HOW KINDERGARTEN ATTENDANCE AFFECTS ACHIEVEMENT OF PUBLIC SCHOOL STUDENTS IN BOZEMAN, MONTANA

by

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A Professional Paper submitted to the Graduate Faculty in partial fulfillment of the requirements for the degree

of

MASTER OF EDUCATION

in

Secondary Education

MONTANA STATE UNIVERSITY
Bozeman, Montana

August, 1968

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CHAPTER I

I. INTRODUCTION

Kindergartens have been an intregal part of some of our public school system in the United States for over 100 years. Whether all public schools should be expanded to include the kindergarten grade is the subject of much controversy. Is kindergarten worthwhile? Should the public schools have kindergarten? Are kindergartens a waste of taxpayers money? These questions and many others concerning kindergarten are being asked by both laymen and professional educators.

In the face of the many problems in modern society, the above questions and many others concerning education are begging to be answered. These questions cannot be answered with any degree of certainty until research has uncovered the facts.

This study was undertaken with the thought in mind that facts concerning kindergarten effect on achievement are now available in Bozeman, Montana. Bozeman has had a kindergarten grade in its public school system for the past thirty years.

II. STATEMENT OF THE PROBLEM

Within the Bozeman Public School System there are students who do attend and others who do not attend kindergarten. Does this attendance or lack of attendance in kindergarten affect student achievement in grades one through nine? Does kindergarten attendance help the students to grasp and retain more subject matter?

Comparing the achievement records of kindergarten and non-kindergarten students should help educators to make a decision concerning the true value of kindergarten.

III. PROCEDURE

Two groups, of thirty pupils each were compared. All of these pupils were in attendance at Bozeman Public High School at the time of this study. The information for this study was obtained from the school records. Each group was composed of 12 students who were in the 9th grade and 18 pupils who were in the 10th grade in the school year of 1967-68.

One group, hereafter called the kindergarten group, was composed of 30 students who attended Bozeman Public Schools from and including kindergarten through the time of this study.

The second group, hereafter called the non-kindergarten group, attended Bozeman Public Schools from and including the 1st grade through the time of this study. This group did not attend any kindergarten.

The two groups were matched in general on a one to one basis by sex and intelligence quotient. Some of the selected students had repeated one grade in school. Care was taken so that the number of these repeaters was not overloaded in either group. Achievement scores of the two groups from the 1st, 3rd, 5th, 7th and 9th grades were collected. Scores were then compared to see if there was a significant difference.

Comparison of the achievement test results for the two groups should show the kindergarten group ahead in total achievement. If there

was a real advantage in kindergarten attendance, the difference in the results for the two groups should be significant. This difference should be significant to the five percent level of probability when standard methods of statistics are used in the calculations.

IV. LIMITATIONS

This study was limited to two groups, of thirty pupils each, whose only formal schooling had been in the Bozeman Public School System. Bozeman was selected for this study because it has had Public School kindergarten for more than thirty years. In addition there are currently about 250 pupils in each grade in Bozeman. Therefore this study group of sixty pupils from two grades should have been exposed to rather uniform school training.

This study was limited to the effect of kindergarten attendance on total achievement of these sixty pupils as measured by achievement tests in grades 1, 3, 5, 7 and 9. The achievement test results that were used came from tests given in the regular Bozeman Public School Testing Program.

V. DEFINITION OF TERMS

Kindergarten attendance: Attendance of pupils in the Bozeman Public School kindergartens. Bozeman kindergartens are set up so that pupils attend half days for one full school year.

Kindergarten Group: Thirty pupils who attended kindergarten in Bozeman and continued in the Bozeman Public School System through the

time of this study.

Non-kindergarten Group: Thirty pupils who did not attend any kindergarten but who started their first year of school in Bozeman and continued in the Bozeman Public School System through the time of this study.

Achievement Test: Tests used in the school testing program in the Bozeman Public School System. They include the Metropolitan Achievement Test, Iowa Basic Skills Test and Iowa Test of Educational Development.

Intelligence Quotient Tests: Tests used in the school testing program in the Bozeman Public School System. They include the Otis Quick Scoring Mental Ability Test, both Alpha and Beta Form, also the California Test of Mental Maturity.

CHAPTER II

REVIEW OF RELATED LITERATURE

Much research has been done trying to find out whether kindergarten attendance is of value. Results have varied so that no clear cut decision has been reached. The following review of research shows the conflicting results concerning the value of kindergarten. Frequently, conflicting results are found within a study itself.

A master's thesis, written by Wright in 1957, partially explored this area. This study compared the Bozeman pupils who had kindergarten with Helena pupils who did not have kindergarten to see if there was a significant difference in reading achievement at the 1st, 2nd and 3rd grade levels.

Wright's study revealed a difference in favor of the kindergarten pupils for the 1st and 2nd grades. However this advantage had disappeared by the time the 3rd grades were tested. (12:42)

It is interesting to note that this study also touched on the comparison of kindergarten and non-kindergarten students within the Bozeman School System. Wright says, "In the Bozeman children who did not repeat a grade, there was no significant difference in achievement between those children who had kindergarten and those children who did not have kindergarten experience." (12:32) A graph showing this is included in Wright's thesis. Wright also said, "The grade equivalents of those children who repeated a grade were compared for the two schools.

The Bozeman repeater who had no kindergarten exceeded those who had kindergarten by from 3 to 4 months each year." (12:34) This is also shown on a graph in Wright's thesis. Though it was not a significant difference, the graphs show that a slightly higher average score in grade equivalents was attained by the non-kindergarten pupils. The fact that non-kindergarten pupils exceeded the kindergarten pupils, even though the difference was not significant, was startling enough to give added impetus to this research.

