 2 \\ 0 \\ - \\ 2 \\ 0 \\ - \\ 2 \\ 0 \\ - \\ 2 \\ 0 \\ - \\ 2 \\ 0 \\ - \\ 2 \\ 0 \\ - \\ 2 \\ 0 \\ - \\ 0 $	$44 \stackrel{2}{\odot} \stackrel{3}{\odot} \stackrel{4}{\odot} \stackrel{4}{\odot} \stackrel{1}{\odot} \stackrel{1}{\odot} \stackrel{2}{\odot} \stackrel{3}{\odot} \stackrel{4}{\odot} \stackrel{1}{\odot} \stackrel{1}{\odot} \stackrel{2}{\odot} \stackrel{2}{\odot} \stackrel{3}{\odot} \stackrel{4}{\odot} \stackrel{1}{\odot} \stackrel{1}{\odot} \stackrel{2}{\odot} \stackrel{2}{\odot} \stackrel{3}{\odot} \stackrel{3}{\odot} \stackrel{4}{\odot} \stackrel{1}{\odot} \stackrel{1}{\odot} \stackrel{2}{\odot} \stackrel{2}{\odot} \stackrel{3}{\odot} \stackrel{4}{\odot} \stackrel{1}{\odot} \stackrel{1}{\odot} \stackrel{2}{\odot} \stackrel{2}{\odot} \stackrel{3}{\odot} \stackrel{4}{\odot} \stackrel{1}{\odot} \stackrel{1}{\odot} \stackrel{2}{\odot} \stackrel{2}{\odot} \stackrel{3}{\odot} \stackrel{1}{\odot} \stackrel{1}{\odot} \stackrel{2}{\odot} \stackrel{1}{\odot} \stackrel{2}{\odot} \stackrel{2}{\odot} \stackrel{3}{\odot} \stackrel{1}{\odot} \stackrel{1}{\odot} \stackrel{2}{\odot} \stackrel{1}{\odot} \stackrel{2}{\odot} \stackrel{1}{\odot} \stackrel$	$\begin{array}{c} 3 \\ 2 \\ 0 \\ - \\$	$102 \bigcirc 0 \bigcirc$	$\begin{array}{c} \mathbf{b} \\ \mathbf{c} \\ $
$\begin{array}{c} 1 \\ 2 \\ 3 \\ 4 \\ 16 \\ - \\ 2 \\ 2 \\ 17 \\ - \\ 17 \\ - \\ 18 \\ - \\ 2 \\ 2 \\ 2 \\ - \\ 2 \\ 2 \\ - \\ 2 \\ 2$	$44 \stackrel{2}{\odot} \stackrel{3}{\odot} \stackrel{4}{\odot} \stackrel{4}{\odot} \stackrel{1}{\odot} \stackrel{2}{\odot} \stackrel{3}{\odot} \stackrel{4}{\odot} \stackrel{4}{\odot} \stackrel{1}{\odot} \stackrel{1}{\odot} \stackrel{2}{\odot} \stackrel{3}{\odot} \stackrel{4}{\odot} \stackrel{4}{\odot} \stackrel{1}{\odot} \stackrel{2}{\odot} \stackrel{3}{\odot} \stackrel{4}{\odot} \stackrel{1}{\odot} \stackrel{2}{\odot} \stackrel{3}{\odot} \stackrel{4}{\odot} \stackrel{1}{\odot} \stackrel{2}{\odot} \stackrel{3}{\odot} \stackrel{4}{\odot} \stackrel{1}{\odot} \stackrel{2}{\odot} \stackrel{2}{\odot} \stackrel{3}{\odot} \stackrel{4}{\odot} \stackrel{1}{\odot} \stackrel{2}{\odot} \stackrel{2}{\odot} \stackrel{3}{\odot} \stackrel{4}{\odot} \stackrel{1}{\odot} \stackrel{2}{\odot} \stackrel{2}{\odot} \stackrel{3}{\odot} \stackrel{4}{\odot} \stackrel{1}{\odot} \stackrel{1}{\odot} \stackrel{1}{\odot} \stackrel{2}{\odot} \stackrel{2}{\odot} \stackrel{3}{\odot} \stackrel{1}{\odot} \stackrel$	