

STRATHMORE PARCHMENT
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IS HOMOGENEOUS GROUPING OF
ELEMENTARY SCHOOL PUPILS
POSSIBLE?

OKLAHOMA
AGRICULTURAL & MECHANICAL COLLEGE

IS HOMOGENEOUS GROUPING OF ELEMENTARY SCHOOL PUPILS
POSSIBLE?

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By

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E. R. L.

Oklahoma A. & M. College,
July 10, 1939.

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CHAPTER I

INTRODUCTION

For many years school administrators have been looking for a plan for organizing groups in schools so that under the system of group instruction, some adjustment could be made to fit the needs of the individual pupils. The introduction of standardized achievement and intelligence tests made educators more aware of the individual differences of pupils.

These tests, especially the intelligence tests, seemed to be a means by which groups could be formed according to the result of these tests. These tests revealed a wide range of ability in the ordinary heterogeneous groups. The new grouping would place pupils in groups which are more alike in ability.

This method of classification was readily accepted by many educators and administrators. According to a survey made by the U. S. Bureau of Education which was published in School and Society,¹ 145 out 165 cities with populations ranging from 10,000 to 30,000, some or all of the elementary school pupils were grouped homogeneously. Of 89 cities with populations ranging from 30,000 to 100,000, 66 had homogeneous grouping. From 40 cities with populations of over 100,000,

¹"Classification of School Children in Accordance with Ability." School and Society, XXV, (February, 1927) p. 128.

36 of them used ability grouping or a means of classification in some or all grades in the elementary schools. These schools used various combinations of criteria for grouping such as: teachers' judgment, intelligence quotient, mental age, educational age, chronological age, and social maturity.

The aim of ability grouping is to bring together pupils who will be able to work together and to progress together under conditions permitting the fullest development of the individuals involved.²

²H. J. Otto, Elementary School Organization and Administration, p. 160.

CHAPTER II

PURPOSES OF THE STUDY

The questions that this study will attempt to answer are as follows:

1. What is the range, in grades four, five, and six, of educational achievement in arithmetic, reading, and spelling as measured by the tests used in this study?
2. If the pupils were regrouped homogeneously according to mental age, what per cent would need adjustment?
3. If the pupils were regrouped homogeneously according to reading age, what per cent would need adjustment?
4. If the pupils were regrouped homogeneously according to arithmetic age, what per cent would need adjustment?
5. If the pupils were regrouped homogeneously according to spelling age, what per cent would need adjustment?
6. To what extent is there overlapping of achievement in grades?
7. In a homogeneous group in reading which was selected hypothetically from the three original groups, what per cent would need adjustment according to mental, chronological, arithmetic, and spelling ages, respectively?
8. In a homogeneous group in arithmetic which was selected hypothetically from the three original groups, what per cent would need adjustment according to mental, chronological, reading, and spelling ages, respectively?

9. In a homogeneous group in mental age, which was selected hypothetically from the three original groups, what per cent would need adjustment according to chronological, spelling, reading, and arithmetic ages, respectively?

10. What conclusions can be reached concerning the possibility of homogeneous grouping?

CHAPTER III

MATERIALS AND METHODS USED IN THIS STUDY

The data for this study consist of the test results secured from the 4th, 5th, and 6th grade pupils in Lincoln School, Stillwater, Oklahoma, for the school year 1938-1939.

Forty-five pupils of the 4th grade, forty pupils of the 5th grade, and thirty-five pupils of the 6th grade, making a total of one hundred twenty pupils, were used.

The following tests were used for the purpose of the study:

1. Unit Scale of Attainment in Reading, Form A., Division I.
2. Unit Scale of Attainment in Spelling, Form A., Division II.
3. Unit Scale of Attainment in Arithmetic, Form A., Division II.
4. Stanford Revision (1917) of the Binet-Simon Intelligence Scale.

DESCRIPTION OF TEST

The reading test, although there was a time limit, was purely a comprehension test. The pupils read silently certain paragraphs, and answered questions about the material they read.

The arithmetic test had two parts; one on problem solving, and the other on fundamental processes. The scores used

in this study were those made on the problem solving division of the test.

The spelling test consisted of fifty words given by the room teacher without definition or comment.

Since an intelligence test is given to pupils when they first enter the Stillwater schools, most of the I. Q. scores were from grade I.

ADMINISTRATION OF TESTS

The reading, spelling, and arithmetic achievement tests were given by Superintendent E. D. Price, Mrs. Evelyn Eaton, secretary to Mr. Price, and Miss Ella Hasemeier, assistant to the elementary principals. Mrs. Eaton and Miss Hasemeier, with some assistance from the teachers, did the checking and scoring.

The raw scores of the achievement tests were converted into "C" scores which in turn were converted into achievement ages in the various school subjects.

METHODS USED

The three original groups and the selected groups were equated by chronological, mental, and achievement ages. The statistical techniques of mean, range, and standard deviation were used for comparison of characteristics.

The distribution of achievement ages is shown on Table I. The overlapping of achievements is shown on Table I and figures 1, 2, 3, 4, and 5.

Superimposed frequency polygons were used in figures 1, 2, 3, 4, and 5, to show overlapping of achievement.

TABLE I

DISTRIBUTION OF C. A., M. A., AND EDUCATIONAL
AGES IN HETEROGENEOUS GROUPS

| Ages | Grade IV. | | | | | Grade V. | | | | | Grade VI. | | | | |
|---------------------------------|-----------|----|----|----|----|----------|----|----|----|----|-----------|----|----|----|----|
| | C. | M. | A. | R. | S. | C. | M. | A. | R. | S. | C. | M. | A. | R. | S. |
| | A. | A. | A. | A. | A. | A. | A. | A. | A. | A. | A. | A. | A. | A. | A. |
| 17:2-18:1 | | | 1 | 1 | 2 | | | 1 | | | | | 1 | | |
| 16:2-17:1 | | | | | 1 | | | 1 | | | | | | | |
| 15:2-16:1 | | | | | 2 | | | | | | 1 | | 2 | | |
| 14:2-15:1 | 1 | | | 2 | 1 | 1 | | 2 | 2 | | 2 | 3 | 2 | 2 | 1 |
| 13:2-14:1 | | | 1 | 3 | 7 | 2 | 4 | 2 | 1 | 3 | 8 | 8 | 1 | 8 | 8 |
| 12:2-13:1 | | 1 | 1 | 19 | 2 | 8 | 2 | 3 | 4 | 5 | 8 | 11 | 8 | 11 | 13 |
| 11:2-12:1 | 2 | 5 | 6 | 10 | 11 | 13 | 10 | 8 | 16 | 6 | 13 | 8 | 13 | 11 | 10 |
| 10:2-11:1 | 22 | 16 | 15 | 8 | 8 | 14 | 15 | 11 | 7 | 19 | 3 | 2 | 6 | 2 | 2 |
| 9:2-10:1 | 18 | 14 | 15 | 2 | 9 | 2 | 8 | 8 | 7 | 6 | | 3 | 1 | 1 | 1 |
| 8:2- 9:1 | 1 | 7 | 4 | | 2 | | 1 | 2 | 3 | | | | 1 | | |
| 7:2- 8:1 | 1 | 2 | 2 | | | | | 2 | | 1 | | | | | |
| Per Cent Normal for Grade | 40 | 31 | 20 | 33 | 4 | 35 | 37 | 47 | 27 | 18 | 37 | 25 | 28 | 37 | 32 |
| One Year Above | 49 | 36 | 18 | 33 | 16 | 33 | 25 | 13 | 20 | 40 | 25 | 31 | 37 | 25 | 31 |
| 2 or More Yrs. Above | 7 | 13 | 58 | 20 | 76 | 27 | 15 | 22 | 23 | 17 | 30 | 30 | 26 | 16 | 28 |
| One year Below | 2 | 16 | 4 | 10 | | 5 | 20 | 15 | 20 | 17 | 8 | 6 | 6 | 17 | 6 |
| 2 or Mor Yrs. Below | 2 | 4 | | 4 | | 3 | 3 | 10 | 8 | | 8 | 3 | 5 | 3 | |

Table I shows the distribution of chronological ages, mental ages, reading, spelling and arithmetic ages in the heterogeneous groups of grades IV, V, and VI. Table II shows the limits of each grade norm.

