A COMPARATIVE STUDY OF THE ACHIEVEMENT OF ELEMENTARY SCHOOL PUPILS ON THE BASIS OF CLASS SIZE AND STATE CLASSIFICATION

A THESIS

SUBMITTED TO THE DEPARTMENT OF EDUCATION AND THE GRADUATE COUNCIL OF THE KANSAS STATE TEACHERS COLLEGE OF EMPORIA IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE

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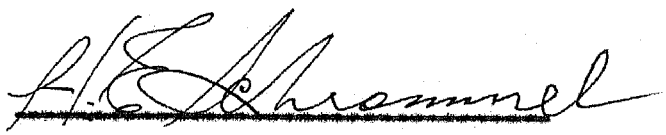

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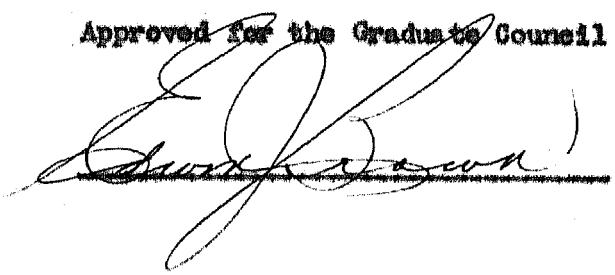

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CHAPTER I

INTRODUCTION

A considerable difference of opinion exists among educators regarding the relative effectiveness of instruction in different size classes. Some think that small classes make possible more individual help and thus accomplish results which cannot be obtained in the larger classes. Others believe that the element of competition combined with better equipment and more highly specialized teachers makes for a higher achievement of pupils in larger schools than is possible in the smaller ones.

In regard to classification of schools by state departments of education, the question naturally arises whether the socalled class "A" schools actually provide better inducements to learning than do class "B" and class "C" schools.

I. THE PROBLEM

Statement of the problem. It is the purpose of this study (1) to make a statistical comparison of the achievement of elementary school pupils in the various size classes and schools of diverse classification in a number of basic school subjects.

Importance of the study. The satisfaction of knowing who really does best in achievement as measured by the accomplishment on some common testing program is worthy of the study in itself. The results obtained

should also shed some light upon the ideas and questions expressed in the first paragraph of this chapter. If the pupil of the small class does as well or better, on the average, than those of the larger classes, then we must lay aside one of the most common arguments for the consolidated school; namely, that a larger group provides greater stimulus for pupil activity and development. If it is found that the students in class "B" schools do as well, on the average, as those in class "A" schools, then perhaps, the school district is not justified in spending larger sums of the tax-payers' money to provide the equipment necessary for a higher rating.

To summarize a long discussion, school men must be able to defend their position, and any information which may bring about a more complete view of the situation is of value in working toward this end.

Source of data. If a study of this kind is to be undertaken, some common testing program must be chosen as a means of gathering the necessary data. For this purpose the Nation-wide Every Pupil Scholarship Tests, sponsored by the Kansas State Teachers College of Emporia, were chosen. Results from both the January, 1938, and the April, 1938, testing programs are included in this comparison. In order to be able to make the desired classification of the schools from which reports of results were received, a brief questionnaire was included with each order for elementary school tests by the Bureau of Measurements. The questionnaire included the following items: school enrollment; population of the city or town; rural or graded school; classification as given by the State Department of Education; and whether it was a

one, two, three or more teacher school. A few schools, however, did not reply to the questionnaire. Hence, the classification of some of these was obtained by personal communication with May Hare, rural school supervisor of Kansas, and others were omitted from the study.

Scope of the study. As mentioned above, this study is based on the results reported in the Nation-wide Every Pupil Scholarship Tests, sponsored by the Kansas State Teachers College of Emporia, of January, 1938, and April, 1938. Comparisons are made herein for the fifth, sixth, seventh, and eighth grades of each of four subjects; namely, arithmetic, reading, spelling, and English. The grouping according to class size includes 291 schools from 26 states for the January Tests and 277 schools from 23 states for the April Tests. The study for arithmetic alone in the January program includes 12,446 pupil scores. The total number of pupil scores for all subjects considered in January was 43,190 and in April, 34,392, making a grand total of 77,582 pupil scores considered in this study.

The grouping according to classification by the State Department of Education includes only schools of Kansas as the classifications of other states were so varied that a common division for the group seemed impractical. In this grouping for the January Tests, 128 schools are included with 17,282 pupil scores while for the April Tests, 97 schools are included with 11,136 pupil scores, making a total of 28,418 pupil scores.

The reliability of the study. Although not all of the tests used

in this Testing Program are standardized, they are revised copies of tests which have been standardized and should make for a consistently reliable study.

The arithmetic test used was like the Kansas Arithmetic Test with an average reliability for all grades of .85. The reading test used was similar to the Emporia Silent Reading Test with an average established reliability of .88. The spelling test was similar to the Davis-Schrammel Spelling Test with an average reliability of .87. The Davis-Schrammel Elementary English Test which was used is in the process of standardization at the present time and has an average reliability of .84.

In making the divisions, any report which could not be clearly classified was discarded. All private and parochial school reports were excluded because of an insufficient number for a group by themselves. In the division of the Kansas schools according to classification by the State Department, the class "C" schools were not included because the number of cases was not large enough to have any statistical significance.

Related Studies. There are a number of other studies similar to this one which have been made and to which references will be made at various times throughout this study. The study made by Z. Vandegraft[1]

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[1] Z. Vandegraft, A Comparison of the Achievement of High Schools According to Classification and Size in Enrollment. Unpublished Master's Thesis, Kansas State Teachers College, Emporia, 1937, p. 43.

in 1937, considering the achievement of high school students, was based on the scores of the Every Pupil Tests for January, 1935, April, 1935, and January, 1936, and included the results from the states of Kansas, Iowa, Minnesota, Montana, Colorado, and Missouri. The schools were divided into 16 divisions according to classification, enrollment, North Central Association Membership, etc. His conclusion was that students from the larger and better classified schools did better in achievement than those of the smaller and lower classifications. The two notable exceptions to this general tendency were in the subjects of typewriting and biology, in which the smaller schools excelled. Also in algebra, the advantages of the larger schools seemed to be less consistent.

The study by Schrammel and McIntosh,[2] was based on the scores of the March, 1931, Every Pupil Test, and included Kansas schools alone. This study indicated that when schools were divided according to classification by the State Department, the differences of achievement were small, but where they existed seemed to favor the higher classified schools. When schools were divided according to enrollment, the differences were larger and favored the larger schools consistently. The one exception here was in the case of algebra, in which the smaller schools ranked best.

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[2] H. E. Schrammel and H. W. McIntosh, "A Comparison of the Achievement of High Schools of Various Sizes and Classes on Every Pupil Scholarship Tests, Teaching, 1931, No. 85, pp. 30-37.

Wood[3] made a study in the state of Ohio in 1931 on the basis of the December, 1930, Ohio Every Pupil Tests. Dr. Wood divided the schools into five groups according to enrollment, and included the grades from three to twelve, inclusive. The results indicated definitely that the larger schools do better in achievement than the smaller ones. His study included only English and as this study will show the larger schools doing better in English, there is a correspondence of results for the two studies.

In 1932, Dr. Schrammel[4] again made a similar study for the purpose of checking the results of the study of the preceding year. It was found that the larger schools excelled in achievement as measured by the Every Pupil Scholarship Tests. The advantage was more evident in comparing the schools of over 250 enrollment with the lower bracket schools but differences did exist even between two adjoining size divisions. This study, therefore, verified the study of 1931.