$\begin{array}{c} 3 \\ 2 \\ 0 \\ - \\$	$102 \bigcirc 0 & 0 & 0 & 0 \\ 103 \bigcirc 0 & 0 & 0 & 0 \\ 103 \bigcirc 0 & 0 & 0 & 0 \\ 104 \bigcirc 0 & 0 & 0 & 0 \\ 105 \bigcirc 0 & 0 & 0 & 0 \\ 105 \bigcirc 0 & 0 & 0 & 0 \\ 105 \bigcirc 0 & 0 & 0 & 0 \\ 106 \bigcirc 0 & 0 & 0 & 0 \\ 107 \bigcirc 0 & 0 & 0 & 0 \\ 108 \bigcirc 0 & 0 & 0 & 0 \\ 109 \bigcirc 0 & 0 & 0 & 0 \\ 109 \bigcirc 0 & 0 & 0 & 0 \\ 109 \bigcirc 0 & 0 & 0 & 0 \\ 109 \bigcirc 0 & 0 & 0 & 0 \\ 109 \bigcirc 0 & 0 & 0 & 0 \\ 109 \bigcirc 0 & 0 & 0 & 0 \\ 109 \bigcirc 0 & 0 & 0 & 0 \\ 109 \bigcirc 0 & 0 & 0 & 0 \\ 109 \bigcirc 0 & 0 & 0 & 0 \\ 109 \bigcirc 0 & 0 & 0 & 0 \\ 109 \bigcirc 0 & 0 & 0 & 0 \\ 109 \bigcirc 0 & 0 & 0 & 0 \\ 109 \bigcirc 0 & 0 & 0 & 0 \\ 100 & 0 & 0 & 0 & 0 $	$\begin{array}{c} \mathbf{b} \\ \mathbf{c} \\ $
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$1 \stackrel{2}{\bigcirc} \stackrel{3}{\bigcirc} \stackrel{4}{\bigcirc} \stackrel{4}{\bigcirc} \stackrel{1}{\bigcirc} \stackrel{1}{\bigcirc} \stackrel{2}{\bigcirc} \stackrel{3}{\bigcirc} \stackrel{4}{\bigcirc} \stackrel{1}{\bigcirc} \stackrel{1}{\bigcirc} \stackrel{1}{\bigcirc} \stackrel{2}{\bigcirc} \stackrel{2}{\bigcirc} \stackrel{3}{\bigcirc} \stackrel{1}{\bigcirc} \stackrel{1}{\bigcirc} \stackrel{1}{\bigcirc} \stackrel{2}{\bigcirc} \stackrel{2}{\bigcirc} \stackrel{3}{\bigcirc} \stackrel{1}{\bigcirc} \stackrel{1}{\bigcirc} \stackrel{1}{\bigcirc} \stackrel{2}{\bigcirc} \stackrel{2}{\bigcirc} \stackrel{3}{\bigcirc} \stackrel{1}{\bigcirc} \stackrel{1}{\bigcirc} \stackrel{2}{\bigcirc} \stackrel{2}{\bigcirc} \stackrel{2}{\bigcirc} \stackrel{3}{\bigcirc} \stackrel{3}{\bigcirc} \stackrel{1}{\bigcirc} \stackrel{1}{\bigcirc} \stackrel{2}{\bigcirc} \stackrel{2}{\bigcirc} \stackrel{2}{\bigcirc} \stackrel{3}{\bigcirc} \stackrel{3}{\bigcirc} \stackrel{1}{\bigcirc} \stackrel{1}{\bigcirc} \stackrel{2}{\bigcirc} \stackrel{2}{\circ} $	$44 \stackrel{2}{\odot} \stackrel{3}{\odot} \stackrel{4}{\odot} \stackrel{4}{\odot} \stackrel{1}{\odot} \stackrel$	$\begin{array}{c} 3 \\ 2 \\ 0 \\ 1 \\ 0 \\ 0$	$102 \bigcirc 0 & 0 & 0 & 0 \\ 103 \bigcirc 0 & 0 & 0 & 0 \\ 103 \bigcirc 0 & 0 & 0 & 0 \\ 104 \bigcirc 