In an article "Why Kindergarten", E. L. Widmer said:

> Some research seems to suggest that the activites during kindergarten years do have a measurable result. These studies point to greater achievement by kindergarten trained in the later grades of the school . . . Others question that this achievement can be measured or that it is perceivable in any concrete way..

Widmer does seem to believe kindergarten has value, such as adjustment to school, and a good year in kindergarten provides a good foundation for later school life. Widmer believes kindergarten encourages children's total development, helps in the transition to more formal activities in the 1st grade, and formulates a favorable attitude towards school. Widmer also believes that personality development along with social adjustment are furthered in this group living.

Widmer is undecided as to whether there can be a concrete measurement of educational values of kindergarten but seems to believe kindergarten is helpful in intangible areas. (10:298)

H. A. Peterson, a psychologist says:

> Not only is much effort wasted trying to teach an immature child to read, it may be actually harmful to him. If he is forced

> to go through the motions of practicing something he does not understand and cannot have any interest in doing, the practice only serves to build up poor learning habits and emotional attitudes of resistance to learning to read. What is more, such forcing often causes in a child feelings of futility and inability to learn, so that later, when he can learn, he will not try for fear of continued failure. (4:26)

In a study performed for the legislature of Nebraska, Kazienka compared three groups of rural pupils who started school at five years of age. Group A started in pre-school with good teachers, Group B in pre-school with poor teachers and Group C directly in 1st grade. The mean intelligence quotient for the three groups was about equal.

This study pointed out a significant advantage for Group A and B over Group C up to 4th grade. This study extended only through the 4th grade. Kazienka checked the resulting coefficient of correlations between achievement and the factor of chronological age, mental age and intelligence quotient. Of the three factors, only mental age was closely correlated with achievement. (5:226)

It should be pointed out that in this study the student with pre-school experience not only had one more year of school by the time they were in the 4th grade but they were also one year older. This makes the findings questionable as to their value.

Wright reports that in 1937, Morrison studied the incidence of non-promotion beyond grade one in 13,730 children. This investigation revealed the number of non-promotions was much higher for children who had not attended kindergarten. (12:9) It must be pointed out that teachers decide on promotion of pupils, and these teachers may be influenced by their knowledge concerning kindergarten attendance of

of their students.

Wright also reported that East compared results from Metropolitan Achievement Tests given to 52 first grade pupils in Blacksburg, South Carolina. Results show the grade placement for kindergarten pupils four months ahead of the non-kindergarten pupils. In the areas of word meaning and numbers the kindergarten pupils excelled as a group. There were also fewer failures among kindergarten children. East concluded that kindergarten attendance was valuable. (12:9) It must be noted that this study only covered kindergarten and the first grade. It was also reported that the teachers knew which of their pupils were involved in the study while the study was being made. This knowledge may have influenced the teachers' judgment about the pupils involved in the study.

Wright reported that Bergamini and Swanson compared two groups of boys and girls in California. One group was a kindergarten group and the other a non-kindergarten group. The average intelligence quotient was 97 for the kindergarten group, and 98 for the non-kindergarten group. Metropolitan Reading Readiness tests were given to both groups and results were compared.

The kindergarteners were better in numbers and copying. The non-kindergarten group consistently had higher scores in word meaning and comprehension of language, but not in usage. The authors suggested that a year longer at home, where the pupils carried on conversation with adults and playmates, might account for the difference. The researchers questioned the value of kindergarten in the readiness for learning in the first grade. Bergamini and Swanson did seem to think that social adjustment is part of the readiness for learning, and from this standpoint

kindergarten may be of some value. (12:18) Here again there are conflicting results within this research as to the value of kindergarten.

In a pamphlet written for the National Education Association, Fuller discussed all phases of kindergartens. In the portion of the pamphlet that dealt with research concerning the value of kindergartens, Fuller summed up the past research by saying:

> Most of the research studies of Grades 1 and 2, comparing the reading progress of children with and without kindergarten experience, attribute an advantage to the kindergarten children regardless of the methods used to teach reading or to foster reading readiness during the kindergarten year. In the early grades of the elementary school, children with the kindergarten background often carry with them more favorable attitudes toward reading and the positive effects of success in their earliest efforts to read. Beyond the third-grade level, research workers have had difficulty in identifying, on the basis of attitudes and reading success, those children with and those children without kindergarten experience. Whatever advantages were discernible earlier have become a part of the child's total behavior and no longer seem to operate as measurable entities. (3:13)

The conflicting research as discussed above,as well as the lack of research, indicates a need for more study to resolve the problem concerning the value of kindergarten.

CHAPTER III

COLLECTION AND INTERPRETATION OF DATA

In order to find how kindergarten attendance in the public school of Bozeman, Montana affected achievement in the later grades, 1 through 9, it was decided that two groups would be compared. Both groups would be composed of students enrolled in public high school in Bozeman during the 1967-68 school year and who have been enrolled in the Bozeman Public School System continuously from the time they started school until the time of this study. The difference between the two groups would be that one group attended the Bozeman kindergarten and the other did not.

In preparation for this study the records of the Bozeman Public School System were examined. It was found that the 9th and 10th grade students for the year 1967-68, with the exception as noted below, had been thoroughly and consistently tested with the results kept and recorded.