Table II
Grade Norms Expressed in Ages

| Grade | Lower Limit | Upper Limit |
|-------|----------------|----------------|
| 10 | 15 yrs.: 2 mo. | 16 yrs.: 1 mo. |
| 9 | 14 yrs.: 2 mo. | 15 yrs.: 1 mo. |
| 8 | 13 yrs.: 2 mo. | 14 yrs.: 1 mo. |
| 7 | 12 yrs.: 2 mo. | 13 yrs.: 1 mo. |
| 6 | 11 yrs.: 2 mo. | 12 yrs.: 1 mo. |
| 5 | 10 yrs.: 2 mo. | 11 yrs.: 1 mo. |
| 4 | 9 yrs.: 2 mo. | 10 yrs.: 1 mo. |
| 3 | 8 yrs.: 2 mo. | 9 yrs.: 1 mo. |
| 2 | 7 yrs.: 2 mo. | 8 yrs.: 1 mo. |

These norms were used in determining pupils at grade, above grade, or below grade.

Table III shows the ranges within grade IV.

TABLE III
RANGES IN THE AGES
AND INTELLIGENCE QUOTIENTS OF THE
45 FOURTH GRADE PUPILS

| Age | Low | High | Range |
|-------|----------------|-----------------|----------------|
| C. A. | 7 yrs.: 8 mo. | 14 yrs.: 2 mo. | 6 yrs.: 6 mo. |
| M. A. | 7 yrs.: 5 mo. | 13 yrs.: 1 mo. | 5 yrs.: 8 mo. |
| A. A. | 8 yrs.: 9 mo. | 17 yrs.: 10 mo. | 9 yrs.: 1 mo. |
| R. A. | 7 yrs.: 0 mo. | 18 yrs.: 2 mo. | 11 yrs.: 2 mo. |
| S. A. | 9 yrs.: 10 mo. | 18 yrs.: 2 mo. | 8 yrs.: 4 mo. |
| I. Q. | 67 | 123 | 56 |

Table I shows that according to chronological age, 40 per cent of grade IV were normal for that grade; 49 per cent were one year older than normal; 7 per cent were two or more years older than normal; 2 per cent were one year younger than normal; and 2 per cent were two or more years younger than normal. According to mental age, 31 per cent of the pupils were normal for grade IV; 36 per cent were one year above normal; 13 per cent were two or more years above normal; 16 per cent were one year below normal; and 4 per cent were two or more years below normal. When the distribution of arithmetic age was considered, it was found that 20 per cent were normal for the grade; 18 per cent were one year above normal; 58 per cent were two or more years above normal; 4 per cent were one year below normal; and none was more than one year below normal. In reading age, 33 per cent

were normal for grade IV; 33 per cent were one year above normal; 20 per cent were two or more years above normal; 10 per cent were one year below normal; and 4 per cent were two or more years below normal. In spelling age, 4 per cent were normal for their grade; 18 per cent were one year above normal; 78 per cent were two or more years above normal; and none was below the grade norm.

In using the data presented in the preceding tables to answer the question, "What per cent of these pupils need adjustment?" only those pupils who were more than one year above or more than one year below the grade norm were designated as needing adjustment.

In chronological age, Grade IV (Table IV) had 2 per cent of its pupils sufficiently retarded and 7 per cent accelerated to the extent of needing adjustment, which made a total of 9 per cent of this group who needed adjustment. In mental age, 17 per cent needed adjustment with 4 per cent retarded and 13 per cent accelerated. According to arithmetic age, none was retarded but 58 per cent were accelerated. In reading age, 4 per cent were retarded and 20 per cent were accelerated making a total of 24 per cent. According to spelling age none was retarded, but 78 per cent were accelerated and needed adjustment.

TABLE IV
ADJUSTMENT NEEDED IN HETEROGENEOUS GROUPS

Grade IV.

| Age | Per Cent Retarded | Per Cent Accelerated | Total. |
|-------|-------------------|----------------------|--------|
| C. A. | 7 | 2 | 9% |
| M. A. | 4 | 13 | 17% |
| A. A. | | 58 | 58% |
| R. A. | 4 | 20 | 24% |
| S. A. | | 78 | 78% |

Grade V.

| Age | Per Cent Retarded | Per Cent Accelerated | Total. |
|-------|-------------------|----------------------|--------|
| C. A. | 27 | | 27% |
| M. A. | 3 | 15 | 18% |
| A. A. | 3 | 22 | 25% |
| R. A. | 10 | 23 | 33% |
| S. A. | 8 | 17 | 25% |

Grade VI.

| Age | Per Cent Retarded | Per Cent Accelerated | Total. |
|-------|-------------------|----------------------|--------|
| C. A. | 30 | | 30% |
| M. A. | 8 | 30 | 38% |
| A. A. | 3 | 26 | 29% |
| R. A. | 5 | 16 | 21% |
| S. A. | 3 | 28 | 31% |

Table V shows the range of achievement of Grade V.

TABLE V
RANGES IN THE AGES
AND INTELLIGENCE QUOTIENTS OF THE
40 FIFTH GRADE PUPILS

| Age | Low | High | Range |
|-------|-----------------|-----------------|----------------|
| C. A. | 9 yrs.: 11 mos. | 14 yrs.: 3 mo. | 4 yrs.: 4 mo. |
| M. A. | 8 yrs.: 4 mo. | 13 yrs.: 10 mo. | 5 yrs.: 6 mo. |
| A. A. | 8 yrs.: 0 mo. | 13 yrs.: 4 mo. | 5 yrs.: 4 mo. |
| R. A. | 7 yrs.: 4 mo. | 17 yrs.: 10 mo. | 10 yrs.: 6 mo. |
| S. A. | 8 yrs.: 7 mo. | 15 yrs.: 0 mo. | 6 yrs.: 5 mo. |
| I. Q. | 62 | 114 | 52 |

Table I shows that according to the chronological age, Grade V had 35 per cent normal for the grade; 33 per cent were one year older than normal, 27 per cent were two or more years older than normal; and 5 per cent were one year younger than normal. According to mental age, 37 per cent were normal for the grade; 25 per cent were one year above normal; 15 per cent were two or more years above normal; 20 per cent were one year below normal; and 3 per cent were two or more years below normal. In arithmetic age, 47 per cent of the group were normal for Grade V; 13 per cent were one year above normal; 22 per cent were two or more years above normal; 15 per cent were one year below normal; and 3 per cent were two or more years below normal. In reading age,

27 per cent were normal for the grade; 20 per cent were one year above normal; 23 per cent were two or more years above normal; 20 per cent were one year below normal; and 10 per cent were two or more years below normal. In spelling age, 18 per cent were normal for the grade; 40 per cent were one year above normal; 17 per cent were two or more years above normal; 17 per cent were one year below normal, and 8 per cent were two or more years below normal.

Grade V had 27 per cent accelerated to the extent that they needed adjustment in chronological age (Table IV). In mental age, 3 per cent were retarded and 15 per cent were accelerated making a total of 18 per cent. In reading age, 10 per cent were retarded and 23 per cent were accelerated making a total of 33 per cent needing adjustment. In arithmetic age, 3 per cent were retarded and 22 per cent were accelerated making a total of 25 per cent who needed adjustment in arithmetic. According to spelling age, 8 per cent were retarded and 17 per cent were accelerated making a total of 25 per cent needing adjustment.

Table VI shows the ranges of achievement in Grade VI.