0 & 0 & 0 & 0 \\ 105 \bigcirc 0 & 0 & 0 & 0 \\ 105 \bigcirc 0 & 0 & 0 & 0 \\ 105 \bigcirc 0 & 0 & 0 & 0 \\ 106 \bigcirc 0 & 0 & 0 & 0 \\ 107 \bigcirc 0 & 0 & 0 & 0 \\ 108 \bigcirc 0 & 0 & 0 & 0 \\ 109 \bigcirc 0 & 0 & 0 & 0 \\ 109 \bigcirc 0 & 0 & 0 & 0 \\ 109 \bigcirc 0 & 0 & 0 & 0 \\ 109 \bigcirc 0 & 0 & 0 & 0 \\ 110 \bigcirc 0 & 0 & 0 & 0 \\ 110 \bigcirc 0 & 0 & 0 & 0 \\ 111 \bigcirc 0 & 0 & 0 & 0 \\ 112 \bigcirc 0 & 0 & 0 & 0 \\ 113 \bigcirc 0 & 0 & 0 & 0 \\ 113 \bigcirc 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 &$	$\begin{array}{c} a \\ 132 \\ \hline 0 \\ 132 \\ \hline 0 \\ 133 \\ \hline 0 \\ 133 \\ \hline 0 \\ 134 \\ \hline 0 \\ 135 \\ 0 \\ 135 \\ 0 \\ 135 \\ 0 \\ 135 \\ 0 \\ 135 \\ 0 \\ 135 \\ 0 \\ 135 \\ 0 \\ 135 \\ 0 \\ 135 \\ 0 \\ 135 \\ 0 \\ 135 \\ 0 \\ 135 \\ 0 \\ 135 \\ 0 \\ 135 \\ 0 \\$
$1 \stackrel{2}{\bigcirc} \stackrel{3}{\bigcirc} \stackrel{4}{\bigcirc} \stackrel{4}{\bigcirc} \stackrel{1}{\bigcirc} \stackrel{1}{\bigcirc} \stackrel{2}{\bigcirc} \stackrel{3}{\bigcirc} \stackrel{4}{\bigcirc} \stackrel{1}{\bigcirc} \stackrel{1}{\bigcirc} \stackrel{1}{\bigcirc} \stackrel{2}{\bigcirc} \stackrel{2}{\bigcirc} \stackrel{3}{\bigcirc} \stackrel{4}{\bigcirc} \stackrel{1}{\bigcirc} \stackrel{1}{\bigcirc} \stackrel{2}{\bigcirc} \stackrel{2}{\bigcirc} \stackrel{3}{\bigcirc} \stackrel{4}{\bigcirc} \stackrel{1}{\bigcirc} \stackrel{1}{\bigcirc} \stackrel{2}{\bigcirc} \stackrel{2}{\bigcirc} \stackrel{3}{\bigcirc} \stackrel{3}{\bigcirc} \stackrel{4}{\bigcirc} \stackrel{1}{\bigcirc} \stackrel{1}{\bigcirc} \stackrel{2}{\bigcirc} \stackrel{2}{\bigcirc} \stackrel{3}{\bigcirc} \stackrel{3}{\bigcirc} \stackrel{4}{\bigcirc} \stackrel{1}{\bigcirc} \stackrel{1}{\bigcirc} \stackrel{2}{\bigcirc} \stackrel{2}{\bigcirc} \stackrel{2}{\bigcirc} \stackrel{3}{\bigcirc} \stackrel{3}{\bigcirc} \stackrel{4}{\bigcirc} \stackrel{1}{\bigcirc} \stackrel{1}{\bigcirc} \stackrel{2}{\bigcirc} \stackrel{2}{\bigcirc} \stackrel{2}{\bigcirc} \stackrel{2}{\bigcirc} \stackrel{2}{\bigcirc} \stackrel{2}{\bigcirc} \stackrel{3}{\bigcirc} \stackrel{3}{\bigcirc} \stackrel{4}{\bigcirc} \stackrel{1}{\bigcirc} \stackrel{1}{\bigcirc} \stackrel{2}{\bigcirc} \stackrel{2}{\circ} \stackrel{2}{\circ} \stackrel{2}{\circ} \stackrel{1}{\circ} \stackrel{1}{\bigcirc} \stackrel{2}{\circ} \stackrel{2}{\circ} \stackrel{2}{\circ} \stackrel{1}{\circ} $	