In general they had been given the following tests: (1) Otis Quick Scoring Mental Abilities Test, Alpha form - given in the 3rd grade, (2) Otis Quick Scoring Mental Abilities Test, Beta form - given in the 5th grade, and (3) California Test of Mental Maturity - given in the 7th grade. The intelligence quotient scores from these three tests and any repeitition of these tests that had been given were averaged to give an intelligence quotient for the students used in this study. Information about these tests is found in Appendix A, page 24.

These students had been given the following achievement tests:

1. Metropolitan Achievement Test - given in 1st grade.
2. Iowa Test of Basic Skills - given in 3rd grade.
3. Iowa Test of Basic Skills - given in 4th grade.
4. Iowa Test of Basic Skills - given in 5th grade.
5. Iowa Test of Basic Skills - given in 6th grade.
6. Iowa Test of Basic Skills - given in 7th grade.
7. Iowa Test of Educational Development - given in 9th grade.

Information about these tests is found in Appendix B, page 26.

There were two basic exceptions to the above testing program. The 9th grade students of 1967-68 had not been uniformly tested in the 1st grade and the 10th grade students of 1967-68 had not had the Iowa Test in the 7th grade.

Since the records of grades 9 and 10 for 1967-68 classes in the Bozeman Public Schools had a goodly share of the required information, it was decided to use students from these two classes for this study.

I. SELECTION OF THE TWO GROUPS

Non-kindergarten. Further examination of the school records revealed a total of 12 students from the 9th grade and 18 students from the 10th grade who had been in the Bozeman School System continuously from the 1st grade but who had not attended any kindergarten. There were some minor exceptions. One student had enrolled in kindergarten in Bozeman for 17 and another for 20 calendar days. One had been in attendance in another school for one year out of the ten years in school

and a few others for short periods of time. However they had all started the 1st grade in Bozeman and all were now enrolled in the Bozeman Public School System. These 30 students were selected as the non-kindergarten group since they met the requirements that had been established for this study.

To help in the selection of the kindergarten group, the non-kindergarten group was classified according to sex and intelligence quotient. The intelligence quotient used was the average of their scores on all of the Otis tests and the California Mental Maturity Tests that they had listed. In a few cases this average intelligence quotient came from two tests, in the great majority of cases from the three tests mentioned above and in a few cases four or more tests.

Kindergarten. In order to get accurate results with regard to the effect of kindergarten training on achievement, it was decided that the two groups, kindergarten and non-kindergarten, should be as nearly alike as possible with the one exception, that being kindergarten training. To make sure that the two groups matched, special qualifications were set up. The qualifications were that they match the non-kindergarten group by grade, sex and intelligence quotient (within 3 points) and that they had attended Bozeman kindergarten and had been enrolled more or less continuously from kindergarten through the time of this study.

In order to get an unbiased group, the following random sampling scheme was used: The school records would be examined alphabetically. When a student was found who fit the qualifications for this group, in regard to kindergarten and school attendance, he was matched with

students from the non-kindergarten group. If the match was successful as far as sex, grade and intelligence quotient (within 3 points) he was selected for the kindergarten group. Thus the two groups became matched on a one to one basis. When the first matching student was found the investigator skipped the rest of the student files under that letter of the alphabet and also all of the files under the next letter of the alphabet before continuing to find a second match. Knowing that only twelve students were to be selected from this grade accounted for this skipping scheme. In the 9th grade file all but one student of the non-kindergarten group was matched by going through the file once. Finding a match for the last 9th grade student required going through the file again alphabetically up to "G".

For the 10th grade, one turn through the file matched all but two of the non-kindergarten groups. Finding matches for the final two of this non-kindergarten 10th grade group required a full turn through the file. The last student could not be matched within the 3 point limit on intelligence quotient so a 5 point difference was allowed in this one case. Now all of the non-kindergarten group had been matched by a second group; this second group became the kindergarten group. A count revealed six students in each group who had repeated one or more school grades. The mean age for each of the two groups was 15 years 7 months. A mean intelligence quotient for each of the two groups was 108. Table I, page 14, gives the actual figures.

Eighteen students were needed in the 10th grade so the researcher decided to modify the skipping scheme as used previously. When the first

match was found only the rest of the files under that letter of the alphabet was skipped before continuing alphabetically to find a second match.

TABLE I

FACTS CONCERNING THE TWO GROUPS

	Boys	Girls	I.Q. Mean	Age	Grade 9	Grade 10
Non-kindergarten	10	20	107.97	186.83 mo.	12	18
Kindergarten	10	20	107.73	187.20 mo.	12	18

As far as could be ascertained the two groups matched in age, sex, intelligence quotient and the number that had repeated a grade in school. They were matched and organized on a one to one basis so that every student in one group had his counterpart in the other group.

The only difference in selection of these groups was in kindergarten attendance.

II. ACHIEVEMENT OF THE TWO GROUPS

Achievement scores for the two groups, kindergarten and non-kindergarten, were compiled for the 1st, 3rd, 5th, 7th and 9th grades. The actual statistics as collected are shown in Appendix C, page 29. The Montana State University computor was used to perform the calculations on the data. Means, variances, F-test for variance and T-test were calculated. The computor had been programmed for the T-test from Ostle. (6:95) All F-tests were checked at the 5 per cent level of probability

and T-tests were checked at the 10 per cent level of probability. Computor charts are in Appendix D, page 34.

Grade 1. Only 13 of the 30 non-kindergarten and 19 of the kindergarten students had results for the Metropolitan Achievement Tests. All were in the 10th grade. The 13 non-kindergarten and their 13 counterparts from the kindergarten group were compared.