TABLE VI
RANGES IN THE AGES
AND INTELLIGENCE QUOTIENTS OF THE
35 SIXTH GRADE PUPILS

| Age | Low | High | Range |
|-------|----------------|-----------------|---------------|
| C. A. | 10 yrs.: 9 mo. | 15 yrs.: 4 mo. | 4 yrs.: 7 mo. |
| M. A. | 8 yrs.: 11 mo. | 15 yrs.: 3 mo. | 6 yrs.: 4 mo. |
| A. A. | 9 yrs.: 10 mo. | 14 yrs.: 10 mo. | 5 yrs.: 0 mo. |
| R. A. | 8 yrs.: 3 mo. | 17 yrs.: 10 mo. | 9 yrs.: 7 mo. |
| S. A. | 9 yrs.: 6 mo. | 15 yrs.: 0 mo. | 5 yrs.: 6 mo. |
| I. Q. | 73 | 137 | 64 |

Table I shows that according to chronological age, 37 per cent of Grade VI were normal for the grade; 25 per cent were one year older than normal; 30 per cent were two or more years older than normal; and 8 per cent were one year younger than normal. In mental age, 25 per cent were normal for Grade VI; 31 per cent were one year above normal; 30 per cent were two or more years above normal; 6 per cent were one year below normal; and 8 per cent were two years or more below normal. In arithmetic age, 28 per cent were normal for the grade; 37 per cent were one year above normal; 26 per cent were two or more years above normal; 6 per cent were one year below normal; and 3 per cent were two or more years below normal. According to reading age, 37 per cent were normal for Grade VI; 25 per cent were one year above normal

16 per cent were two or more years above normal; 17 per cent were one year below normal; and 5 per cent were two or more years below normal. In spelling age, 32 per cent were normal for the grade; 31 per cent were one year above normal; 28 per cent were two or more years above normal; 6 per cent were one year below normal, and 3 per cent were two or more years below normal.

In Grade VI, 30 per cent were accelerated in chronological age to the extent that they needed adjustment. None was retarded more than one year. According to mental age, 8 per cent were retarded and 30 per cent were accelerated making a total of 38 per cent needing adjustment. In arithmetic age, 3 per cent were retarded and 26 per cent were accelerated making a total of 29 per cent. According to reading age, 5 per cent were retarded and 16 per cent were accelerated making a total of 21 per cent needing adjustment in reading. According to spelling age, 3 per cent were retarded and 28 per cent were accelerated making a total of 31 per cent needing adjustment in spelling.

Grades IV, V, and VI made up of 45, 40, and 35 pupils, respectively, were the ordinary heterogeneous groups. If these same groups were rearranged according to C. A., M. A., or some achievement age, how many pupils would need adjustment? What per cent of the pupils would need adjustment?

When the actual number of pupils in Grade IV was considered, 4 needed adjustment if they were regrouped according to chronological age, 8 needed adjustment if regrouped

by mental age, 26 needed adjustment if regrouped according to arithmetic age; 11 needed adjustment if reading age were used in the regrouping; and 36 needed adjustment if regrouped according to spelling age. The average number of pupils who needed adjustment of the five ages considered was 16.8 or 37 per cent.

In Grade V, 11 pupils would need adjustment if they were regrouped according to chronological age; 7 would need adjustment if mental age determined the regrouping; 10 would need adjustment if regrouped by arithmetic age; 13 if regrouped by reading age; and 10 if they were regrouped according to spelling age. The average number of pupils who needed adjustment was 10.2 or 25 per cent.

If chronological age were used to regroup Grade VI, 11 would need adjustment; 14 would need adjustment if regrouped according to mental age; 10 would need adjustment if regrouped by arithmetic age; 8 would need adjustment if reading age determined the regrouping; and 11 would need adjustment if they were regrouped according to spelling age. The average number of pupils needing adjustment when the five factors were used was 10.8, or a little more than 29 per cent.

HYPOTHETICAL HOMOGENEOUS GROUPS.

The purpose of this part of the study is to determine the range and variability of achievement within groups homogeneous in accordance with one factor. Three hypothetical groups were selected from Grades IV, V, and VI. These groups were selected in order that one would be homogeneous

in mental age, one in accordance with reading age; and one group would be homogeneous according to arithmetic age. To what extent do groups homogeneous in one subject need adjustment when other subject achievements are considered?

A group of pupils was selected with arithmetic ages between 10 yrs. : 2 mo. and 11 yrs. : 1 mo. This group was considered homogeneous as far as arithmetic was concerned. When the chronological, mental, reading, and spelling ages were considered, Table VII shows that there was a wide range of achievement. The chronological ages were from 9 yrs.: 5 mo. to 14 yrs.: 3 mo.; the mental ages ranged from 7 yrs.: 5 mo. to 12 yrs.: 9 mo.; the reading ages were from 7 yrs.: 4 mo. to 14 yrs.: 4 mo.; and the spelling ages ranged from 8 yrs.: 7 mo. to 18 yrs.: 2 mo.

TABLE VII

DISTRIBUTION OF ACHIEVEMENT AND
ADJUSTMENT NEEDED IN HYPOTHETICAL
GROUP HOMOGENEOUS IN ARITHMETIC

| Age in Yrs. & Mos. | C.A. | M.A. | A.A. | R.A. | S.A. |
|---|------|------|------|------|------|
| 13:2-14:1 | 2 | 2 | | | 4 |
| 12:2-13:1 | 5 | 3 | | 2 | 2 |
| 11:2-12:1 | 7 | 14 | | 8 | 14 |
| 10:2-11:1 | 13 | 8 | 29 | 8 | 3 |
| 9:2-10:1 | 2 | 1 | | 8 | 4 |
| 8:2- 9:1 | | 1 | | 1 | 2 |
| 7:2- 8:1 | | | | 2 | |
| Per Cent Normal | 44 | 48 | 100 | 28 | 10 |
| Per Cent one year above normal | 24 | 10 | | 28 | 48 |
| Per Cent 2 or more Yrs. above normal | 27 | 7 | | 7 | 21 |
| Per Cent on year Below Normal | 4 | 28 | | 27 | 14 |
| Per Cent 2 or more Yrs Below normal | 3 | 7 | | 10 | 7 |

TABLE VIII
RANGE OF ACHIEVEMENT OF A
HYPOTHETICAL GROUP HOMOGENEOUS IN ARITHMETIC

| Ages | Low | High | Range |
|-------|----------------|----------------|----------------|
| A. A. | 10 yrs.: 2 mo. | 11 yrs.: 1 mo. | 1 yr. |
| R. A. | 7 yrs.: 4 mo. | 14 yrs.: 4 mo. | 7 yrs.: 0 mo. |
| S. A. | 8 yrs.: 7 mo. | 18 yrs.: 2 mo. | 9 yrs.: 7 mo. |
| M. A. | 7 yrs.: 5 mo. | 12 yrs.: 9 mo. | 5 yrs.: 4 mo. |
| C. A. | 9 yrs.: 5 mo. | 14 yrs.: 3 mo. | 4 yrs.: 10 mo. |

Although this group was organized in accordance with arithmetic ages Table VII shows that there is need of adjustment in other achievements. According to chronological age, 27 per cent needed adjustment; 14 per cent needed adjustment in mental age; 17 per cent needed adjustment in reading; and 28 per cent needed adjustment in spelling. The average per cent of adjustment needed in this group was 23.

Another hypothetical group was taken from the three original groups. This group was homogeneous as to mental age with a range from 10 yrs.: 2 mo. to 11 yrs.: 1 mo. When chronological age, arithmetic; reading, and spelling ages were considered, a wide variation was found within the group. The chronological age varied (Table X) from 9 yrs.: 7 mo. to 14 yrs.: 3 mo.; the arithmetic age ranged from 9 yrs.: 4 mo. to 17 yrs.: 10 mo.; the reading age was from 7 yrs.: 10 mo. to 12 yrs.: 8 mo.; and the spelling age was from 9 yrs.: 4 mo. to 13 yrs.: 2 mo.