$\begin{array}{c} -2 & 0 & 0 \\ 46 & 0 & 2 \\ 47 & 0 & 3 \\ 48 & 0 \\ 47 & 0 & 2 \\ 7 & 0 & 0 \\ 48 & 0 \\ 7 & 0 \\ 7 & 0 \\ 7 & 0 \\ 7 \\ 7 & 0 \\ 7 \\ 7 \\ 7 \\ 7 \\ 7 \\ 7 \\ 7 \\ 7 \\ 7 \\$	$\begin{array}{c} 3 \\ 3 \\ 4 \\ 0 \\ 1 \\ 0 \\ 0$	$102 \bigcirc 0 & 0 & 0 \\ 103 \bigcirc 0 & 0 & 0 \\ 103 \bigcirc 0 & 0 & 0 \\ 104 \bigcirc 0 & 0 & 0 \\ 105 \bigcirc 0 & 0 & 0 \\ 107 \bigcirc 0 & 0 & 0 \\ 107 \bigcirc 0 & 0 & 0 \\ 108 \bigcirc 0 & 0 & 0 \\ 109 \bigcirc 0 & 0 & 0 \\ 110 \bigcirc 0 & 0 & 0 \\ 110 \bigcirc 0 & 0 & 0 \\ 111 \odot 0 & $	$\begin{array}{c} & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & &$
$\begin{array}{c} 1 \\ 2 \\ 3 \\ 4 \\ 16 \\ - \\ 0 \\ 2 \\ 2 \\ 17 \\ - \\ 0 \\ 2 \\ 2 \\ 0 \\ 17 \\ - \\ 0 \\ 2 \\ 0 \\ 17 \\ - \\ 0 \\ 2 \\ 0 \\ 2 \\ 0 \\ 19 \\ - \\ 0 \\ 2 \\ 0 \\ 2 \\ 0 \\ 2 \\ 0 \\ 19 \\ - \\ 0 \\ 2 \\ 0 \\ 2 \\ 0 \\ 0 \\ 1 \\ 0 \\ 0 \\ 1 \\ 0 \\ 0 \\ 1 \\ 0 \\ 0$	$\begin{array}{c} -2 \\ -2 \\ -2 \\ -3 \\ -4 \\ -4 \\ -4 \\ -4 \\ -4 \\ -4 \\ -4$	$\begin{array}{c} 3 \\ 3 \\ 4 \\ 0 \\ 1 \\ 0 \\ 0$	$102 \bigcirc 0 & 0 & 0 \\ 103 \bigcirc 0 & 0 & 0 \\ 103 \bigcirc 0 & 0 & 0 \\ 104 \bigcirc 0 & 0 & 0 \\ 105 \bigcirc 0 & 0 & 0 \\ 106 \bigcirc 1 & 0 & 0 \\ 106 \bigcirc 1 & 0 & 0 \\ 107 \bigcirc 1 & 0 & 0 \\ 108 \bigcirc 1 & 0 & 0 \\ 109 \bigcirc 1 & 0 & 0 \\ 110 \bigcirc 1 & 0 & 0 \\ 111 \bigcirc 0 & 0 & 0 \\ 113 \bigcirc 1 & 0 & 0 \\ 114 \bigcirc 1 & 0 & 0 \\ 115 \bigcirc 0 & 0 \\ 115 \bigcirc 0 & 0 \\ 100 \bigcirc 0 & 0 \\ 110 \bigcirc 0 \\ 110 \bigcirc 0 & 0 \\ 110 \bigcirc 0 \\ 100 \bigcirc 0 $	$\begin{array}{c} & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & &$
$\begin{array}{c} 1 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\$	440 440 470 490 490 400 490 400 490 400	$\begin{array}{c} 3 \\ 3 \\ 4 \\ 0 \\ 1 \\ 0 \\ 0$	$102 \bigcirc 0 & 0 & 0 \\ 103 \bigcirc 0 & 0 & 0 \\ 103 \bigcirc 0 & 0 & 0 \\ 104 \bigcirc 0 & 0 & 0 \\ 105 \bigcirc 0 & 0 & 0 \\ 106 \bigcirc 1 & 0 & 0 \\ 106 \bigcirc 1 & 0 & 0 \\ 107 \bigcirc 1 & 0 & 0 \\ 108 \bigcirc 1 & 0 & 0 \\ 109 \bigcirc 1 & 0 & 0 \\ 100 & 0 & 0 & 0 \\ 110 \bigcirc 1 & 0 & 0 \\ 110 \odot 1 & 0 & 0 \\ 110 \odot 1 & $	$\begin{array}{c} \mathbf{a} \\ \mathbf{a} \\ \mathbf{b} \\ \mathbf{c} \\ $