These students had been tested and results recorded on the reading section of the Metropolitan Achievement Test. The composite reading score was used in the comparisons. This score was recorded as grade placement in years. The mean score for the non-kindergarten group was 2.55 while for the kindergarten it was 2.64, a difference of .09 of a year. Statistical calculations show this was not significant. It should be noted that since 13 was a small group numerically, the data should be read and considered with this in mind.

Grade 3. Twenty-nine of the 30 non-kindergarten students had been tested and scored in the 3rd grade so they were compared with their counterparts in the kindergarten group.

The test used in the 3rd grade was the Iowa Test of Basic Skills. This test measured five basic areas of achievement, (1) vocabulary, (2) reading, (3) language, (4) work-study and (5) arithmetic. A comparison was made on the basis of the composite score covering all five sections of this test with the following results. The mean score for the non-kindergarten group was 50.38 and for the kindergarten group was 49.21. Statistical calculations show this difference of 1.17 in standard scores is not significant.

In this test a 30 score would denote the average for all third year zero month students in the United States. By moving the decimal one place to the left, the standard scores as recorded on this test can be converted to a grade placement score. Since this test was given in April, the standard score was expected to be 3.8. This result shows both groups to be above national norms but with a slight difference in favor of the non-kindergarten group.

Grade 5. All 30 pupils in both groups were compared. The same test was used as in grade three, and again the composite score was compared. The non-kindergarten group mean score was 71.03 and kindergarten group was 70.60. Calculated statistically this difference was not significant. A difference of less than one-half month in achievement was shown since this would read 7 years 1.03 months for non-kindergarten and 7 years .60 months for kindergarten.

Grade 7. Only 10 of the non-kindergarten and 12 of the kindergarten group had been tested in this grade. The 10 non-kindergarten pupils and their counterparts were compared. As in the 3rd and 5th grades the Iowa Test of Basic Skills was used. Composite scores again were compared. The non-kindergarten group mean score was 80.5 and the kindergarten group was 83.2. This was a difference of 2.7 in standard score. Statistical calculations show this is not significant. This 7th grade comparison also comes from a small sample numerically and should be read with this in mind.

Grade 9. All but one of the non-kindergarten and all the kindergarten pupils had been tested using the Iowa Test of Educational

Development.

This test covered 9 areas: (1) social studies background, (2) natural science background, (3) correctness of expression, (4) quantitative thinking, (5) reading - social studies, (6) reading - natural science (7) reading - literature, (8) general vocabulary, and (9) use of sources. Scores were reported for all 9 areas. A composite score for the first 8 areas was recorded and this composite score was used in this comparison. All scores from this test, as reported and used here, were standard scores only. The non-kindergarten group mean score was 18.28, and the kindergarten group was 17.07; a difference of 1.21. Statistical calculations show this is not significant.

Table II shows the mean standard scores for the two groups according to grade. The great numerical variation of the first grade and the ninth grade from the middle three grades is due to the different tests used at these grade levels. The numerical size of the score is not important here. The difference between the two scores for the same grade when compared to the size of the score is the important information.

TABLE II

MEAN STANDARD SCORES FOR THE TWO GROUPS

	Grade 1	Grade 3	Grade 5	Grade 7	Grade 9
Non-kindergarten	2.55	50.38	71.03	80.5	18.28
Kindergarten	2.64	49.21	70.60	83.2	17.07

The non-kindergarten group had higher scores in grades three, five and nine. The kindergarten group was ahead in grades one and seven. None of the differences for the various grades was significant to the five percent level or even the ten percent level of probability.

III. SUMMARY

The test results of the achievement for the two groups show no significant difference for the 1st, 3rd, 5th, 7th and 9th grades when calculated at the ten percent level of probability. It may be argued that the 1st and 7th grade results are based on too small a number of students to be meaningful but they do fit into the pattern of the rest of the results. Neither the non-kindergarten nor the kindergarten groups have any advantage over each other as measured by the achievement tests in this study. There are some small differences but these differences could be due to sampling error and not necessarily due to the kindergarten training.

CHAPTER IV

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

This study was made to see how kindergarten attendance affected the achievement of students in grades one through nine in the public school system of Bozeman, Montana.

I. SUMMARY

Two groups of 30 pupils each were compared. These groups were matched on a one to one basis with regard to sex, intelligence quotient, age and year in school. There were the same number of repeaters in each group. One group had attended kindergarten and one group had not. This was the only difference between the two groups as selected for the study.

Achievement test results were gathered and compared. There was no significant difference in the achievement of the kindergarten and non-kindergarten groups in the 1st, 3rd, 5th, 7th and 9th grades when calculated to the 10 percent level of probability. Therefore kindergarten attendance in the Bozeman Public School System had no significant effect within the 10 percent limit of probability on achievement for the pupils who attend. In fact it is shown that the students who enter the Bozeman system without kindergarten do just as well in later school years according to the achievement tests results used in this study. This finding was contrary to what was expected.

II. CONCLUSION

Kindergarten attendance did not promote achievement in later grades as measured by the achievement tests in this study and neither did it hinder achievement in later school years. A quite startling but definite result that should have real meaning for educators or anyone interested in education.

Therefore, if kindergartens are provided for prime purpose of increasing student achievement, then kindergartens of the type found in the Bozeman Public School System do not satisfy their objective. It is doubtful that any kindergarten can be justified from an achievement standpoint. If increased achievement is the reason for providing kindergartens, then it is likely that kindergartens are a waste of time, effort and money, and should be eliminated.