TABLE IX

DISTRIBUTION OF ACHIEVEMENT AND
ADJUSTMENT NEEDED IN HYPOTHETICAL
GROUP HOMOGENEOUS IN MENTAL AGE

| Age in Yrs. & Mos. | C.A. | M.A. | A.A. | R.A. | S. A. |
|------------------------------|------|------|------|------|-------|
| 13:2-14:1 | 2 | | 5 | | 1 |
| 12:2-13:1 | 3 | | 1 | 1 | 7 |
| 11:2-12:1 | 4 | | 9 | 6 | 15 |
| 10:2-11:1 | 12 | 32 | 12 | 14 | 4 |
| 9:2-10:1 | 11 | | 5 | 8 | 5 |
| 8:2-9 :1 | | | | 2 | |
| 7:2-8 :1 | | | | 1 | |
| Per Cent Normal | 37 | 100 | 37 | 44 | 12 |
| 1 Year Above Normal | 13 | | 28 | 19 | 47 |
| 2 or More Years Above Normal | 16 | | 19 | 3 | 25 |
| 1 year Below Normal | 34 | | 16 | 25 | 16 |
| 2 or More Years Below Normal | | | | 9 | |

TABLE X
RANGE OF ACHIEVEMENT OF A
HYPOTHETICAL GROUP HOMOGENEOUS IN MENTAL AGE

| Age | Low | High | Range |
|-------|----------------|-----------------|----------------|
| M. A. | 10 yrs.: 2 mo. | 11 yrs.: 1 mo. | 1 yr. |
| C. A. | 9 yrs.: 7 mo. | 14 yrs.: 3 mo. | 4 yrs.: 8 mo. |
| A. A. | 9 yrs.: 4 mo. | 17 yrs.: 10 mo. | 8 yrs.: 6 mo. |
| R. A. | 7 yrs.: 11 mo. | 12 yrs.: 8 mo. | 4 yrs.: 9 mo. |
| S. A. | 9 yrs.: 4 mo. | 13 yrs.: 2 mo. | 3 yrs.: 10 mo. |

When other achievement ages were considered with the age which the pupils were homogeneous, there was need of adjustment. In chronological age (Table IX), 16 per cent needed adjustment; and in arithmetic 19 per cent needed adjustment. In reading age, 12 per cent needed adjustment and according to spelling age, 25 per cent needed adjustment. The average per cent of adjustment needed in the hypothetical group homogeneous according to mental age was 18.

A third hypothetical group which was homogeneous according to reading age was selected. The reading range was from 10 yrs.: 2 mo. to 11 yrs.: 1 mo., which was normal for Grade V. The range of chronological ages of the same group was from 8 yrs.: 2 mo. to 14 yrs.: 2 mo. In mental age, the ages were from 8 yrs.: 4 mo. to 14 yrs. In arithmetic age, there was a variation from 9 yrs.: 4 mo. to 15 yrs.: 4 mo.; and spelling ages were from 9 yrs.: 6 mo. to 14 yrs.: 4 mo.

TABLE XI

DISTRIBUTION OF ACHIEVEMENT AND
ADJUSTMENT NEEDED IN HYPOTHETICAL
GROUP HOMOGENEOUS IN READING

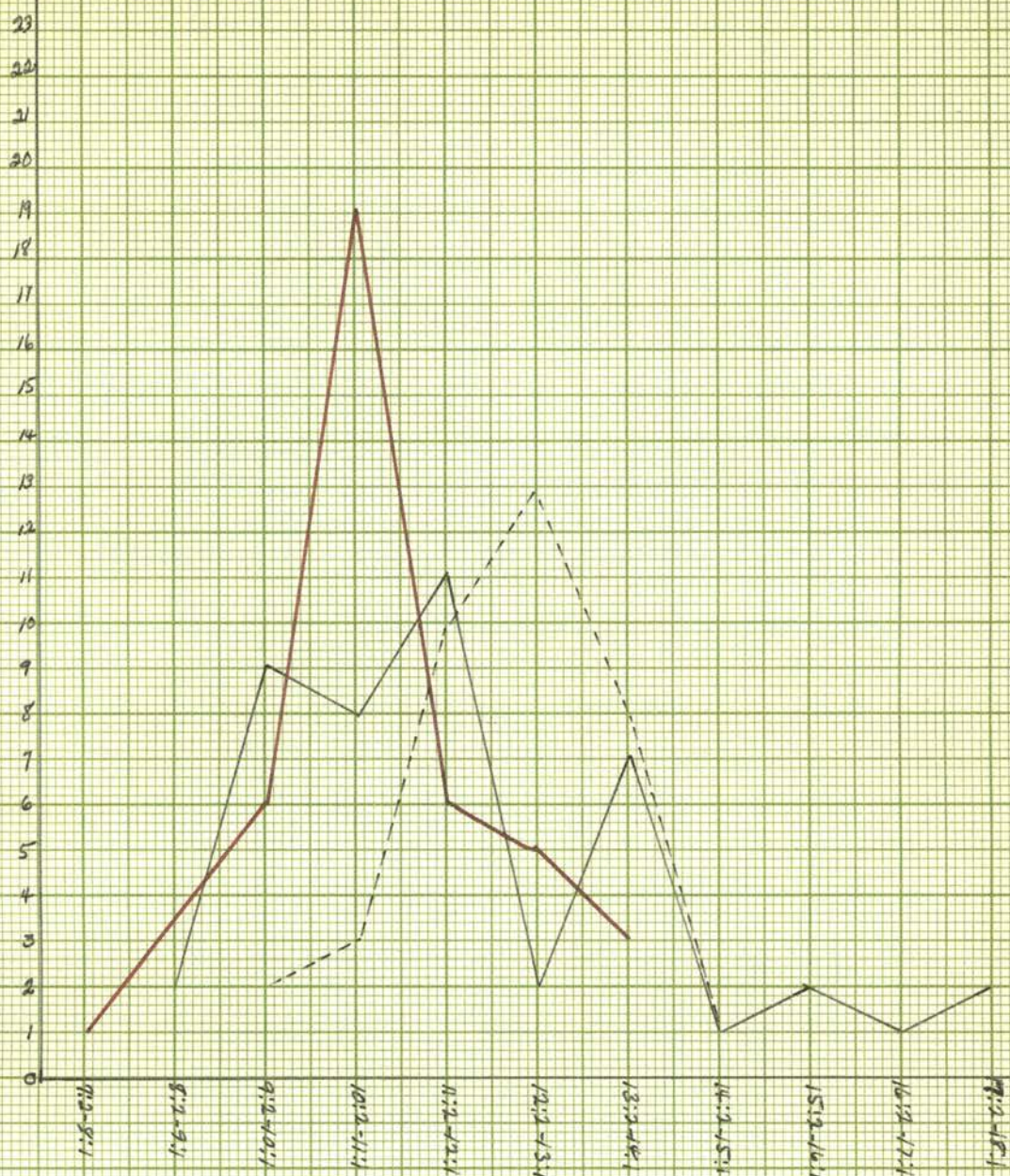
| Age in Yrs. & Mos. | C.A. | M.A. | A.A. | R.A. | S.A. |
|--|------|------|------|------|------|
| 13:2-14:1 | 4 | 3 | 9 | | 7 |
| 12:2-13:1 | 4 | 2 | 4 | | 8 |
| 11:2-12:1 | 5 | 8 | 6 | | 7 |
| 10:2-11:1 | 9 | 13 | 7 | 32 | 8 |
| 9:2-10:1 | 9 | 5 | 6 | | 2 |
| 8:2- 9:1 | 1 | 1 | | | |
| Per Cent Normal | 28 | 40 | 22 | 100 | 25 |
| Per Cent one year Above Normal | 16 | 25 | 19 | | 22 |
| Per Cent 2 or more years above normal | 25 | 16 | 40 | | 47 |
| Per Cent one year Below normal | 28 | 16 | 19 | | 6 |
| Per Cent 2 or more years below normal | 3 | 3 | | | |