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APPENDIX B

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ILLUSTRATIONS OF OPINIONNAIRES USED FOR

BOOKLET

SCOREZE

PIN-PUNCH

CAL-CARD

OPINIONNAIRE USED BY GROUPS WRITING

ANSWERS IN THE TEST BOOKLET

Students nam	e Grade
Directions:	Below are two questions. Answer the first ques-
	tion by marking circle around the answer of your
	choice. Then on the lines following Why? state
	the reasons why you answered the first question
	as you did.
Did way like	to write your enginers in the test backlat?

Did you like to write your answers in the test booklet?

Yes____ No____

Why?_____

OPINIONNAIRE USED BY GROUPS MARKING ANSWERS ON A

SCOREZE SEPARATE ANSWER SHEET

Students name	e Grade
Directions:	Below are two questions. Answer the first ques-
	tion by marking circle around the answer of your
	choice. Then on the lines following Why? state
	the reasons why you answered the first question
	as you did.

Did you like to mark your answers on the separate answer sheet?

Yes____ No____

Why?_____

OPINIONNAIRE USED BY GROUPS PIN-PUNCHING

ANSWERS ON AN ANSWER PAD

e Grade
Below are two questions. Answer the first ques-
tion by marking circle around the answer of your
choice. Then on the lines following Why? state
the reasons why you answered the first question
as you did.

Did you like to pin-punch your answers on the answer pad?

	Yes	No	
Why?	•		

OPINIONNAIRE USED BY GROUPS MARKING ANSWERS ON A

CAL-CARD IBM ANSWER CARD

Students Name	e Grade
Directions:	Below are two questions. Answer the first ques-
	tion by marking circle around the answer of your
	choice. Then on the lines following Why? state
	the reasons why you answered the first question
	as you did.

Did you like to mark your answers on the answer card?

Yes_____ No_____

Why?_____

APPENDIX C

TABLE 20.--Test data for four fourth-grade groups by test response mode and sex

		Booklet				Scoreze			Pin-Punch			Cal-Card				
Stu- dent No.	Boy (n=1	s .2)	Gir] (n=]	Ls L2)	Boy (n=]	/s .2)	Girl (n=1	Ls 12)	Boy (n=1	s.2)	Girl (n=1	s 2)	Boy (n=1	75 L2)	Girl (n=1	.s .2)
	x	Y	x	Y	x	Y	X	Y	X	Y	x	Y	x	Y	x	Y
1	1.17	94	1.12	91	.70	35	1.18	77	.95	33	1.13	83	1.15	83	1.07	48
2	1.01	80	1.13	90	.92	47	.96	67	1.37	73	1.32	75	1.16	87	1.07	74
3	1.15	36	1.21	80	.81	32	1.18	70	1.06	73	1.04	60	1.23	87	1.21	74
4	1.19	83	1.04	85	.85	52	1.09	105	.89	39	1.08	81	1.18	77	.91	49
5	1.28	91	1.14	87	1.04	38	1.13	60	1.31	82	1.08	63	1.22	101	1.07	72
6	1.29	89	.99	70	1.02	31	1.11	73	1.14	40	1.17	89	1.20	93	1.01	44
7	1.20	97	1.21	79	.95	30	.95	67	1.31	92	1.02	53	1.18	65	1.13	78
8	1.07	75	.97	102	1.15	86	1.02	65	1.19	65	1.04	62	1.05	61	1.11	85
9	1.09	92	1.11	79	1.05	80	1.27	77	.88	30	.99	69	1.13	61	.99	58
10	1.10	71	1.20	78	1.21	113	1.01	83	1.25	96	1.14	70	1.22	67	1.12	79
11	1.21	99	1.25	101	1.04	59	1.18	80	1.21	44	1.24	72	1.03	43	.99	73
12	.96	57	1.18	83	1.04	88	1.09	80	1.03	57	1.13	62	1.32	89	.87	49

^aTotal number of students in all groups N=96.

X = California Test of Mental Maturity (Mental age-chronological age ratio).<math>Y = California Reading Test (Raw Score).