Fulmer,[5] in his study concerning the college success of high school graduates, found that when college success was measured by scholastic achievement in college, the small school graduate had a distinct advantage. These results seem to conflict with those of most of the related studies.

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[3] E. R. Wood, Report of the December 2, 1931, Every Pupil Test. The State Department of Education, Columbus, Ohio, 1931.

[4] H. E. Schrammel, "The Effect of the Size of a School's Enrollment on Achievement," Teaching, 1932, No. 89, pp. 3-8.

[5] Virgil G. Fulmer, A Study of the College Success of Graduates of Kansas High Schools, Unpublished Master's Thesis, Kansas State Teachers College, Emporia, 1933, p. 51.

A study in 1930, by McIntosh and Schrammel,[6] comparing the achievements of eighth grade pupils in the rural schools with those in graded schools, resulted in the conclusion that the graded schools did better but not as much better as might be expected since they have, on the average, one month more of school each year, better equipment, and more experienced teachers. The difference seemed to be a cumulative one since the margin was greater in arithmetic, reading, and spelling than in history, agriculture, civics, and other one or two year subjects.

Wilson and Ashbaugh[7] made a study in Ohio comparing the achievement of consolidated schools with one-room rural schools. Out of thirty-six group comparisons made, the consolidated schools exceeded the one-room schedule in achievement in all except three cases. The advantages were not large but being consistent would indicate a true difference in that direction.

A survey of these studies would indicate a decided trend in the majority of cases toward better achievement in the larger schools than in the smaller ones. While several of these studies are on the secondary school level and may or may not relate definitely to this study on the elementary school level, they will form a basis for interesting comparisons as the study progresses.

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[6] H. W. McIntosh and H. E. Schrammel, "A Comparison of the Achievement of Eighth-grade Pupils in the Rural Schools and Graded Schools," Elementary School Journal, 1930, Vol. 31, pp. 301-306.

[7] W. K. Wilson and E. J. Ashbaugh, "Achievement in Rural and Consolidated Schools," Educational Research Bulletin, College of Education, Ohio State University, November, 1929, No. 16, pp. 358-362.

II. DEFINITION OF TERMS

Average. The average is used as a measure of central tendency in Tables I to VIII, inclusive. It was chosen because it gives proportionate weight to every score and thus gives more reliable results than any of the other measures.

Standard deviation. The standard deviation, better known statistically as sigma, is the most accurate measure of variability. The average score ± 1 sigma will include approximately 68 per cent of all the cases. An average of 60 with a sigma of 7 means that 68 per cent of the cases will fall between 53 and 67 or between 60 ± 7.

Sigma-average. The sigma-average is a measure of the standard error of the average. It indicates how reliable the average is. For example, an average of 60 with a sigma-average of .75 means that the chances are 68 in 100 that the obtained average does not differ from the true average by more than ± .75 or lies between 59.25 and 60.75. The chances are practically 100 in 100 that the obtained average does not diverge from the true average by more than ± 3 sigma-average, or in the above example, lies between 57.75 and 62.25.

Sigma-difference. The sigma of the difference is a measure of the reliability of the difference between two averages. A difference between two averages of 3.50 with a sigma-difference of .50 is interpreted as follows: the chances are 68 in 100 that the true difference is between 3.50 - .50 and 3.50 + .50 or between 3.00 and 4.00. Also the chances are 99 in 100 that the true difference between the averages

lies between 3.50 ± (3 x .50) or between 2.00 and 5.00.

Critical ratio. The critical ratio is the quotient of the difference between two averages by the sigma of the difference between the two averages. It is a final indication of the degree of reliability of the difference between the averages. A quotient of ± 3 indicates complete reliability. One less than 3 indicates a certain number of chances in 100 of a true difference and one over ± 3 indicates so much more reliability.

N. The letter "N" in Tables I to VIII indicates the total number of students taking the test in that particular division or group.

Tables IX to XII were compiled by calculating the difference between the average scores of the first eight tables. Tables XIII to XVI, inclusive, are in terms of the sigma of the difference. Tables XVII to XX, inclusive, were figured by dividing the difference in Tables IX to XII by the sigma of the difference as shown in Tables XIII to XVI. This quotient, known as the critical ratio, is the basis for Tables XXI to XXIV. The latter tables indicate the chances of a true difference greater than zero between the averages of the various groups.

III. METHOD OF PROCEDURE

Grouping of data. In gathering the data for this study, two groupings of the Elementary Report Sheets were made. For the first grouping, reports from all the states were considered and were divided according to class size as shown a little later. This grouping was made by checking the number of students shown to have taken the test by the

total enrollment for the school as shown on the questionnaire mentioned before. Four divisions were formed here which will be represented by the letters A, B, C, and D.

In the second grouping only Kansas schools were used and they were divided into three divisions according to classification by the State Department. These divisions were represented by the letters E, F, and G. The division representing class "C" schools does not appear in this thesis because of an insufficient number of cases.

The divisions as they appear later are as follows:

Division A ..... All classes reported with an enrollment of more than 40 students.

Division B ..... All classes reported with an enrollment between 20 and 39.

Division C ..... All classes reported with an enrollment between 10 and 19.

Division D ..... All classes reported with an enrollment between 1 and 9.

Division E ..... Only classes from Kansas elementary schools with a class "A" rating.

Division F ..... Only classes from Kansas elementary schools with a class "B" rating.

Every school reported in division A is a junior high school. Approximately one-half of those in division B are junior high schools. A very limited number of schools in divisions C and D are junior high schools.

CHAPTER II

BASIC DATA FOR COMPARING THE ACHIEVEMENT OF PUPILS ACCORDING TO CLASS SIZE AND STATE CLASSIFICATION

All the tables found in this chapter and in the chapters which follow this one are calculated from the Every Pupil Scholarship Report Blanks. The tables are used here to include a mass of material which it would be impossible to represent otherwise.

After the proper classification of all reports had been made, the averages were figured for each division and every grade subject considered in the study. The standard deviation or sigma was then figured for each of the divisions and subjects as shown in the tables that follow. Next the sigma of the average was determined as a means of obtaining a definite expression of the reliability of the averages. "N" in each case refers to the number of students taking the test in that particular subject and division.

Table I (page 13) includes all the basic data for the six divisions and the four grades of arithmetic in the January Testing Program, 1938. Table II (page 14) includes the same type of data for all six of the divisions and all four grades of reading for the January Tests, 1938. Tables III (page 15) and IV (page 16) include the same material for the subjects of spelling and English, respectively. Tables V (page 17) to VIII (page 20) contain similar data in the same order as the first four tables mentioned above except that they relate to the

April Testing Program, 1938, instead of the January, 1938, Tests.

By remembering that divisions A, B, C, and D represent classes of various sizes with the larger ones listed first, a comparison can easily be drawn between the different size classes as one reads the tables. A second relationship can be noted by keeping in mind that divisions E and F represent Class "A" and "B" schools of Kansas, respectively. These basic tables appear below in the order designated above for the convenience of the reader in making comparisons. The word "classification" in the tables refers to the groups or divisions as set up in Chapter I.

A brief survey of these basic data tables will leave the impression that the larger schools are poorer in arithmetic than the smaller ones. For reading, the advantage is questionable, while in spelling and English, the larger schools seem quite definitely in the lead. These are mere impressions, however, and cannot be given weight until further statistical comparisons are made. These comparisons will follow in the form of tables and discussions in the next chapter.