This study did not attempt to measure the other aims and objectives of kindergarten. Aims and objectives such as social adjustment and personal development of children that many educators believe are the true value of kindergarten.

III. RECOMMENDATIONS

The pupils must learn something in kindergarten that is related to achievement. It is evident from this study that children who do not attend kindergarten either learn as much at home or quickly catch up when they enroll in school. This may be due to many factors.

1. The non-kindergarten student upon entering school and finding himself behind, as far as school experience is concerned, may take on a

catch up attitude and so learn better self control as far as study is concerned.

2. The student's parents, being aware that the student had a late start, when compared to the kindergarten pupil, may put more pressure on the student and thus influence him into working harder so that he catches up to the kindergarten student.

3. Kindergarten may tend to develop attitudes that are not helpful, in fact may be harmful to achievement. Kindergarten may develop a feeling of resentment in the student due to his young years and the shock of being away from home too early, competing with others at the same time that he is forced into a large group. This may negate his kindergarten training and place him on a par with his non-kindergarten counterpart.

4. Kindergarten may develop a play attitude toward school. Since kindergarten students are very young they must, of necessity, be given much leeway. The leeway that they come to expect may be detrimental as they progress up through the grades. This too, may bring him back on a par with his non-kindergarten counterpart.

5. Non-kindergarten children may learn more on an individual basis at home through every day contact with their parents. Some of this contact would be missed if they were in kindergarten. This parent-child relationship is on a one to one basis, whereas kindergarten is a 1 to 40 relationship between the teacher and 40 students.

Even though the teacher devotes full time to the students while the parent does not, the parent may have more effect because of this

one to one relationship. There is also the added factor of the closeness between the parent and child. The time of the day during kindergarten hours (school hours), is especially well suited for extra influence and communications between parent and child due to the rest of the children in the family, if there are any, being away at school.

There may be other factors that influence the non-kindergartener so as to put him on an equal basis with the kindergarten trained child, but this researcher believes the five listed are of principal importance.

This researcher believes that more study should be undertaken to find which of the five reasons listed above do negate the value of kindergarten training. If the reason or reasons can be found it is possible that finding them may illuminate both strengths and weaknesses in present-day educational practices. The result would be a more efficient educational system.

Other research using this study as a pattern should be carried on. These studies should be expanded to include:

1. Schools that have a different type kindergarten from that found in Bozeman.

2. Comparison of achievement test results for every grade.

3. Comparison of achievement test results through High School and College.

4. A larger sample numerically.

From these studies we may receive much information that will aid us in the evaluation of kindergarten. This information may help in the evaluation and improvement of education in general.

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APPENDIX A

APPENDIX A - INTELLIGENCE QUOTIENT TESTS USED

Otis Quick Scoring Mental Abilities Test. Harcourt, Brace and World Inc., New York, New York.

This test is published in three levels:

1. Alpha test, grades 1 - 4, 35 minutes.
2. Beta test, grades 4 - 9, 35 minutes.
3. Gamma test, high school and college. (3)

California Short Form Test of Mental Maturity, 1963 revision. - California Test Bureau, Del Monte Research Park, Monterey, Calif.

This test is published in eight levels:

Level 0 (Pre-Primary)
Level 1 (Primary)
Level 2 (Elementary)
Level 3 (Junior High)
Level 4 (Secondary)
Level 5 (Advanced)

Two other Levels, 1 H and 2 H, are for special needs in grades 3 - 4 and 6 - 7 respectively. Each Level test has seven test units. The first four are:

Test 1 - Opposites
Test 2 - Similarities
Test 3 - Analogies
Test 4 - Numerical Values, and are in general non-language

Test 5 - Number problems
Test 6 - Verbal Comprehension
Test 7 - Delayed Recall, and are the language section of the test. This test is machine scored, and takes approximately 40 minutes to administer. (1)

APPENDIX B

APPENDIX B - ACHIEVEMENT TESTS USED

Metropolitan Achievement Test. World Book Co., Yonkers N. Y.

This group achievement test consists of a series of tests for grades 1 through 8. Primary I - Battery, shows achievement in the subjects of word knowledge, word discrimination, reading, arithmetic concepts and arithmetic skills. This test takes 85 minutes to administer, in four sessions. (11)

Iowa Test of Basic Skills. Houghton, Mifflin Co., Boston, Copyright 1955, 1956 and 1964, State University of Iowa, Ames, Iowa.

This test consists of eleven separate tests for grades 3 through 9. The Battery is organized as shown below:

Test V - Vocabulary (17 minutes)

Test L - Language Skills (67 minutes)
- L-1: Spelling (12 minutes)
- L-2: Capitalization (15 minutes)
- L-3: Punctuation (20 minutes)
- L-4: Usage (20 minutes)

Test W - Work-Study Skills (80 minutes)
- W-1: Map Reading (30 minutes)
- W-2: Reading Graphs and Tables (20 minutes)
- W-3: Knowledge and Use of Reference Materials (30 minutes)

Test A - Arithmetic Skills (60 minutes)
- A-1: Arithmetic Concepts (30 minutes)
- A-2: Arithmetic Problem Solving (30 minutes) (4)

Iowa Test of Educational Development. Science Research Associates Inc. 259 East Erie St. Chicago, Ill. 60611. Copyright State University of Iowa, 1949 and 1963.