		Booklet			Scoreze			Pin-Punch			Cal-Card					
Stu- dent No.	Boy (n=	ys 12)	Gir (n=1	ls 12)	Boy (n=1	ys 12)	Gir (n=1	ls 12)	Boy (n=1	ys L2)	Gir] (n=]	Ls L2)	Boy (n=]	75 L2)	Gir] (n=]	Ls L2)
	x	Y	x	Y	x	Y	x	Y	x	Y	x	Y	x	Y	x	Y
1	.93	82	.90	97	1.18	110	1.07	95	1.09	67	1.16	102	1.10	87	1.08	89
2	1.16	103	.90	67	1.21	116	1.09	105	1.08	100	1.09	102	1.12	108	1.09	98
3	.92	100	1.11	110	1.22	100	1.13	89	.98	88	1.11	79	1.19	99	.99	49
4	.94	66	1.08	87	1.24	114	1.07	102	1.25	104	1.08	97	1.09	105	1.05	74
5	1.12	111	.97	85	1.21	105	1.28	106	1.19	107	1.08	101	1.23	101	.96	98
6	1.13	92	.93	96	1.17	104	1.02	90	1.10	99	1.10	90	1.05	101	1.03	95
7	1.08	100	.99	93	1.10	105	1.03	93	1.14	91	1.23	112	1.08	94	1.17	117
8	1.13	112	.88	68	1.23	105	1.26	102	1.21	98	1.13	107	1.01	80	1.23	114
9	1.01	103	1.01	94	1.28	113	1.22	103	.97	89	1.13	105	1.05	98	.90	74
10	1.04	94	1.03	94	1.24	101	1.23	107	1.03	84	1.13	96	1.05	86	1.08	87
11	1.09	103	1.06	59	1.18	94	1.09	109	1.35	112	1.05	90	.97	85	.84	81
12	.97	82	.90	52	1.29	100	1.07	96	1.17	100	1.11	98	1.15	95	.97	92

TABLE 21.--Test data for four sixth-grade groups by test response mode and sex^a

^aTotal number of students in all groups N=96.

X = California Test of Mental Maturity (Mental age-chronological age ratio).<math>Y = California Reading Test (Raw Score).

	<u> </u>	Воо	klet			Scoreze			Pin-Punch			Cal-Card				
Stu- dent No.	Boy (n=	ys 12)	Gir (n=	ls 12)	Boy (n=	ys 12)	Gir (n=)	ls 12)	Boy (n=	ys L2)	Gir] (n=]	.s .2)	Boy (n=]	ys L2)	Gir] (n=]	Ls L2)
	x	Y	x	Y	x	Y	Χ-	Y	x	Y	X	Y	x	Y	x	Y
1	1.02	83	1.12	124	1.13	86	1.17	128	1.12	71	.98	51	1.05	65	1.12	117
2	1.15	127	1.32	133	1.16	120	1.08	119	1.16	114	1.06	116	1.18	109	.91	55
3	1.33	131	1.09	119	1.11	115	1.10	99	1.31	132	1.12	108	1.09	101	.89	50
4	1.00	100	1.13	120	1.00	88	.97	91	1.09	64	.95	53	1.12	73	1.02	89
5	1.08	122	.96	92	1.03	91	1.04	82	1.12	40	.97	119	1.10	95	1.00	92
6	1.09	91	1.10	136	1.02	82	.98	79	1.00	103	1.18	131	1.15	71	7.05	125
7	1.09	101	1.08	92	1.07	97	.87	70	.94	65	1.08	97	1.17	62	.95	80
8	1.15	103	.98	109	1.05	106	.90	64	1.03	76	1.06	84	1.10	103	1.11	120
9	1.05	116	1.18	120	1.11	98	1.19	125	1.07	85	1.03	103	1.07	97	.94	86
10	1.12	100	1.27	140	1.17	121	1.11	126	.93	41	.99	73	1.09	132	1.38	135
11	1.06	95	.75	74.	.94	91	1.00	100	1.13	73	.96	48	.92	57	1.27	128
12	1.10	101	1.01	100	1.20	117	1.25	128	1.17	119	.98	93	1.09	61	.98	101

TABLE 22.--Test data for four eighth-grade groups by test response mode and sex^a

^aTotal number of students in all groups N=96.