TABLE I

BASIC DATA FOR COMPARING THE ACHIEVEMENT IN ARITHMETIC OF THE SCHOOLS, ACCORDING TO CLASSIFICATION ON THE BASIS OF THE EVERY PUPIL SCHOLARSHIP TEST OF JANUARY, 1938

Subjects and Measures	Divisions					
	A	B	C	D	E	F
Arith. V						
Average	17.22	21.01	21.79	21.21	19.83	22.30
Sigma	6.80	7.12	6.99	8.05	7.11	7.02
Sigma-ave.	.29	.23	.26	.48	.25	.37
N	554	919	750	281	807	354
Arith. VI						
Average	26.37	30.25	31.25	31.63	29.61	33.87
Sigma	10.30	9.50	9.25	9.13	9.92	9.84
Sigma-ave.	.41	.28	.32	.50	.34	.52
N	618	1175	840	334	853	354
Arith. VII						
Average	19.01	21.40	21.83	22.17	21.51	21.25
Sigma	6.78	7.81	8.22	8.01	8.22	7.85
Sigma-ave.	.25	.20	.27	.46	.26	.38
N	756	1516	955	301	1031	424
Arith. VIII						
Average	25.64	26.63	27.01	26.99	26.37	27.19
Sigma	8.08	8.50	8.64	8.22	8.65	8.54
Sigma-ave.	.27	.23	.30	.47	.27	.43
N	908	1394	844	301	1021	392

Read Table thus: For the January testing program, the average score for 5th grade arithmetic was 17.22, sigma of the distribution was 6.80, sigma of the average was .29, and the number of students taking the test in this division was 554.

TABLE II

BASIC DATA FOR COMPARING THE ACHIEVEMENT IN READING OF THE SCHOOLS, ACCORDING TO CLASSIFICATION ON THE BASIS OF THE EVERY PUPIL SCHOLARSHIP TEST OF JANUARY, 1938

Subjects and Measures	Divisions					
	A	B	C	D	E	F
Reading V						
Average	14.86	16.40	16.35	15.14	15.77	14.92
Sigma	5.82	6.02	5.12	5.29	5.78	5.12
Sigma-ave.	.21	.21	.20	.30	.21	.25
N	767	850	679	318	748	456
Reading VI						
Average	17.81	19.60	18.46	18.15	18.28	18.22
Sigma	6.17	6.16	5.96	5.86	6.09	6.26
Sigma-ave.	.22	.21	.22	.30	.21	.29
N	764	879	761	388	755	461
Reading VII						
Average	19.36	21.26	20.67	21.44	20.62	20.97
Sigma	6.41	6.23	6.62	6.54	6.54	6.94
Sigma-ave.	.30	.19	.24	.37	.27	.30
N	470	1044	778	311	583	544
Reading VIII						
Average	23.35	24.09	23.00	22.97	22.54	22.45
Sigma	6.61	6.85	6.53	6.67	6.95	6.75
Sigma-ave.	.34	.22	.26	.37	.28	.32
N	379	969	638	317	596	458

Read Table thus: In 5th grade reading for group A, the average score was 14.86, the sigma of the distribution was 5.82, the sigma of the average was .21, and there were 767 students in the group.

TABLE III

BASIC DATA FOR COMPARING THE ACHIEVEMENTS IN SPELLING OF THE SCHOOLS, ACCORDING TO CLASSIFICATION ON THE BASIS OF THE EVERY PUPIL SCHOLARSHIP TEST OF JANUARY, 1938

Subjects and Measures	Divisions					
	A	B	C	D	E	F
Spelling V						
Average	57.09	58.95	56.48	54.50	58.88	54.87
Sigma	28.07	28.36	28.44	29.88	28.33	28.81
Sigma-ave.	1.30	1.00	1.04	1.78	1.21	2.07
N	464	818	745	282	550	194
Spelling VI						
Average	55.24	59.02	57.16	54.08	63.63	57.45
Sigma	27.96	28.30	27.81	27.78	27.08	28.94
Sigma-ave.	1.32	.95	.97	1.63	1.08	2.01
N	449	867	814	331	627	207
Spelling VII						
Average	65.40	63.21	59.31	59.99	62.93	57.34
Sigma	27.06	25.86	26.78	27.15	26.20	27.79
Sigma-ave.	1.23	.87	.91	1.55	1.05	1.88
N	485	886	863	307	626	219
Spelling VIII						
Average	61.41	61.16	56.93	61.05	58.27	55.20
Sigma	24.88	23.77	25.98	25.87	25.58	26.40
Sigma-ave.	1.04	.78	.94	1.51	.96	1.78
N	568	924	768	293	714	220

Read Table thus: In 5th grade spelling, group A, the average score was 57.09. The sigma of the distribution was 28.07, the sigma of the average was 1.30, and there were 464 in the group.

TABLE IV

BASIC DATA FOR COMPARING THE ACHIEVEMENTS IN ENGLISH OF THE SCHOOLS, ACCORDING TO CLASSIFICATION ON THE BASIS OF THE EVERY PUPIL SCHOLARSHIP TEST OF JANUARY, 1938

Subjects and Measures	Divisions					
	A	B	C	D	E	F
English V						
Average	50.20	53.35	53.40	51.41	53.61	51.87
Sigma	9.74	9.30	9.28	11.34	9.21	10.36
Sigma-ave.	.57	.36	.35	.66	.40	.55
N	296	677	718	299	534	356
English VI						
Average	53.67	58.39	57.50	55.74	57.74	56.78
Sigma	9.30	8.48	8.40	9.70	8.42	9.38
Sigma-ave.	.51	.33	.29	.51	.36	.64
N	339	678	848	365	561	215
English VII						
Average	60.52	60.79	59.65	59.96	60.57	60.05
Sigma	8.57	9.23	8.91	8.68	9.37	9.64
Sigma-ave.	.28	.29	.28	.48	.35	.58
N	942	1014	993	346	803	278
English VIII						
Average	63.40	64.10	63.70	63.15	63.68	63.25
Sigma	8.60	8.20	8.50	7.79	8.55	8.60
Sigma-ave.	.28	.23	.32	.42	.25	.55
N	961	1231	782	340	1102	246

Read Table thus: In 5th grade English, group A, the average score was 50.20, the sigma of the distribution was 9.57, the sigma of the average was .57, and the number of students in the group was 296.

TABLE V

BASIC DATA FOR COMPARING THE ACHIEVEMENT IN ARITHMETIC OF THE SCHOOLS, ACCORDING TO CLASSIFICATION ON THE BASIS OF THE EVERY PUPIL SCHOLARSHIP TEST OF APRIL, 1938

Subjects and Measures	Divisions					
	A	B	C	D	E	F
Arith. V						
Average	26.79	25.27	25.38	24.94	26.45	26.00
Sigma	10.36	8.34	9.21	8.95	8.35	8.64
Sigma-ave.	.50	.31	.39	.49	.44	.53
N	423	707	567	333	366	268
Arith. VI						
Average	35.39	34.59	35.74	36.08	35.05	37.22
Sigma	11.00	11.01	10.86	10.10	10.48	9.97
Sigma-ave.	.55	.41	.45	.51	.54	.54
N	405	727	580	386	374	337
Arith. VII						
Average	23.24	24.97	25.83	25.79	25.36	26.50
Sigma	9.57	8.32	8.72	8.77	8.85	8.63
Sigma-ave.	.31	.32	.34	.42	.41	.41
N	952	696	676	427	458	435
Arith. VIII						
Average	30.11	29.47	31.20	30.72	31.09	29.67
Sigma	8.91	9.18	9.56	9.70	8.72	10.00
Sigma-ave.	.25	.34	.37	.49	.31	.52
N	1310	744	656	391	804	366

Read Table thus: In 5th grade arithmetic, the average score for group A was 26.79, the sigma was 10.36, the sigma of the average or the probably error was .50, and the number of students taking the test was 423.