TABLE XII
RANGE OF ACHIEVEMENT OF A
HYPOTHETICAL GROUP HOMOGENEOUS IN READING AGE

| Age | Low | High | Range |
|-------|----------------|----------------|----------------|
| R. A. | 10 yrs.: 2 mo. | 11 yrs.: 1 mo. | 1 yr. |
| C. A. | 8 yrs.: 2 mo. | 14 yrs.: 2 mo. | 6 yrs. |
| M. A. | 8 yrs.: 4 mo. | 14 yrs.; 0 mo. | 5 yrs.: 8 mo. |
| A. A. | 9 yrs.: 4 mo. | 15 yrs.: 4 mo. | 4 yrs.: 10 mo. |
| S. A. | 9 yrs.: 6 mo. | 14 yrs.: 4 mo. | 4 yrs.: 10 mo. |

When other achievement ages, mental age, and chronological ages were considered in the group (Table XI) shows that 28 per cent needed adjustment according to chronological age and 19 per cent needed adjustment according to mental age. In arithmetic, 40 per cent needed adjustment and 47 per cent needed adjustment in spelling. The average per cent of adjustment needed in the hypothetical group homogeneous in reading was 36.

The averages of adjustment needed in the three hypothetically selected groups homogeneous in mental age, arithmetic age, and reading age were 18 per cent, 23 per cent, and 36 per cent, respectively. The mean of these three per cents is 25.6.



— Grade III

$M = 11 \text{ yr. } 11 \text{ mo.}$

$S.D. = 2.09 \text{ yr.}$

$R = 9 \text{ yr. } 1 \text{ mo.}$

— Grade IV

$M = 11 \text{ yr. } 1 \text{ mo.}$

$S.D. = 1.24 \text{ yr.}$

$R = 5 \text{ yr. } 4 \text{ mo.}$

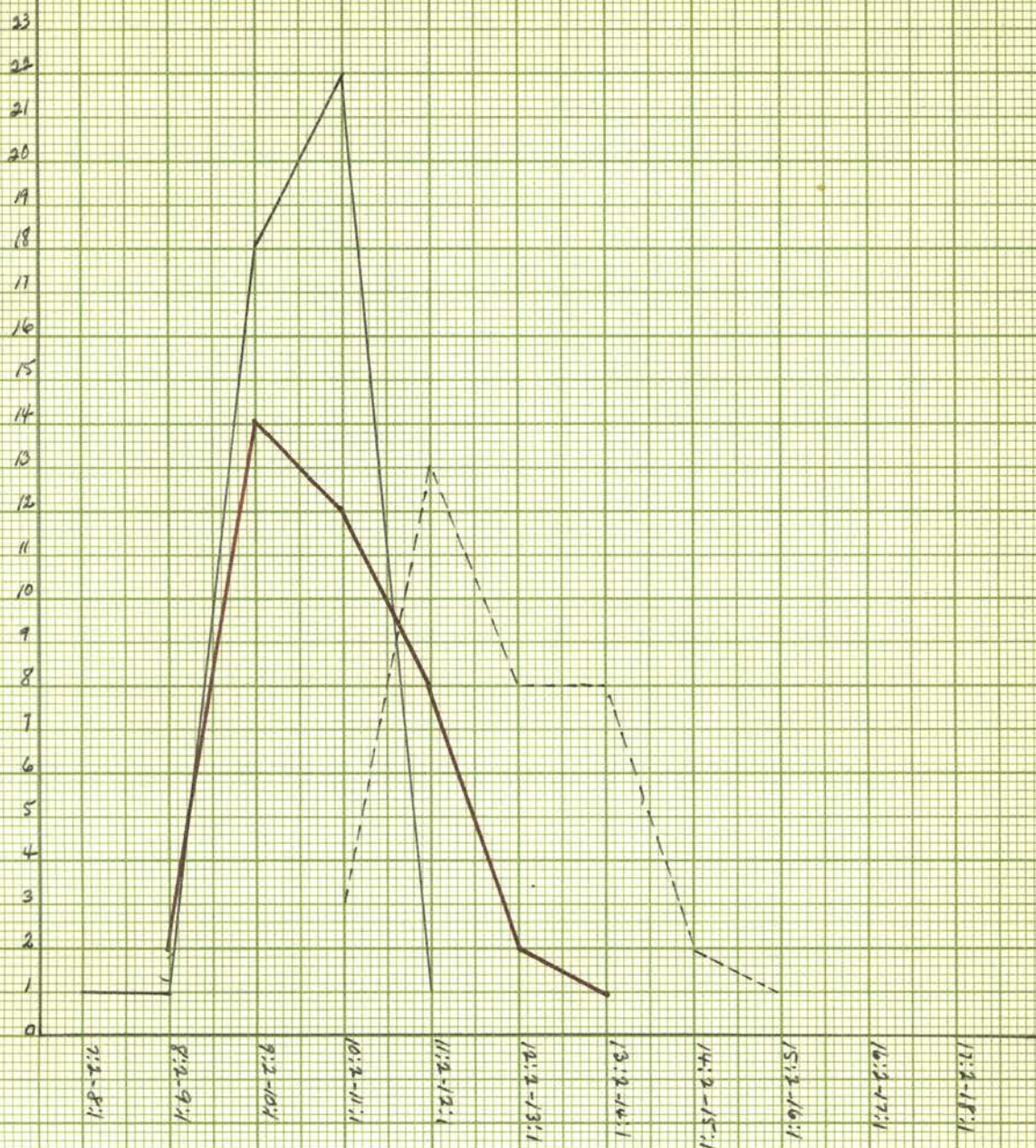
--- Grade V

$M = 12 \text{ yr. } 4 \text{ mo.}$

$S.D. = 1.09 \text{ yr.}$

$R = 5 \text{ yr.}$

Fig. 1.
Over Lapping of Arithmetic Ages



— Grade IV
 M. = 10yr. 3mo.
 S.D. = 1.03 yr.
 R. = 6yr. 6mo.

— Grade V
 M. = 11yr. 6mo.
 S.D. = 1.08 yr.
 R. = 4yr. 4mo.

--- Grade VI
 M. = 12yr. 6mo.
 S.D. = 1.19 yr.
 R. = 4yr. 7mo.

Fig. 2.
 Over Lapping of C. A.