This test is designed for grades 9 through 12. It has nine test areas:

APPENDIX B - continued

1. Understanding of Basic Social Concepts
2. General Background in Natural Science
3. Correctness and Appropriatness of Expression
4. Ability to do Quantitative Thinking
5. Ability to Interpret Reading Material in the Social Studies
6. Ability to Interpret Reading Material in the Natural Sciences
7. Ability to Interpret Literary Materials
8. General Vocabulary
9. Use of Sources of Information.

This test takes 339 minutes to administer. (9)

APPENDIX C

APPENDIX C - continued - DATA COLLECTED

Ninth Grade Non - Kindegarten Group

Name	Birth Date	Mean I.Q.	Kuhlmann-Anderson	Ketro. Ach. Test Grade 1	Reading	Arith.	Composite	Iowa Std. Ach. Test Grade 3	Vocabulary	Reading	Language	Work study	Arith.	Composite	Iowa Std. Ach. Test Grade 5	Vocabulary	Reading	Language	Work Study	Arith.	Composite	Iowa Std. Ach. Test Grade 7	Vocabulary	Reading	Language	Work Study	Arith.	Composite	Iowa Test Educ. Dev. Grade 9	Quant. Think	Read Ave.	Composite
[illegible]	[illegible]	105	[illegible]					64	58	58	53	52	52	57	58	80	69	69	59	59	59	70	69	80	81	57	71	7	12	12
[illegible]	[illegible]	103	[illegible]					48	48	53	53	48	48	50	69	89	83	89	72	81	81	80	93	99	90	82	89	14	20	19
[illegible]	[illegible]	[illegible]	[illegible]					45	42	49	47	51	45	47	87	87	71	60	74	77	72	90	83	90	87	78	82	11	18	16
[illegible]	[illegible]	[illegible]	[illegible]					45	42	41	45	42	41	43	43	43	43	53	55	57	52	55	53	55	64	86	63	20	11	14
[illegible]	[illegible]	122	[illegible]					52	42	45	44	38	38	45	61	63	61	60	55	55	55	75	76	88	66	71	75	6	14	12
[illegible]	[illegible]	118	[illegible]					49	42	46	45	40	38	49	62	82	72	85	55	57	55	59	75	90	81	68	77	7	19	17
[illegible]	[illegible]	122	[illegible]					47	42	46	45	55	55	47	73	83	63	73	55	54	57	82	82	98	73	68	79	18	14	15
[illegible]	[illegible]	107	[illegible]					54	52	53	53	50	50	53	86	105	93	85	73	68	65	85	82	108	98	95	99	19	25	24
[illegible]	[illegible]	107	[illegible]					54	53	53	53	58	54	54	78	105	97	85	78	73	68	85	82	101	99	95	99	22	18	21
[illegible]	[illegible]	107	[illegible]					42	43	44	43	43	42	45	71	70	71	67	64	55	55	68	68	73	85	68	88	15	16	18
[illegible]	[illegible]	107	[illegible]					45	45	45	45	45	42	47	64	67	55	64	64	60	54	85	85	91	84	66	82	11	15	15

APPENDIX C - continued - DATA COLLECTED

Tenth Grade Non - Kindegerten Group

Student	Birth Date	Iowa I.Q.	Repeator	Sex	Kctro. Ach. Test Grade 1 Reading	Arith.	Composite	Iowa Std. Ach. Test Grade 3 Vocabulary	Reading	Language	Work Study	Arith.	Composite	Iowa Std. Ach. Test Grade 5 Vocabulary	Reading	Language	Work Study	Arith.	Composite	Iowa Std. Ach. Test Grade 7 Vocabulary	Reading	Language	Work Study	Arith.	Composite	Iowa Test Educ. Dev. Grade 9 Gram. Think	Read Avo.	Composite
A	4-52	115		G	3.1	3.1	3.1	60	59	62	52	50	55	77	83	91	69	65	77							11	19	19
B	7-51	89		G	3.1	2.4	2.7	46	45	45	42	49	49	65	75	64	59	66	67							10	17	15
C	2-52	85		G	3.2			42	45	45	40	43	43	61	68	68	59	63	60							8	12	13
D	7-52	118		G				51	59	63	56	49	56	80	102	92	82	72	86							21	25	23
E	5-52	105		B	3.1	2.7	2.9	55	55	58	44	48	51	82	86	86	75	75	81							13	15	16
F	3-52	112		G	2.1	2.6	2.3	54	45	45	40	42	45	75	79	70	60	61	71							11	17	15
G	7-52	103		G				45	41	50	50	42	47	70	77	71	73	63	71							20	17	18
H	5-51	105		G	1.7	1.3	1.7	65	54	43	51	45	52	87	89	65	74	60	77							8	21	20
I	6-51	109		G	2.0			38	42	42	42	46	43	59	58	72	71	62	65							20	17	18
J	4-51	111		G	2.1			50	40	34	41	42	43	75	75	92	62	69	75							14	20	19
K	9-51	105		G	1.5	2.3	2.0	45	49	53	47	47	50	75	61	75	67	65	69							23	20	21
L	4-51	111		G	2.5	3.2	3.4	69	62	61	53	52	59	91	112	99	77	71	90							18	29	30
M	9-51	105	M	B				55	55	54	50	47	52	72	77	65	65	52	66							19	19	20
N	3-52	121		B	2.6	2.4	2.5	59	69	58	55	55	61	82	85	87	73	66	82							16	15	16
O	1-52	115		G				49	55	55	51	51	54	82	81	101	77	75	85							17	24	23
P	5-51	111		G	3.0			42	45	44	42	50	45	72	55	88	66	69	71							24	25	25
Q	2-52	111		G	2.2			45	32	42	39	38	40	66	70	78	58	59	66							12	17	17
																										13	19	19