TABLE VI

BASIC DATA FOR COMPARING THE ACHIEVEMENT IN READING OF THE SCHOOLS, ACCORDING TO CLASSIFICATION ON THE BASIS OF THE EVERY PUPIL SCHOLARSHIP TEST OF APRIL, 1938

Subjects and Measures	Divisions					
	A	B	C	D	E	F
Reading V						
Average	19.30	17.89	19.99	18.88	18.92	16.86
Sigma	6.14	6.14	6.17	6.24	6.15	6.08
Sigma-ave.	.26	.26	.27	.34	.34	.32
N	566	550	530	335	318	351
Reading VI						
Average	22.55	21.28	22.51	21.65	21.18	21.82
Sigma	6.32	6.15	6.50	6.25	5.77	6.74
Sigma-ave.	.29	.25	.28	.33	.31	.46
N	508	602	538	360	342	213
Reading VII						
Average	25.75	24.75	24.91	25.62	25.12	24.12
Sigma	6.43	6.55	6.79	7.38	6.91	7.17
Sigma-ave.	.29	.29	.30	.39	.37	.48
N	508	510	519	355	346	220
Reading VIII						
Average	27.14	27.49	27.56	27.52	26.89	27.67
Sigma	6.98	6.70	6.51	6.70	6.71	6.62
Sigma-ave.	.30	.32	.29	.38	.35	.50
N	537	442	503	315	405	184

Read Table thus: In 5th grade reading, the average score for group A was 19.30, the sigma was 6.14, the sigma of the average was .26, and the number taking the test in this group was 566.

TABLE VII

BASIC DATA FOR COMPARING THE ACHIEVEMENT IN SPELLING OF THE SCHOOLS, ACCORDING TO CLASSIFICATION ON THE BASIS OF THE EVERY PUPIL SCHOLARSHIP TEST OF APRIL, 1938

Subjects and Measures	Divisions					
	A	B	C	D	E	F
Spelling V						
Average	64.40	63.52	65.61	63.04	68.92	71.67
Sigma	26.69	25.45	25.68	27.11	23.56	24.50
Sigma-ave.	1.44	1.00	1.23	1.60	1.34	1.65
N	345	648	434	291	311	221
Spelling VI						
Average	66.55	66.60	68.35	62.79	69.57	71.21
Sigma	25.77	26.70	25.68	27.67	24.13	26.30
Sigma-ave.	1.45	1.05	1.22	1.57	1.38	1.79
N	315	650	440	311	305	217
Spelling VII						
Average	73.11	64.69	69.68	69.65	71.79	72.40
Sigma	24.64	24.77	26.06	24.80	23.37	26.44
Sigma-ave.	.95	.95	1.13	1.46	1.36	1.73
N	696	676	535	289	295	234
Spelling VIII						
Average	73.57	70.03	70.98	67.94	71.61	73.14
Sigma	22.91	24.75	23.61	26.23	24.33	23.07
Sigma-ave.	.93	1.00	1.06	1.65	1.35	1.65
N	602	615	506	252	326	195

Read Table thus: In 5th grade spelling, the average score made by group A was 64.40, the sigma was 26.69, the sigma of the average was 1.44, and the number taking the test in this group was 345.

TABLE VIII

BASIC DATA FOR COMPARING THE ACHIEVEMENT IN ENGLISH OF THE SCHOOLS, ACCORDING TO CLASSIFICATION ON THE BASIS OF THE EVERY PUPIL SCHOLARSHIP TEST OF APRIL, 1938

Subjects and Measures	Divisions					
	A	B	C	D	E	F
English V						
Average	56.04	55.04	54.92	54.91	54.81	56.47
Sigma	10.05	10.26	9.97	9.12	10.42	8.32
Sigma-ave.	.57	.40	.44	.54	.64	.51
N	307	662	522	283	266	263
English VI						
Average	60.32	60.12	59.65	59.23	59.81	59.70
Sigma	8.68	9.71	9.60	9.56	8.80	8.35
Sigma-ave.	.53	.38	.41	.54	.53	.44
N	272	665	543	312	280	355
English VII						
Average	64.37	64.06	61.89	62.69	63.72	61.27
Sigma	9.50	9.26	8.99	9.61	9.35	9.85
Sigma-ave.	.31	.34	.36	.51	.45	.49
N	957	743	638	353	476	409
English VIII						
Average	68.34	66.23	66.42	65.60	66.66	65.44
Sigma	8.75	9.07	8.31	8.62	9.45	8.83
Sigma-ave.	.26	.32	.34	.47	.33	.45
N	1143	804	590	335	809	387

Read Table thus: The average score for 5th year English in group A was 56.04, sigma was 10.05, sigma of the average was .57 and the number of students was 307.

CHAPTER III

COMPARISONS ACCORDING TO CLASS SIZE AND STATE CLASSIFICATION

Contents of Table IX to XII. Tables IX to XII, inclusive, contain the differences between the various divisions for which comparisons are to be made. Since the first comparison will include the four divisions; namely, A, B, C, and D, all the possible combinations of these groups have been set up at the left hand margin of the tables. Reading across the table at the top is found the various subjects included in the study. Since only two state classifications were used, there is only one combination available for the second comparison.

Table IX consists of a summary of the differences found between the average scores of the various divisions of schools on the January, 1938, Every Pupil Scholarship Tests for the subjects arithmetic and reading, including four grades of each. Table X contains the differences between the average scores of the various divisions of schools on the January, 1938, Every Pupil Scholarship Tests for the subjects spelling and English, including the upper four grades of each. Tables XI and XII (page 23) present like material in respective order for the April, 1938, Every Pupil Scholarship Tests.

COMPARISONS OF ELEMENTARY SCHOOLS ON THE BASIS OF CLASS SIZE

For this comparison all of the schools of all the states are divided into four divisions according to size of classes.

TABLE IX

THE DIFFERENCE BETWEEN THE AVERAGE SCORES FOR ARITHMETIC AND READING OF THE VARIOUS DIVISIONS OF SCHOOLS ON THE JANUARY, 1938, EVERY PUPIL SCHOLARSHIP TEST

	Arith. V	Arith. VI	Arith. VII	Arith. VIII	Read. V	Read. VI	Read. VII	Read. VIII
A and B	-3.79	-3.88	-2.39	- .99	-1.54	-1.79	-1.92	- .74
A and C	-4.57	-4.88	-2.62	-1.37	-1.49	- .65	-1.31	.35
A and D	-5.99	-5.26	-5.16	-1.35	- .28	- .32	-2.08	.38
B and C	- .78	-1.00	- .43	- .38	.05	1.14	.61	1.09
B and D	- .20	-1.38	- .77	- .36	1.26	1.47	- .16	1.12
C and D	.58	- .38	- .34	- .02	1.21	.33	- .77	.03
E and F	-2.47	-4.26	.26	- .82	.85	.04	- .35	.09

Read table thus: In fifth grade arithmetic, the difference between the average of group A and group B is -3.79. Note: A number preceded by a minus sign indicates the advantage is in favor of the second group named, while those without a sign favor the first group named.