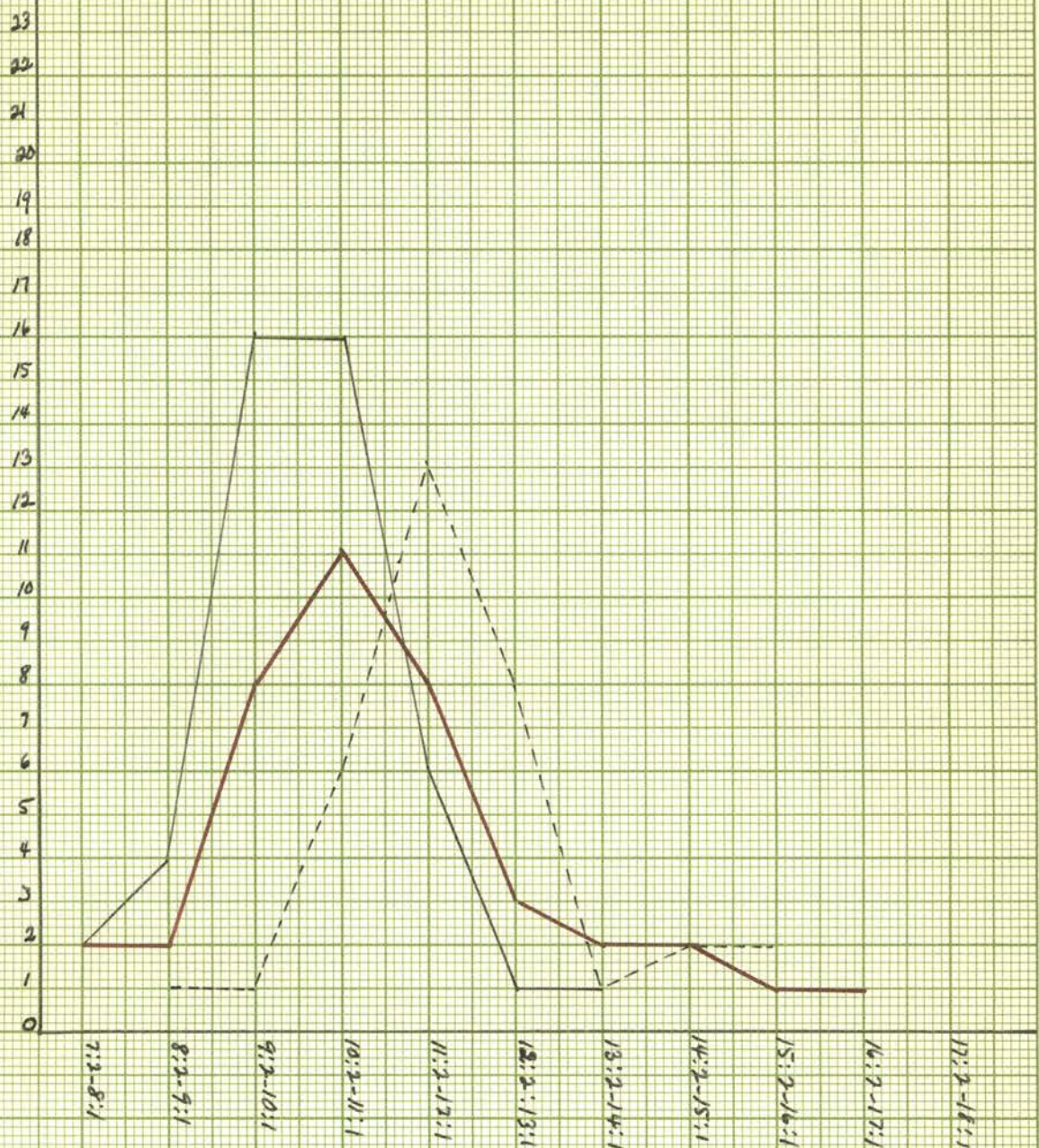


— Grade IV
 M = 9yr. 11mo.
 S.D. = .96yr.
 R. = 5yr. 8mo.

— Grade V
 M = 10yr. 10mo.
 S.D. = .84yr.
 R. = 5yr. 6mo.

--- Grade VI
 M = 12yr. 2mo.
 S.D. = 1.39yr.
 R. = 6yr. 4mo.

Fig. 3
 Over Lapping of M.A.



— Grade IV

M. = 10yr. 1mo.

S.D. = 1.17yr.

R. = 11yr. 2mo.

— Grade V

M. = 11yr. 1mo.

S.D. = 2.17yr.

R. = 10yr. 6mo.

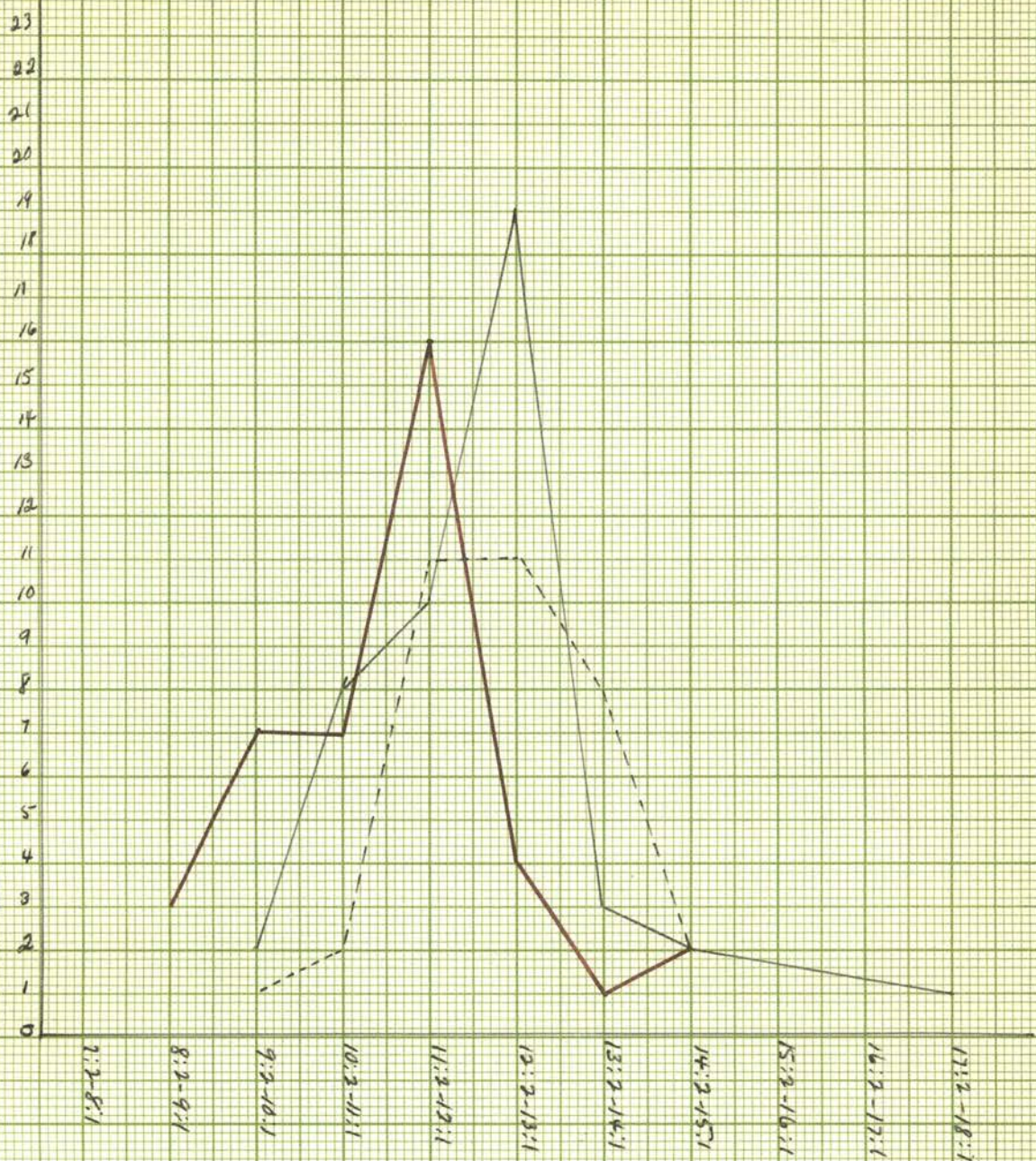
---- Grade VI

M. = 12yr.

S.D. = 1.74yr.

R. = 9yr. 7mo.

Fig. 4
Overlapping of Reading Ages



— Grade IV

M. = 12yr. 1mo.

S.D. = 1.39yr.

R. = 8yr. 4mo.

— Grade V

M. = 11yr. 1mo.

S.D. = 1.32yr.

R. = 6yr. 5mo.

- - - Grade VI

M. = 12yr. 4mo.

S.D. = 1.10yr.

R. = 5yr. 6mo.

Fig. 5
Overlapping of Spelling Ages

Overlapping of Achievements in Heterogeneous Groups.

The superimposed polygons in Figures 1, 2, 3, 4, and 5 show the overlapping of mental age, chronological age, reading age, spelling age, and arithmetic age.

Reading.