X = California Test of Mental Maturity (Mental age-chronological age ratio).<math>Y = California Reading Test (Raw Score).

		klet			Scoreze				Pin-Punch			Cal-Card				
Stu- dent No.	Boy (n=)	ys 12)	Gir: (n=)	ls 12)	Boy (n=:	75 12)	Gir: (n=)	ls 12)	Boy (n=1	75 L2)	Girl (n=1	.s .2)	Boy (n=1	75 12)	Girl (n=l	.s .2)
	x	Y	x	Y	x	Y	x	Y	x	Y	x	Y	x	Y	x	Y
1	1.09	127	1.03	103	1.04	90	1.09	119	.93	74	.75	82	.82	84	1.01	53
2	.98	77	.94	90	1.21	132	1.01	110	1.05	79	1.06	73	1.08	110	.94	61
3	1.09	108	.90	96	1.04	108	1.21	117	.99	73	.98	98	.85	82	1.04	83
4	.94	96	.97	103	1.20	95	1.19	77	.93	102	.98	67	1.00	90	1.13	94
5	1.10	83	1.05	97	1.15	80	.99	74	1.04	87	.93	75	1.07	74	.95	66
6	.93	73	.95	98	1.04	105	1.03	90	1.00	90	1.07	83	.95	80	.98	61
7	1.02	77	1.08	108	1.14	115	.98	85	1.10	73	•98	65	.90	51	1.00	82
8	.92	72	1.12	87	1.11	112	1.12	114	1.06	65	•98	71	1.01	104	1.04	85
9	1.19	116	.95	86	.99	77	1.02	84	1.07	75	•92	79	.96	81	1.03	99
10	1.04	96	1.00	79	1.08	87	1.09	96	1.01	73	1.07	79	.93	83	.95	78
11	.94	90	.89	74	1.15	118	1.08	108	.98	83	1.04	77	.86	49	1.03	94
12	1.00	78	1.08	104	1.08	96	1.14	98	1.00	54	.94	78	1.04	81	1.00	65

TABLE 23.--Test data for four eleventh-grade groups by test response mode and sex^a

^aTotal number of students in all groups N=96.

X = California Test of Mental Maturity (Mental age-chronological age ratio).
Y = California Reading Test (Raw Score).

APPENDIX D

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Response Mode	Sex	y ²	đ£	Variance Estimates	Log s ²
	Boys	3874.40	11	353.13	2,54790
Booklet	Girls	2316.10	11	210.57	2,32346
-	Boys	8474.40	11	770.41	2.88672
Scoreze	Girls	6419.40	11	583.58	2.76612
	Boys	4234.00	11	384.90	2,58535
Pin-Punch	Girls	1296.80	11	117.90	2.07151
	Boys	8011.60	11	728.32	2.86231
Cal-Card	Girls	11530.90	11	1048.37	3.02048
Sum		46157.80	88	4197.08	21.06385

TABLE 24.--Bartlett's test of the homogeneity of variance of fourth grade groups, by sex, using four test response modes

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Response Mode	Sex	y ²	đf	Variance Estimates	Log s ²
	Boys	1970.67	11	179.15	2.25334
Booklet	Girls	3471.00	11	315.55	2.49000
-	Boys	474.92	11	43.18	1.63528
Scoreze	Girls	5666.25	11	515.11	2.71189
	Boys	9872.67	11	897.52	2.95303
Pin-Punch	Girls	19136.67	11	1739.69	3.24047
	Boys	536.92	11	48.81	1.68851
Cal-Card	Girls	3734.00	11	339.45	2.53084
Sum		44863.10	88	4138.46	19.50337

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TABLE 25.--Bartlett's test of the homogeneity of variance of sixth grade groups, by sex, using four test response modes

Response Mode	lesponse Sex Mode		Y ² df		Log s ²
	Boys	2427.67	11	220.09	2.34262
Booklet	Girls	4701.25	11	427.38	2.63083
Scoreze	Boys	2218.00	11	201.63	2.30449
	Girls	14596.25	11	1326 .9 3	3.12287
Pin-Punch	Boys	9805.59	11	891.41	2.95007
	Girls	30389.00	11	2762.63	3.44132
	Boys	6235.00	11	566.81	2.75343
Cal-Card	Girls	8589.67	11	780.87	2.89260
Sum		51611.43	88	7177.75	22.43823