APPENDIX C - continued - DATA COLLECTED

Ninth Grade - Kindegarten Group

				Metro. Ach. Test Grade 1			Iowa Std. Ach. Test Grade 3						Iowa Std. Ach. Test Grade 5						Iowa Std. Ach. Test Grade 7						Iowa Test Educ. Dev. Grade 9		
Student	Birth Date	[illegible] I.Q.	Repeater Sex	Reading	Arith	Composite	Vocabulary	Reading	Language	Work Study	Arith.	Composite	Vocabulary	Reading	Language	Work Study	Arith.	Composite	Vocabulary	Reading	Language	Work Study	Arith.	Composite	Quant. Think	Read Ave.	Composite
[illegible]	5-55	101	G				48	49	49	42	53	45	68	50	81	62	57	63	75	48	81	77	66	69	10	12	11
[illegible]	8-55	107	G				55	56	48	48	44	50	75	73	84	69	65	72	83	80	86	87	84	85	15	14	15
[illegible]	5-55	99	G				45	40	54	45	45	43	56	71	92	63	63	70	72	74	100	79	82	83	6	13	13
[illegible]	[illegible]	107	B				49	40	50	47	40	44	80	93	80	72	69	80	82	84	85	91	90	86	23	17	19
[illegible]	[illegible]	100	R G				42	33	45	38	33	38	55	55	73	56	56	58	74	70	84	57	62	69	15	15	14
[illegible]	[illegible]	109	G				60	56	53	56	49	55	72	79	91	67	63	74	82	91	92	87	82	87	12	24	21
[illegible]	[illegible]	109	G				52	53	47	43	53	52	75	75	89	72	69	76	85	95	95	94	83	91	14	18	18
[illegible]	[illegible]	116	G				51	60	63	53	52	57	92	71	94	77	72	81	90	90	108	93	102	97	20	23	21
[illegible]	[illegible]	109	G				53	75	67	53	53	60	96	100	105	79	70	90	102	87	107	102	94	100	16	25	25
[illegible]	[illegible]	111	G				[illegible]	57	42	53	44	50	92	83	82	70	56	77	94	89	88	87	86	89	20	22	23
[illegible]	[illegible]	111	B				44	48	40	54	52	48	60	70	83	69	71	73	87	93	102	105	102	98	15	17	18
[illegible]	[illegible]	97	G				[illegible]	[illegible]	43	53	42	42	63	46	75	62	56	62	59	53	77	65	69	65	11	12	10

APPENDIX C - continued - DATA COLLECTED

Tenth Grade - Kindergarten Group

Student	Birthdate	Birth Date	Iowa I.Q.	Repeater	Sex	Reading	Arith.	Composite	Vocabulary	Reading	Language	Work Study	Arith.	Composite	Vocabulary	Reading	Language	Work Study	Arith.	Composite	Vocabulary	Reading	Language	Work Study	Arith.	Composite	Quant. Think	Read Ave.	Composite
						Intro. Ach. Test Grade 1			Iowa Std. Ach. Test Grade 3						Iowa Std. Ach. Test Grade 5						Iowa Std. Ach. Test Grade 7						Iowa Test Educ. Dev. Grade 9		
																											13	18	17
																											1	10	9
																											7	9	8
																											22	22	23
																											13	19	19
																											18	22	21
																											14	16	19
																											16	17	19
																											12	12	11
																											6	11	13
																											10	15	14
																											20	25	22
																											17	12	14
																											13	15	15
																											13	13	21
																											19	22	22
																											13	12	13
																											23	27	25

APPENDIX D

APPENDIX D - COMPUTOR CHARTS

In the ITEM column of the Computor Charts on pages 36, 37, and 38, there is a double numbering system, two 1's, two 2's, etc. In this double numbering system, the first numeral is the non-kindergarten group, and the repetition of this numeral is the kindergarten group.

The ITEM column also refers to the data that is found in Appendix C.

Item 1 is the Reading column for grade 1
Item 2 is the Arithmetic column for grade 1
Item 3 is the Composite Score column for grade 1
Item 4 is the Vocabulary column for grade 3
Item 5 is the Reading column for grade 3
Item 6 is the Language column for grade 3
Item 7 is the Work Study column for grade 3
Item 8 is the Arithmetic column for grade 3
Item 9 is the Composite Score for grade 3
Item 10 is the Vocabulary column for grade 5
Item 11 is the Reading column for grade 5
Item 12 is the Language column for grade 5
Item 13 is the Work Study column for grade 5
Item 14 is the Arithmetic study for grade 5
Item 15 is the Composite Score column for grade 5
Item 16 is the Vocabulary column for grade 7
Item 17 is the Reading column for grade 7
Item 18 is the Language column for grade 7
Item 19 is the Work Study column for grade 7
Item 20 is the Arithmetic column for grade 7
Item 21 is the Composite Score column for grade 7
Item 22 is the Quantitative Thinking column for grade 9
Item 23 is the Reading Average column for grade 9
Item 24 is the Composite Score column for grade 9

The Items that were used in this study have been underlined for convenience and are numbers 1, 9, 15, 21 and 24.