In Grade IV there were 7.5 per cent of the pupils below third grade reading level. Six per cent of Grade VI; 15 per cent of Grade V; and 23 per cent of Grade IV were below fourth grade level. Forty-eight per cent of Grade IV; 12 per cent of Grade VI; and 45 per cent of Grade V were below the fifth grade level. Fifty-five per cent of Grade V and 52 per cent of Grade IV were above the fifth grade level. Eighty-three per cent of Grade VI; 38 per cent of Grade V; and 12 per cent of Grade IV were above the sixth grade level. Sixty-four per cent of Grade VI; 23 per cent of Grade V; and 7.5 per cent of Grade IV were above the seventh grade level. Forty-two per cent of Grade VI; 13 per cent of Grade V; and 2.5 per cent of Grade IV were above the eighth grade level.

Arithmetic.

In arithmetic, 6 per cent of Grade IV and 7.5 per cent of Grade V were below the fourth grade level. Thirty-one per cent of Grade IV; 17.5 per cent of Grade V; and 8 per cent of Grade VI were below the fifth grade level. Sixty-nine per cent of Grade IV and 82.5 per cent of Grade V were above the fifth grade level. Ninety-two per cent of Grade VI; 23 per cent of Grade V; and 52 per cent of Grade IV were above the sixth grade level. Thirty-three per cent of Grade IV;

5 per cent of Grade V; and 61 per cent of Grade VI were above the seventh grade level. Ten per cent of Grade IV and 23 per cent of Grade VI were above the eighth grade level.

Spelling.

In spelling, 10 per cent of Grade V were below the fourth grade level. None of Grades IV or VI was below the fourth grade level. Five per cent of Grade VI; 22 per cent of Grade V; and six per cent of Grade IV were below the fifth grade level. Seventy-eight per cent of Grade V and 94 per cent of grade IV were above the fifth grade level. Eight per cent of grade VI were below the grade norm. Ninety-two per cent of Grade VI; 60 per cent of Grade V; and 72 per cent of Grade IV were above the sixth grade level. Sixty-six per cent of Grade VI; 29 per cent of Grade V; and 57 per cent of Grade IV were above the seventh grade level. Twenty-two per cent of Grade VI; 13 per cent of Grade V; and 10 per cent of Grade IV were above the eighth grade spelling norm.

CONCLUSIONS

1. Any group can only be homogeneous in one characteristic. When other items are considered the range is so great that some pupils will need adjustment. From this study the average per cent of pupils needing adjustment in heterogeneous groups was 30 per cent. The average per cent of pupils needing adjustment in hypothetically selected homogeneous groups was 25.7.
2. Since only 4.3 per cent was the difference between the adjustment needed in heterogeneous and homogeneous groups, apparently it makes little difference how pupils are grouped. In each subject, some will need adjustment.
3. Since the adjustment of the homogeneous groups according to M. A., arithmetic, and reading abilities were 18 per cent, 23 per cent, and 36 per cent, respectively, mental age is the best criterion of these three in creating groups that are more nearly alike in ability. There is less adjustment to make when the pupils are selected according to mental age.

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Data Sheet for Forty-Five Fourth Grade Pupils

| Pupil | C. A. | I. Q. | M. A. | A. A. * | R. A. * | S. A. * |
|-------|-------|-------|-------|---------|---------|---------|
| 1 | 10-5 | 97 | 10-1 | 15-4 | 11-2 | 12-5 |
| 2 | 10-4 | 85 | 8-9 | 12-0 | 11-2 | 12-5 |
| 3 | 10-3 | 91 | 9-2 | 10-5 | 10-6 | 11-10 |
| 4 | 10-5 | 102 | 10-7 | 13-4 | 10-10 | 12-0 |
| 5 | 10-6 | 89 | 9-5 | 11-6 | 8-2 | 9-10 |
| 6 | 10-5 | 93 | 9-8 | 12-0 | 10-0 | 12-5 |
| 7 | 9-10 | 104 | 10-3 | 11-8 | 11-2 | 13-0 |
| 8 | 10-9 | 109 | 11-9 | 14-0 | 10-4 | 10-11 |
| 9 | 9-8 | 121 | 11-7 | 11-6 | 9-10 | 12-9 |
| 10 | 10-4 | 97 | 10-1 | 12-4 | 13-4 | 15-0 |
| 11 | 9-8 | 101 | 9-9 | 12-4 | 10-0 | 11-11 |
| 12 | 9-4 | 123 | 11-4 | 15-4 | 10-4 | 13-0 |
| 13 | 10-5 | 97 | 10-2 | 14-0 | 9-2 | 11-8 |
| 14 | 9-8 | 92 | 8-10 | 9-8 | 9-1 | 12-6 |
| 15 | 10-6 | 104 | 10-8 | 9-8 | 9-4 | 13-0 |
| 16 | 7-9 | 112 | 8-5 | 16-8 | 18-2 | 12-4 |
| 17 | 9-11 | 120 | 11-10 | 14-4 | 10-6 | 10-4 |
| 18 | 11-11 | 88 | 10-6 | 10-3 | 9-7 | 11-2 |
| 19 | 10-8 | 87 | 9-6 | 9-6 | 9-2 | 13-0 |
| 20 | 9-7 | 97 | 9-3 | 11-11 | 9-7 | 13-4 |
| 21 | 10-8 | 83 | 8-11 | 10-2 | 8-0 | 11-0 |
| 22 | 9-8 | 97 | 9-4 | 13-4 | 9-7 | 12-5 |
| 23 | 9-9 | 102 | 9-11 | 9-10 | 10-6 | 12-6 |
| 24 | 9-10 | 109 | 10-8 | 11-5 | 12-0 | 12-5 |
| 25 | 11-0 | 87 | 9-10 | 10-11 | 10-7 | 13-4 |
| 26 | 10-8 | 79 | 8-5 | 9-5 | 7-0 | 9-10 |
| 27 | 14-2 | 67 | 9-8 | 8-9 | 8-11 | 11-5 |
| 28 | 11-0 | 68 | 7-5 | 10-2 | 11-5 | 18-2 |
| 29 | 10-5 | 98 | 10-0 | 10-3 | 9-2 | 12-0 |
| 30 | 11-0 | 100 | 11-0 | 10-2 | 9-10 | 11-0 |
| 31 | 10-2 | 76 | 7-8 | 8-9 | 8-9 | 10-7 |
| 32 | 10-6 | 79 | 8-4 | 10-0 | 10-4 | 13-0 |
| 33 | 12-1 | 74 | 9-0 | 10-0 | 9-2 | 11-11 |
| 34 | 9-7 | 112 | 10-8 | 14-0 | 11-2 | 12-0 |
| 35 | 10-2 | 106 | 10-9 | 10-0 | 9-8 | 11-0 |
| 36 | 9-10 | 106 | 10-5 | 10-0 | 10-4 | 11-0 |
| 37 | 9-9 | 109 | 10-8 | 12-0 | 10-8 | 12-8 |
| 38 | 10-8 | 124 | 13-1 | 13-8 | 9-10 | 10-11 |
| 39 | 10-1 | 102 | 10-2 | 11-2 | 10-4 | 13-2 |
| 40 | 8-2 | 125 | 10-1 | 11-8 | 10-4 | 12-6 |
| 41 | 10-0 | 107 | 10-8 | 11-8 | 10-4 | 12-5 |
| 42 | 9-5 | 118 | 11-0 | 10-6 | 10-10 | 11-4 |
| 43 | 10-0 | 106 | 10-7 | 17-10 | 12-8 | 12-7 |
| 44 | 9-7 | 120 | 11-6 | 13-4 | 10-8 | 12-6 |
| 45 | 10-4 | 100 | 10-4 | 17-10 | 9-2 | 12-6 |

NOTE: * A. A. - Arithmetic Ages; R. A. - Reading Ages; S. A. - Spelling Ages.