TABLE X

THE DIFFERENCE BETWEEN THE AVERAGE SCORES FOR SPELLING AND ENGLISH OF THE VARIOUS DIVISIONS OF SCHOOLS ON THE JANUARY, 1938, EVERY PUPIL SCHOLARSHIP TEST

	Spell. V	Spell. VI	Spell. VII	Spell. VIII	Eng. V	Eng. VI	Eng. VII	Eng. VIII
A and B	-1.86	-3.78	2.19	.25	-3.15	-4.72	- .47	- .70
A and C	.61	-1.92	6.09	4.48	-3.20	-3.83	.69	- .30
A and D	2.59	1.16	5.41	.36	-1.21	-2.07	.36	.25
B and C	2.47	1.86	3.90	4.23	- .05	.89	1.16	.40
B and D	4.45	4.94	3.22	.11	1.94	2.65	.83	.95
C and D	1.98	3.08	- .68	-4.12	1.99	1.76	- .33	.55
E and F	4.01	6.18	5.59	3.07	1.74	.96	.52	.43

Note: Read this table in the same manner as Table IX.

TABLE XI

THE DIFFERENCE BETWEEN THE AVERAGE SCORES FOR ARITHMETIC AND READING OF THE VARIOUS DIVISIONS OF SCHOOLS ON THE APRIL, 1938, EVERY PUPIL SCHOLARSHIP TEST

	Arith. V	Arith. VI	Arith. VII	Arith. VIII	Read. V	Read. VI	Read. VII	Read. VIII
A and B	1.52	.80	-1.73	.64	1.41	1.27	-1.00	- .35
A and C	1.38	- .35	-2.59	-1.09	- .69	.04	-1.14	- .41
A and D	1.85	- .67	-2.55	- .61	.42	.90	-1.89	- .38
B and C	- .11	-1.15	- .86	-1.73	-2.10	-1.23	- .18	- .06
B and D	.33	-1.47	- .82	-1.25	- .99	- .37	- .89	- .03
C and D	.44	- .32	.04	.48	1.11	.86	- .71	.03
E and F	.45	-2.17	-1.14	1.42	2.06	- .64	1.00	- .78

Note: Read this table in the same manner as Table IX.

TABLE XII

THE DIFFERENCE BETWEEN THE AVERAGE SCORES FOR SPELLING AND ENGLISH OF THE VARIOUS DIVISIONS OF SCHOOLS ON THE APRIL, 1938, EVERY PUPIL SCHOLARSHIP TEST

	Spell. V	Spell. VI	Spell. VII	Spell. VIII	Eng. V	Eng. VI	Eng. VII	Eng. VIII
A and B	.88	- .05	8.42	3.54	1.00	.20	.31	2.11
A and C	-1.21	-1.78	3.43	2.59	1.12	.67	2.48	1.92
A and D	1.36	3.76	3.48	5.63	1.13	1.09	1.68	2.74
B and C	-2.09	-1.73	-4.99	- .95	.12	.47	2.17	- .19
B and D	.48	3.81	-4.94	2.09	.13	.89	1.47	.83
C and D	2.57	5.54	.05	3.04	.01	.42	- .80	.82
E and F	-2.75	-1.64	- .81	-1.53	-1.66	.11	2.45	1.22

Note: Read this table in the same manner as Table IX.

Comparing the larger with the smaller classes on the basis of subjects. It will be observed in Table IX (page 22) for arithmetic, that the larger classes excelled the smaller classes in only one out of twenty-four comparisons. In Table XI (page 23) for arithmetic, the larger classes won from the smaller ones in only nine out of twenty-four comparisons. Combining the two tables for arithmetic, it is found that the larger classes excelled the smaller ones in ten out of forty-eight comparisons. The ratio here is approximately four to one in favor of the smaller classes.

In Table IX (page 22) for reading, the larger classes outscored the smaller classes in twelve out of twenty-four comparisons. In Table XI (page 23) for reading, the larger classes won in eight out of twenty-four comparisons. Combining the tables, the larger classes excelled in twenty out of forty-eight comparisons for approximately a ratio of three to two in favor of the smaller classes.

Reference to Table X (page 22) for spelling reveals that the larger classes surpassed the smaller classes in nineteen out of twenty-four comparisons. In Table XII (page 23) for spelling, the larger classes won in sixteen out of twenty-four comparisons, making a total of thirty-five out of forty-eight comparisons in favor of the larger classes or a ratio of approximately three to one in favor of the larger classes.

In Table X (page 22) for English, the larger classes excelled the smaller classes in thirteen out of twenty-four comparisons. In Table XI (page 23) for English, the larger classes won twenty-two out

of twenty-four times. Combining the tables the larger classes won thirty-five out of forty-eight comparisons for a three to one ratio in their favor.

Comparing a single division with the next lower division. Combining Tables IX and X (page 22), it is found that group A excelled group B in only two out of sixteen comparisons. For Tables XI and XII (page 23), or the April Test, group A surpassed group B in twelve out of sixteen comparisons.

For the January Tests, group B excelled group C in eleven out of sixteen comparisons while for the April Tests, group B won from group C in only three out of sixteen comparisons. Combining the two tests, the larger class excelled in fourteen out of thirty-two comparisons for a nine to seven ratio in favor of the smaller classes.

In Tables IX and X (page 22) group C exceeded group D in achievement nine out of sixteen times. In Tables XI and XII (page 23) group C surpassed group D thirteen out of sixteen times. Combining the tables, we find group C exceeding group D in twenty-two out of thirty-two comparisons for approximately a ratio of two to one in favor of group C.

Comparing the divisions with other divisions except the one next them. In Tables IX and X (page 22) group A excelled group C in five out of sixteen comparisons. In Tables XI and XII (page 23) group A won from group C in eight out of sixteen comparisons. Combining the data from the two tables, group A surpassed group C in thirteen out of thirty-two comparisons, for approximately a three to two ratio in favor of the smaller classes.

Examining Tables IX and X (page 22) it is discovered that group A won from group D in seven out of sixteen comparisons. Combining the tables, it is found that group A won from group D in eighteen out of thirty-two comparisons for a nine to seven ratio in favor of group A.

In Tables IX and X (page 22) group B excelled group D in eleven out of sixteen comparisons. In Tables XI and XII (page 23) group B won from D in eight out of sixteen comparisons. Combining the tables, it is found that group B surpassed group D in nineteen out of thirty-two comparisons for a three to two ratio in favor of the B group.

Comparing the achievement of the larger with the smaller classes on a grade basis. Combining the four Tables IX, X, XI and XII, it is found that for the fifth grade, the larger classes won in twenty-nine out of forty-eight comparisons for approximately a four to three ratio in favor of the larger classes. For the sixth grade, the larger classes were ahead in twenty-four out of forty-eight comparisons for exactly a one to one ratio. In the seventh grade, the larger classes surpassed the smaller classes in twenty out of forty-eight comparisons for a seven to five ratio in favor of the smaller classes. In the eighth grade, the larger classes were ahead in twenty-seven out of forty-eight comparisons for a ratio of four to three in favor of the larger classes.

Summary of the comparison on the basis of class size. In summarizing the comparisons made between the larger and the smaller classes, the following statements might be made. In arithmetic the smaller classes definitely excel the larger classes. The results in

reading indicate a slight advantage in favor of the smaller classes. In English and spelling the larger classes are definitely in the lead. The results here will correspond with the study of Wood,[1] made in Ohio in 1931, since his conclusions were based on the subject of English carried through from the third to the twelfth grades. Vandegraft's study[2] is substantiated to some small degree here, since he found that the larger schools did not excel the smaller ones to the same degree in algebra as they did in some of the other subjects and since, in this study, the smaller classes definitely excel in arithmetic, a subject related to algebra.