ITEM	N	MEAN	SIGMA	VARIANCE	F-TEST VAR	D.F.	T-TEST
1	13	25.53844	6.25875	39.17188	1.49233	24	0.41148
1	13	26.46152	5.12336	26.24878			

ITEM	N	MEAN	SIGMA	VARIANCE	F-TEST VAR	D.F.	T-TEST
2	8	25.87500	4.10602	16.85938	1.58665	14	0.16061
2	8	25.00000	5.17204	26.75000			

ITEM	N	MEAN	SIGMA	VARIANCE	F-TEST VAR	D.F.	T-TEST
3	8	25.75000	5.30919	28.18750	1.64000	14	0.62984
3	8	27.25000	4.14578	17.18750			

ITEM	N	MEAN	SIGMA	VARIANCE	F-TEST VAR	D.F.	T-TEST
4	30	52.06894	9.02188	82.48358	1.26541	56	0.33619
4	28	51.21429	8.07247	65.18102			

ITEM	N	MEAN	SIGMA	VARIANCE	F-TEST VAR	D.F.	T-TEST
5	29	50.72414	9.65582	93.23491	1.03564	56	0.04043
5	29	50.58763	9.82640	96.55817			

ITEM	N	MEAN	SIGMA	VARIANCE	F-TEST VAR	D.F.	T-TEST
6	29	52.48276	9.25733	85.69826	1.08108	56	1.04288
6	29	49.89655	9.62531	92.64655			

ITEM	N	MEAN	SIGMA	VARIANCE	F-TEST VAR	D.F.	T-TEST
7	29	53.62067	8.37604	70.16808	1.61386	56	0.50515
7	29	47.62067	6.55382	42.97344			

ITEM	N	MEAN	SIGMA	VARIANCE	F-TEST VAR	D.F.	T-TEST
8	29	47.41379	9.79846	30.62215	1.01245	56	0.65811
8	29	46.24304	5.83844	34.04065			

ITEM	N	MEAN	SIGMA	VARIANCE	F-TEST VAR	D.F.	T-TEST
9	29	50.93820	6.91544	47.82826	1.04655	56	0.65292
9	29	49.89655	6.75894	45.68317			

ITEM	N	MEAN	SIGMA	VARIANCE	F-TEST VAR	D.F.	T-TEST
10	30	73.29999	10.28327	105.74582	1.82730	58	0.47515
10	30	74.79999	13.90069	193.22916			
ITEM	N	MEAN	SIGMA	VARIANCE	F-TEST VAR	D.F.	T-TEST
11	30	73.50000	16.70081	278.91626	1.17496	58	0.49014
11	30	71.46666	15.40724	237.38332			
ITEM	N	MEAN	SIGMA	VARIANCE	F-TEST VAR	D.F.	T-TEST
12	30	77.59998	15.31802	234.64165	1.42670	58	0.91390
12	30	80.93332	12.82437	164.46457			
ITEM	N	MEAN	SIGMA	VARIANCE	F-TEST VAR	D.F.	T-TEST
13	30	67.29999	8.10015	65.61249	1.06039	58	0.04710
13	30	67.39998	8.34116	69.57500			
ITEM	N	MEAN	SIGMA	VARIANCE	F-TEST VAR	D.F.	T-TEST
14	30	62.29999	7.90438	62.47916	1.31058	58	0.06953
14	30	62.16666	6.90456	47.67290			
ITEM	N	MEAN	SIGMA	VARIANCE	F-TEST VAR	D.F.	T-TEST
15	30	71.03333	9.99166	99.83333	1.06553	58	0.16329
15	30	70.59998	10.31382	106.37500			
ITEM	N	MEAN	SIGMA	VARIANCE	F-TEST VAR	D.F.	T-TEST
16	10	79.00000	11.26943	127.00000	1.23733	18	0.29214
16	10	80.39999	10.13117	102.64063			
ITEM	N	MEAN	SIGMA	VARIANCE	F-TEST VAR	D.F.	T-TEST
17	10	79.29999	13.27446	176.21132	1.37472	18	0.26280
17	10	77.59998	15.56409	242.24100			
ITEM	N	MEAN	SIGMA	VARIANCE	F-TEST VAR	D.F.	T-TEST
18	10	86.20000	13.65146	186.36249	2.02472	18	0.83389
18	10	90.59995	9.59394	92.04375			

ITEM	N	MEAN	SIGMA	VARIANCE	F-TEST VAR	D.F.	T-TEST
19	10	82.29999	10.75232	115.61249	1.60061	18	0.21885
19	10	83.50000	13.60330	185.04999			

ITEM	N	MEAN	SIGMA	VARIANCE	F-TEST VAR	D.F.	T-TEST
20	10	73.89998	10.65319	113.49062	1.51285	18	1.68531
20	10	82.89998	13.10320	171.69373			

ITEM	N	MEAN	SIGMA	VARIANCE	F-TEST VAR	D.F.	T-TEST
21	10	80.50000	9.57340	91.64998	1.36347	18	0.58013
21	10	83.20000	11.17866	124.96248			

ITEM	N	MEAN	SIGMA	VARIANCE	F-TEST VAR	D.F.	T-TEST
22	29	14.75862	5.16391	26.66594	1.09142	57	0.55122
22	30	14.03333	4.94290	24.43227			

ITEM	N	MEAN	SIGMA	VARIANCE	F-TEST VAR	D.F.	T-TEST
23	29	18.20688	4.12211	16.99178	1.49381	57	1.11616
23	30	16.86664	5.03811	25.38254			

ITEM	N	MEAN	SIGMA	VARIANCE	F-TEST VAR	D.F.	T-TEST
24	29	18.27585	4.02493	16.20000	1.38244	57	1.05551
24	30	17.06667	4.73240	22.39557			

ITEM	N	MEAN	SIGMA	VARIANCE	F-TEST VAR	D.F.	T-TEST
N*EXIT*							