Data Sheet for Forty Fifth Grade Pupils.

| Pupil | C. A. | I. Q. | M. A. | A. A.* | R. A.* | S. A.* |
|-------|--------|-------|-------|--------|--------|--------|
| 1 | 13-0 | 91 | 13-11 | 12-8 | 10-2 | 11-0 |
| 2 | 10-11 | 94 | 10-3 | 10-7 | 11-2 | 11-2 |
| 3 | 13-4 | 72 | 8-4 | 9-10 | 9-2 | 8-10 |
| 4 | 12-0 | 93 | 11-2 | 10-7 | 11-2 | 11-7 |
| 5 | 12-6 | 75 | 9-5 | 10-3 | 7-4 | 8-7 |
| 6 | 12-6 | 89 | 11-2 | 10-8 | 9-5 | 9-6 |
| 7 | 12-1 | 78 | 9-6 | 8-0 | 9-5 | 9-10 |
| 8 | 11-2 | 105 | 11-9 | 11-7 | 17-10 | 12-0 |
| 9 | 12-9 | 83 | 10-7 | 9-4 | 10-4 | 9-6 |
| 10 | 10-2 | 95 | 10-8 | 10-8 | 10-8 | 10-6 |
| 11 | 11-8 | 89 | 10-6 | 11-7 | 12-0 | 9-6 |
| 12 | 10-8 | 94 | 10-1 | 10-10 | 9-2 | 12-0 |
| 13 | 11-5 | 86 | 9-9 | 10-7 | 11-4 | 13-0 |
| 14 | 14-0 | 85 | 11-11 | 10-7 | 10-6 | 14-4 |
| 15 | 14-3 | 75 | 10-11 | 10-10 | 10-6 | 9-10 |
| 16 | 12-6 | 88 | 10-11 | 10-7 | 13-8 | 9-10 |
| 17 | 10-4 | 93 | 9-5 | 10-7 | 9-8 | 9-1 |
| 18 | 11-1 | 97 | 10-9 | 10-3 | 10-8 | 11-11 |
| 19 | 10-10 | 101 | 10-11 | 11-6 | 12-0 | 10-9 |
| 20 | 10-8 | 98 | 10-6 | 9-10 | 7-11 | 11-8 |
| 21 | 11-2 | 107 | 11-11 | 12-2 | 16-8 | 15-0 |
| 22 | 12-4 | 97 | 12-0 | 10-1 | 11-8 | 12-5 |
| 23 | 10-10- | 91 | 9-10 | 9-4 | 10-8 | 11-1 |
| 24 | 10-9 | 98 | 10-7 | 10-6 | 9-7 | 9-4 |
| 25 | 11-9 | 113 | 13-4 | 12-8 | 12-0 | 11-10 |
| 26 | 10-11 | 113 | 12-4 | 13-2 | 12-0 | 11-2 |
| 27 | 11-5 | 106 | 12-1 | 9-4 | 10-2 | 13-2 |
| 28 | 11-6 | 116 | 13-4 | 13-4 | 10-2 | 10-8 |
| 29 | 10-1 | 97 | 10-9 | 11-6 | 9-0 | 11-4 |
| 30 | 10-11 | 114 | 12-5 | 10-10 | 14-4 | 12-4 |
| 31 | 12-4 | 110 | 13-8 | 13-4 | 13-4 | 12-8 |
| 32 | 10-5 | 93 | 9-9 | 10-6 | 12-8 | 11-10 |
| 33 | 12-0 | 78 | 9-5 | 12-5 | 9-4 | 12-1 |
| 34 | 10-8 | 102 | 11-10 | 11-11 | 10-6 | 11-0 |
| 35 | 11-3 | 103 | 11-7 | 10-8 | 12-8 | 12-0 |
| 36 | 11-9 | 92 | 10-10 | 10-5 | 8-9 | 11-4 |
| 37 | 11-9 | 87 | 10-3 | 10-5 | 10-2 | 11-4 |
| 38 | 11-0 | 103 | 11-4 | 12-5 | 14-4 | 11-0 |
| 39 | 9-11 | 110 | 10-11 | 10-5 | 9-4 | 11-4 |
| 40 | 14-2 | 96 | 13-10 | 11-4 | 12-8 | 12-0 |

Note: * A. A. - Arithmetic Ages; R. A. Reading Ages; S. A. - Spelling Ages.

Data Sheet for Thirty-five Sixth Grade Pupils.

| Pupil | C. A. | I.Q. | M. A. | A. A.* | R. A.* | S. A.* |
|-------|-------|------|-------|--------|--------|--------|
| 1 | 11-11 | 114 | 13-8 | 13-0 | 14-4 | 15-0 |
| 2 | 11-6 | 103 | 11-11 | 11-0 | 11-2 | 11-4 |
| 3 | 11-5 | 111 | 12-9 | 11-8 | 13-0 | 12-5 |
| 4 | 12-9 | 100 | 12-9 | 11-0 | 11-2 | 13-2 |
| 5 | 11-1 | 137 | 15-3 | 12-8 | 12-0 | 12-8 |
| 6 | 11-7 | 103 | 12-0 | 13-8 | 11-8 | 11-8 |
| 7 | 11-11 | 77 | 9-2 | 14-0 | 10-0 | 13-4 |
| 8 | 12-5 | 94 | 11-7 | 13-4 | 15-4 | 13-8 |
| 9 | 11-4 | 117 | 13-3 | 12-5 | 11-8 | 13-8 |
| 10 | 11-0 | 112 | 13-7 | 11-4 | 11-0 | 13-8 |
| 11 | 14-9 | 82 | 12-1 | 12-2 | 12-8 | 12-4 |
| 12 | 13-5 | 83 | 11-1 | 13-0 | 10-2 | 10-3 |
| 13 | 11-10 | 107 | 12-8 | 14-10 | 12-8 | 11-10 |
| 14 | 11-0 | 125 | 13-9 | 13-8 | 13-8 | 15-0 |
| 15 | 11-10 | 109 | 13-0 | 12-5 | 12-5 | 12-8 |
| 16 | 13-3 | 107 | 14-3 | 11-11 | 11-10 | 11-6 |
| 17 | 11-8 | 1-8 | 12-8 | 12-8 | 10-2 | 12-5 |
| 18 | 11-3 | 105 | 11-10 | 12-8 | 12-6 | 12-4 |
| 19 | 15-4 | 73 | 11-4 | 9-10 | 8-3 | 9-6 |
| 20 | 13-0 | 100 | 13-0 | 12-8 | 11-2 | 13-0 |
| 21 | 10-9 | 94 | 10-1 | 11-8 | 11-8 | 12-0 |
| 22 | 12-8 | 80 | 10-2 | 11-11 | 11-0 | 11-5 |
| 23 | 13-2 | 94 | 12-4 | 12-5 | 12-8 | 12-6 |
| 24 | 12-7 | 104 | 13-2 | 12-6 | 12-8 | 12-5 |
| 25 | 14-2 | 98 | 14-0 | 14-0 | 10-2 | 12-4 |
| 26 | 13-3 | 97 | 12-11 | 11-8 | 17-10 | 13-2 |
| 27 | 12-1 | 109 | 13-1 | 13-4 | 12-8 | 13-2 |
| 28 | 13-2 | 101 | 13-4 | 12-8 | 15-4 | 11-0 |
| 29 | 13-9 | 100 | 13-9 | 11-11 | 11-8 | 13-0 |
| 30 | 11-6 | 77 | 8-11 | 13-8 | 11-2 | 12-0 |
| 31 | 12-9 | 98 | 12-6 | 13-0 | 10-2 | 11-7 |
| 32 | 13-2 | 100 | 13-2 | 11-4 | 14-4 | 11-4 |
| 33 | 13-1 | 89 | 11-8 | 11-6 | 11-8 | 12-0 |
| 34 | 12-3 | 95 | 11-9 | 11-6 | 11-8 | 12-0 |
| 35 | 12-4 | 100 | 12-4 | 11-11 | 11-2 | 13-10 |

NOTE: * A. A. - Arithmetic ages; R. A. Reading Ages; S. A. - Spelling Ages.

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