In comparing the divisions with the next lower division, group C was the only group which excelled the group below it. In comparing the divisions with divisions below them and not next to them, it is found that group A won from group D, but all other comparisons were won by the lower group. In the fifth and eighth grades, the larger classes were out in front while the sixth grade showed a tie and the seventh grade favored the smaller classes.

COMPARISON OF ELEMENTARY SCHOOLS ON THE BASIS OF STATE CLASSIFICATION

Comparing class "A" schools with class "B" schools on the basis

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[1] Wood, loc. cit.

[2] Vandegraft, loc. cit., pp. 42-43.

of subjects. In Tables IX (page 22) and XI (page 23), the class "A" schools excelled the class "B" schools in three out of eight comparisons, for arithmetic. In the same Tables, it is found that the class "A" schools were ahead of the class "B" schools in five out of eight comparisons, for reading. In Tables X (page 22) and XII (page 23) for spelling, the class "A" schools surpassed the class "B" schools in four out of eight comparisons. In the same tables, it is found that the class "A" schools excelled the class "B" schools in seven out of eight comparisons, for English.

Taking all subjects into consideration, the class "A" schools won in nineteen out of thirty-two comparisons for approximately a three to two ratio in their favor. In arithmetic the class "B" schools did a little better than the class "A" schools while the ratio was just reversed for reading. In English the class "A" schools definitely excelled the class "B" schools while spelling indicated a one to one ratio of achievement.

Comparing class "A" with class "B" schools according to grades. Combining Tables IX, X, XI, and XII, the fifth grade of class "A" schools excelled in five out of eight comparisons. For the sixth grade, the class "A" schools won from the class "B" schools in four out of eight comparisons. For the seventh grade, the class "A" schools were ahead in five out of eight comparisons. For the eighth grade, the class "A" schools surpassed the class "B" schools in five out of eight comparisons.

In summarizing this comparison, it is found that the class "A" schools did better than the class "B" schools but not much better. This

conclusion is substantiated by the findings of Z. Vandegraft[3] in his study made in 1937 and also by the study of Schrammel and McIntosh[4] based on the Every Pupil Scholarship Tests of March, 1931. Both of these studies were summarized in Chapter I.

Contents of Tables XIII to XVI. Tables XIII to XXIV, inclusive, were constructed for the purpose of determining how reliable the difference of the averages are. Tables XIII to XVI (pages 30 and 31) show the sigma of the difference between the average scores of the various divisions of schools for the January and April Testing Programs. In general, the larger the sigma of the difference the less reliable the results will be. When sigma is large it indicates that the scores are widely scattered about the average and when it is small it shows them to be closely grouped. It will be noticed by glancing at the tables that spelling is the only subject for which the sigma exceeds the number 1. The fact that the sigma of the difference is small in most cases indicates reliability of results.

Contents of Tables XVII to XX. Tables XVII to XX (pages 33 and 34) are critical ratio tables. These ratios are found by dividing the difference between the average scores of two groups by the sigma of the difference between the average scores. The larger this ratio is

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[3] Vandegraft, loc. cit., pp. 42-43.

[4] Schrammel and McIntosh, loc. cit., pp. 30-37.

TABLE XIII

THE SIGMA OF THE DIFFERENCE BETWEEN THE AVERAGE SCORES FOR ARITHMETIC AND READING OF THE VARIOUS DIVISIONS OF SCHOOLS ON THE JANUARY, 1938, EVERY PUPIL SCHOLARSHIP TEST

	Arith. V	Arith. VI	Arith. VII	Arith. VIII	Read. V	Read. VI	Read. VII	Read. VIII
A and B	.37	.60	.32	.35	.30	.30	.36	.40
A and C	.39	.52	.37	.40	.29	.31	.38	.43
A and D	.56	.65	.52	.54	.35	.37	.48	.50
B and C	.35	.45	.33	.38	.29	.30	.31	.34
B and D	.53	.57	.50	.52	.35	.35	.42	.43
C and D	.55	.59	.53	.56	.34	.37	.44	.45
E and F	.45	.62	.46	.51	.33	.36	.40	.43

Read Table thus: In fifth grade arithmetic the sigma of the difference between the average scores of group A and B is .37. The sigma of the difference between group A and group C is .39, etc.

TABLE XIV

THE SIGMA OF THE DIFFERENCE BETWEEN THE AVERAGE SCORES FOR SPELLING AND ENGLISH OF THE VARIOUS DIVISIONS OF SCHOOLS ON THE JANUARY, 1938, EVERY PUPIL SCHOLARSHIP TEST

	Spell. V	Spell. VI	Spell. VII	Spell. VIII	Eng. V	Eng. VI	Eng. VII	Eng. VIII
A and B	1.64	1.63	1.51	1.30	.67	.61	.40	.36
A and C	1.68	1.64	1.53	1.40	.67	.59	.40	.43
A and D	2.20	2.02	1.98	1.83	.94	.72	.56	.50
B and C	1.44	1.36	1.26	1.22	.50	.44	.40	.39
B and D	2.04	1.80	1.78	1.70	.75	.61	.56	.48
C and D	2.06	1.81	1.80	1.78	.75	.59	.56	.53
E and F	2.40	2.28	2.15	2.02	.68	.75	.67	.60

Note: Read this table in the same manner as Table XIII.

TABLE XV

THE SIGMA OF THE DIFFERENCE BETWEEN THE AVERAGE SCORES FOR ARITHMETIC AND READING OF THE VARIOUS DIVISIONS OF SCHOOLS ON THE APRIL, 1938, EVERY PUPIL SCHOLARSHIP TEST

	Arith. V	Arith. VI	Arith. VII	Arith. VIII	Read. V	Read. VI	Read. VII	Read. VIII
A and B	.59	.69	.45	.42	.37	.38	.41	.44
A and C	.63	.71	.46	.45	.37	.40	.42	.42
A and D	.70	.75	.52	.55	.43	.44	.49	.46
B and C	.50	.61	.47	.50	.37	.38	.42	.43
B and D	.63	.65	.53	.60	.37	.41	.49	.50
C and D	.65	.68	.54	.61	.43	.43	.49	.48
E and F	.69	.76	.58	.61	.47	.55	.61	.60

Note: Read this table in the same manner as Table XIII.

TABLE XVI

THE SIGMA OF THE DIFFERENCE BETWEEN THE AVERAGE SCORES FOR SPELLING AND ENGLISH OF THE VARIOUS DIVISIONS OF SCHOOLS ON THE APRIL, 1938, EVERY PUPIL SCHOLARSHIP TEST

	Spell. V	Spell. VI	Spell. VII	Spell. VIII	Eng. V	Eng. VI	Eng. VII	Eng. VIII
A and B	1.75	1.79	1.33	1.37	.70	.65	.46	.41
A and C	1.89	1.90	1.46	1.41	.72	.67	.47	.43
A and D	2.15	2.14	1.78	1.89	.79	.76	.60	.54
B and C	1.59	1.61	1.48	1.46	.69	.56	.50	.47
B and D	1.89	1.89	1.74	1.93	.67	.66	.61	.57
C and D	2.02	1.99	1.85	1.96	.70	.68	.62	.58
E and F	2.12	2.26	2.20	2.15	.82	.69	.67	.56

Note: Read this table in the same manner as Table XIII.

the more reliable the results. A negative number represents the same degree of reliability as a positive number of the same size. The negative sign indicates, however, that the advantage is in favor of the second group named while a positive number indicates the advantage is in favor of the first group named. A ratio of plus or minus three shows that the chances are one hundred in one hundred of a true difference. A ratio of plus or minus two indicates ninety-eight chances in one hundred of a true difference, while a ratio of one shows eighty-four chances in one hundred of a true difference. As the critical ratio approaches zero, the chances of a true difference of averages approach fifty in one hundred. A critical ratio larger than plus or minus three shows that much more reliability, but is never represented by more than one hundred chances in one hundred.