TABLE 26.--Bartlett's test of the homogeneity of variance of eighth grade groups, by sex, using four test response modes

Response Mode	esponse Sex Mode		đf	Variance Estimates	Loq s ²
	Boys	3560.92	11	323.72	2.51014
Booklet	Girls	1310.00	11	119.09	2.07591
Scoreze	Boys	3026.25	11	275.11	2.43949
	Girls	2750.67	11	250.06	2.39811
Pin-Punch	Boys	1666.67	11	251.51	2.18041
	Girls	810.25	11	73.66	1.86723
Cal-Card	Boys	3438.25	11	312.57	2.49499
	Girls	2540.25	11	230.93	2.36342
Sum		19103.26	88	1836.65	18.32970

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TABLE 27.--Bartlett's test of the homogeneity of variance of eleventh grade groups, by sex, using four test response modes

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APPENDIX E

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	Booklet		Scoreze		Pin-Punch		Cal-Card	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
x.	114.33	112.92	98.17	109.75	113.25	111.50	117.25	104.58
$\overline{X}_i - \overline{X}$	4.11	2.70	-12.05	47	3.03	1.28	7.03	-5.64
$b(\overline{X}_i - \overline{X})$	3.08	2.03	- 9.04	35	2.27	.96	5.27	4.23
Ÿ.	77.17	85.42	59.42	75.33	71.50	72.75	76.08	72.25
Adj. $\overline{\underline{Y}}_{\underline{i}}$	74.09	83.39	68.46	75.68	69.23	71.79	70.81	68.02

TABLE 28.--Adjusted means for four fourth-grade groups by test response mode and sex $(\overline{X} = 110.22, \ \overline{Y} = 73.74, \ b = .7503)$

	Boo	Booklet		Scoreze		Pin-Punch		Cal-Card	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	
x.	110.33	108.25	109.25	107.25	112.25	103.00	109.42	105.67	
$\overline{x}_{i} - \overline{x}$	2.27	.19	1.19	39	4.19	-5.06	1.36	-2.39	
$b(\overline{x}_i - \overline{x})$	3.38	.28	1.77	58	6.23	-7.53	2.02	-3.55	
Ϋ́ι	105.83	113.25	101.00	100.92	81.92	102.67	89.33	98.17	
Adj. Y	102.45	112.97	99.23	101.50	78.69	110.20	87.31	101.71	

TABLE 29.--Adjusted means for four eighth-grade groups by test response mode and sex . ($\overline{x} = 108.06$, $\overline{y} = 99.14$, b = 1.4874)

TABLE 30.--Adjusted means for four fourth-grade groups by test response mode with data pooled by sex^a

	Booklet	Scoreze	Pin-Punch	Cal-Card
x,	113.63	103.96	112.38	110.92
$\overline{x_i} - \overline{x}$	3.41	-6.26	2.16	.70
$b(\overline{x}_{i}-\overline{x})$	2. 56	-4.67	1.62	•53
Y i	81.29	67.37	72.12	74.17
Adj. Ÿi	78.73	72.04	70.50	73.64

 $(\overline{X} = 110.22, \overline{Y} = 73.74, b = .7503)$

^aSince "t" tests of adjusted means between boys and girls were not significant at the 0.05 level of significance, data for boys and girls in each group were pooled for each group before adjusting the means for "t" tests between test response mode groups. APPENDIX F

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TABLE 31.--Unadjusted means for four sixth-grade groups by test response mode and sex

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$$(\overline{X} = 109.19, \overline{Y} = 94.59, b = 1.9198)$$

	Bool	Booklet		Scoreze		Pin-Punch		Cal-Card	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	
x i	104.33	98.00	121.25	113.00	113.75	111.67	109.08	103.25	
Ϋ́.	89.83	83.50	105.58	99.7 5	94.92	98.2 5	94.92	90.00	

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TABLE 32.--Unadjusted means for four eleventh-grade groups by test response mode and sex

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 $(\bar{x} = 101.89, \bar{y} = 87.01)$

	Booklet		Scoreze		Pin-Punch		Cal-Card	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
x	102.00	99.67	110.25	107.91	101.33	97.50	95.58	99.17
Ŧ	89.42	94.00	101.25	81.77	77.33	77.25	80.75	76.75