By studying these tables carefully, one will notice that in a large number of cases this ratio exceeds plus or minus one. By actual count, this ratio is larger than one in 154 cases or approximately 70% of the total number of cases included in Tables XVII to XX, inclusive. This proves that a rather high degree of reliability exists between the differences of the averages.

Contents of Tables XXI to XXIV. Tables XXI to XXIV (pages 36 and 37) show the number of chances in one hundred that the advantage of a given division over another is a true one. The reader should keep in mind that a score of one hundred is an indication of complete reliability while a score of fifty means that the chances are even

TABLE XVII

THE CRITICAL RATIO OR $\frac{\text{DIFFERENCE}}{\text{SIGMA (DIFF.)}}$ FOR ARITHMETIC AND READING ON THE JANUARY, 1938, EVERY PUPIL SCHOLARSHIP TEST

	Arith. V	Arith. VI	Arith. VII	Arith. VIII	Read. V	Read. VI	Read. VII	Read. VIII
A and B	-10.25	- 7.76	- 7.47	- 2.83	-5.13	-5.97	-5.33	-1.85
A and C	-11.72	- 9.38	- 7.62	- 3.43	-5.14	-2.10	-3.45	.81
A and D	- 7.13	- 8.09	- 6.08	- 2.50	- .80	- .86	-4.33	.76
B and C	- 2.23	- 2.35	- 1.30	- 1.00	.17	3.80	1.97	3.21
B and D	- .38	- 2.42	- 1.54	- .69	5.60	4.20	- .38	2.60
C and D	1.05	- .64	- .64	- .04	3.56	.89	-1.75	.07
E and F	- 5.49	- 6.87	.56	- 1.61	2.58	.11	- .88	.21

Read Table thus: In fifth grade arithmetic, the critical ratio between group A and group B is -10.25; between group A and C, the critical ratio is -11.72. Note: A number preceded by a minus sign indicates the advantage is in favor of the second group named.

TABLE XVIII

THE CRITICAL RATIO OR $\frac{\text{DIFFERENCE}}{\text{SIGMA (DIFF.)}}$ FOR SPELLING AND ENGLISH ON THE JANUARY, 1938, EVERY PUPIL SCHOLARSHIP TEST

	Spell. V	Spell. VI	Spell. VII	Spell. VIII	Eng. V	Eng. VI	Eng. VII	Eng. VIII
A and B	-1.13	-2.32	1.45	.19	-4.70	-7.74	-1.18	-1.94
A and C	.37	-1.17	3.98	3.20	-4.78	-6.49	1.73	- .70
A and D	1.18	.57	2.73	.20	-1.29	-2.88	.64	.50
B and C	1.72	1.37	3.09	3.47	- .10	2.02	2.90	1.03
B and D	2.18	2.74	1.81	.06	2.59	4.34	1.48	1.98
C and D	.96	1.70	- .38	-2.31	2.65	2.98	- .59	1.04
E and F	1.67	2.71	2.60	1.52	2.56	1.32	.78	.72

Note: Read this table in the same manner as Table XVII.

TABLE XIX

THE CRITICAL RATIO OR $\frac{\text{DIFFERENCE}}{\text{SIGMA (DIFF.)}}$ FOR ARITHMETIC AND READING ON THE APRIL, 1938, EVERY PUPIL SCHOLARSHIP TEST

	Arith. V	Arith. VI	Arith. VII	Arith. VIII	Read. V	Read. VI	Read. VII	Read. VIII
A and B	2.58	1.16	-3.84	1.52	3.81	3.34	-2.44	- .80
A and C	2.19	- .49	-5.63	-2.42	-1.86	.10	-2.71	- .98
A and D	2.64	- .89	-4.90	-1.11	.98	2.05	-3.86	- .79
B and C	- .22	-1.89	-1.85	-3.46	-5.68	-3.24	- .43	- .14
B and D	.62	-2.26	-1.55	-2.08	-2.88	- .90	-1.82	- .06
C and D	.70	- .47	.07	.79	2.58	2.00	-1.45	.06
E and F	.65	-2.86	-1.97	2.55	4.38	-1.16	1.64	-1.50

Read Table thus: In fifth grade arithmetic, the critical ratio between group A and group B is 2.58; between group A and group C, the critical ratio 2.19. Note: A number preceded by a minus sign indicates the advantage is in favor of the second group named.

TABLE XX

THE CRITICAL RATIO OR $\frac{\text{DIFFERENCE}}{\text{SIGMA (DIFF.)}}$ FOR SPELLING AND ENGLISH ON THE APRIL, 1938, EVERY PUPIL SCHOLARSHIP TEST

	Spell. V	Spell. VI	Spell. VII	Spell. VIII	Eng. V	Eng. VI	Eng. VII	Eng. VIII
A and B	.50	- .03	6.33	2.58	1.43	.31	.87	5.15
A and C	- .64	- .94	3.35	1.84	1.56	1.00	5.26	4.47
A and D	.63	1.76	2.01	2.98	1.45	1.48	2.80	5.07
B and C	-1.31	-1.07	-3.37	- .65	.20	.84	4.34	- .40
B and D	.25	2.02	-2.84	1.09	.19	1.35	2.41	1.11
C and D	1.27	2.78	.03	1.55	.01	.62	-1.29	1.41
E and F	-1.50	- .75	- .28	- .72	-2.02	.16	3.66	2.18

Note: Read this table in the same manner as Table XIX

that the difference between the averages is a true one.

In studying the four tables just mentioned, it will be found that complete reliability is established sixty-four times. The tables will show that the chances in one hundred are great enough to have statistical significance in all except about fifteen comparisons out of the 224 given in the tables. It should be remembered here again that the numbers preceded by a minus sign indicate that the second group or division named has outscored the first one named and that all numbers not preceded by a sign indicate that the first group named has excelled in that comparison.

Contents of Table XXV. Table XXV (page 38) is a summary table compiled from the data given in Tables XVII to XX, inclusive. It shows the distribution of the critical ratios represented in these tables. It is interesting to note from the per cent column of this table that the critical ratios of this complete study represent almost a perfect normal curve. Forty-seven per cent of the ratios are negative and fifty-three per cent are positive. This table, in itself, summarizes the results of the study. The arithmetic column, being heavy in the lower part of the table, indicates that the critical ratios were mostly negative and this means that the smaller classes, or the second ones named, excelled the larger, or first ones named, in most cases. The reading column looks about balanced which means there is not any marked trend in favor of either group. Closer observation will show the lower half a little heavier than the upper half which means the advantage is slightly in favor of the smaller schools. A glance at the spelling and English columns will show the bulk of the scores in the upper half

TABLE XXI

THE NUMBER OF CHANCES IN 100 OF A TRUE DIFFERENCE GREATER THAN ZERO BETWEEN THE AVERAGES OF THE VARIOUS GROUPS ON THE JANUARY, 1938, EVERY PUPIL SCHOLARSHIP TEST

	Arith. V	Arith. VI	Arith. VII	Arith. VIII	Read. V	Read. VI	Read. VII	Read. VIII
A and B	-100	-100	-100	- 97	-100	-100	-100	- 97
A and C	-100	-100	-100	-100	-100	- 98	-100	79
A and D	-100	-100	-100	- 99	- 79	- 80	-100	77
B and C	- 99	- 99	- 90	- 84	56	100	98	100
B and D	- 65	- 99	- 93	- 76	100	100	- 65	99
C and D	85	- 74	- 74	- 52	100	82	- 96	52
E and F	-100	-100	71	- 94	99	54	- 82	58

Read Table thus: For fifth grade arithmetic, there were 100 chances in 100 that there was a true difference greater than zero between the averages of group A and group B, etc. Note: A number preceded by a minus sign indicates that the advantage was in favor of the second group named. Numbers with no sign before them indicate an advantage for the first group named.

TABLE XXII

THE NUMBER OF CHANCES IN 100 OF A TRUE DIFFERENCE GREATER THAN ZERO BETWEEN THE AVERAGES OF THE VARIOUS GROUPS ON THE JANUARY, 1938, EVERY PUPIL SCHOLARSHIP TEST

	Spell. V	Spell. VI	Spell. VII	Spell. VIII	Eng. V	Eng. VI	Eng. VII	Eng. VIII
A and B	- 86	- 99	93	58	-100	-100	- 88	- 97
A and C	64	- 87	100	100	-100	-100	96	- 76
A and D	88	71	100	58	- 90	-100	74	69
B and C	96	91	100	100	- 54	98	100	85
B and D	99	100	96	52	99	100	93	98
C and D	83	96	- 65	- 99	100	100	- 75	85
E and F	95	100	99	93	99	90	79	76

Note: This table should be read in the same manner as Table XXI.

TABLE XXIII

THE NUMBER OF CHANCES IN 100 OF A TRUE DIFFERENCE GREATER THAN ZERO BETWEEN THE AVERAGES OF THE VARIOUS GROUPS ON THE APRIL, 1938, EVERY PUPIL SCHOLARSHIP TEST

	Arith. V	Arith. VI	Arith. VII	Arith. VIII	Read. V	Read. VI	Read. VII	Read. VIII
A and B	99	87	-100	93	100	100	- 93	- 79
A and C	99	- 69	-100	- 99	- 97	54	-100	- 84
A and D	99	- 82	-100	- 86	84	98	-100	- 79
B and C	- 58	- 97	- 98	-100	-100	-100	- 67	- 56
B and D	69	- 99	- 94	- 98	-100	- 82	- 96	- 52
C and D	76	- 67	54	79	99	98	- 93	82
E and F	74	-100	- 98	99	100	- 87	94	- 90

Read Table thus: For fifth grade arithmetic, there were 99 chances in 100 that there was a true difference greater than zero between the averages of groups A and B, etc. Note: A number preceded by a minus sign indicates that the advantage was in favor of the second group named.

TABLE XXIV

THE NUMBER OF CHANCES IN 100 OF A TRUE DIFFERENCE GREATER THAN ZERO BETWEEN THE AVERAGES OF THE VARIOUS GROUPS ON THE APRIL, 1938, EVERY PUPIL SCHOLARSHIP TEST

	Spell. V	Spell. VI	Spell. VII	Spell. VIII	Eng. V	Eng. VI	Eng. VII	Eng. VIII
A and B	69	- 52	100	99	93	62	74	100
A and C	- 74	- 85	99	97	94	84	100	100
A and D	73	96	98	100	93	93	100	100
B and C	- 90	- 86	-100	- 74	58	80	100	- 65
B and D	60	98	-100	86	58	91	99	86
C and D	89	100	82	94	50	73	- 90	92
E and F	- 90	- 77	- 62	- 76	- 98	56	100	99

Note: Read this table in the same manner as Table XXIII.

TABLE XXV

A COMBINED SUMMARY OF CRITICAL RATIOS FOR BOTH THE JANUARY AND APRIL, 1938, EVERY PUPIL SCHOLARSHIP TESTS

Critical ratio	Subjects				Total	Per cent of all ratios
	Arith.	Read.	Spell.	Eng.		
3 or more	0	8	5	7	20	9
2 to 2.99	4	5	11	9	29	13
1 to 1.99	3	2	13	13	31	14
0 to .99	6	10	10	12	38	17
- .99 to -.01	9	11	8	4	32	14
-1.99 to - 1	9	7	5	4	25	11
-2.99 to - 2	9	4	3	3	19	9
-3 or more	16	9	1	4	30	13

Read Table thus: The number of critical ratios of 3 or more for arithmetic was 0, for reading 8, for spelling 5, and for English 7, making a total of 20 such ratios, which is 9% of all the critical ratios of the study. The number of critical ratios between 2 and 2.99 was 4 for arithmetic, 5 for reading, 11 for spelling, and 9 for English, making a total of 29 or 13% of the total critical ratios of the study, etc.

and in a manner similar to the ones explained indicates the larger schools, or the groups first named, won in the majority of comparisons.

CHAPTER IV

CONCLUSIONS

In conclusion, it may be stated that when achievement was measured by the results of the Nation-wide Every Pupil Scholarship Tests of January, 1938, and April, 1938, the smaller classes have very definitely outscored the larger classes in arithmetic. In reading, the advantage is slightly in favor of the smaller classes but not nearly as consistently as in the case of arithmetic. In the subjects, spelling and English, the larger classes outscored the smaller ones in approximately a three to one ratio.

Conclusions when divided according to state classification. When divided according to state classification the differences are fewer and smaller but favor the higher classified schools in the majority of cases. In this study the class "A" schools had a slight advantage over the class "B" schools in arithmetic, reading, and English. In spelling the two classifications split fifty-fifty. In other words the class "A" schools won in the same number of cases as did the class "B" schools.

Conclusions when compared on a grade basis. When the results of the study are compared on a grade basis, there seems to be a tendency for the larger classes and higher classified schools to excel the smaller classes and lower classified schools in the fifth and eighth grades. For the sixth and seventh grades, the advantages were

few and slight but where they existed, they were in favor of the smaller classes and lower classified schools in the majority of cases. The study on the basis of state classification would have been much more interesting if there had been sufficient reports from class "C" schools to have included them as another division for comparison.

No attempt will be made here to explain why the results of this study are as found. However, some thought-provoking questions might be suggested. Does the fact that the smaller schools excelled in arithmetic and reading indicate that those two subjects are closely related? In other words, is it necessary to be able to read and understand a problem to work it? No doubt the answer here is in the affirmative. Is there any relationship between spelling and English which should cause approximately the same students to excel over others in those subjects? Do students in larger classes have more opportunities to learn correct speech than those of smaller classes? Does arithmetic require more individual help than English or spelling? Are students in the junior high schools with their supposed advantages missing something that other children are getting in their one and two-room schools?

These and other questions might be asked and probably cannot be answered, but at least they are "food for thought."

It should be remembered that, although the results of these comparisons are interesting and challenging, one should never base a final judgment on any single study alone. Perhaps other students

will undertake studies similar to this one from time to time and their results can then be compared to see if there are any definite and consistent trends in a particular direction.

In concluding this summary, it might be said that this study has shown the larger classes or schools and the higher classified schools to have a slight advantage as a whole over the smaller classes and lower classified schools. This advantage is not as great or as consistent, however, as that found in several other studies which have been referred to in this thesis.

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