A COMPARISON OF THE ACADEMIC ACHIEVEMENT OF HIGH SCHOOLS ACCORDING TO CLASSIFICATION AND SIZE IN ENROLLMENT

A THESIS

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By

Z. VANDEGRAFT

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Approved for the Major Department

P. E. Schramm

Approved for the Graduate Council

Edwin L. Rawe

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CHAPTER I

INTRODUCTION

Are the larger high schools better than the smaller high schools? What are the educational advantages of the smaller high schools over the larger high schools? Do the larger high schools have better teachers than the smaller high schools? These and other similar questions are being asked today where there is competition between schools of secondary rank.

During the early period of secondary school development in America, and particularly during that period when the public high school was just beginning to gain favor, these questions were not vital. Parents were not much concerned about whether a large high school was better than a small one or not. They usually had no choice as to size or classification of the school to which they would send their children, but felt themselves fortunate if they were able to patronize any high school at all. Today, however, the situation is different. High schools have become popular throughout the land and have been established in every town. They have begun to compete with one another for students and have made various assertions concerning academic advantages, which are claimed by both the larger and the smaller schools.

THE PURPOSE OF THE STUDY

In attacking this problem, concerning whether students from the

larger or the smaller high schools do better in their academic work, one is brought face to face with two pertinent questions. First, do these differences actually exist; and second, if differences do exist, how great are they? Before either of these questions can be answered, it is necessary to find some common measuring device, wherewith an impartial comparison can be made. For this purpose, the records of the schools in the Nation-wide Every Pupil Scholarship Tests, sponsored by the Kansas State Teachers College of Emporia, were selected.

These tests are offered impartially to all schools alike, and are conducted quite generally in both the larger and the smaller high schools. Also, they offer a convenient means of securing data on the achievement of all schools taking the tests. It, therefore, becomes the immediate purpose of this study to determine what relation exists between the achievement of schools, as determined by their records in the Emporia Nation-wide Every Pupil Scholarship Tests, and their size and classification.

RELATED STUDIES

Other studies have been made on the same general subject-matter as that covered in this study. One of these, the study by Schrammel and McIntosh,[1] was based on the scores of the March, 1931, Every Pupil Test, and included only schools of the state of Kansas. This study showed that when schools are divided according to classification by the state department, the differences in achievement are not large, but where differences

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

do exist, they seem mostly to be in favor of the school with the higher classification. When schools were divided according to enrollment, the differences became more apparent and seemed to favor the larger schools more decidedly.

During the same year that the study, previously mentioned, was being made in Kansas, a similar study was made by Wood[2] in the state of Ohio. Dr. Wood used the December, 1930, Ohio Every Pupil Tests as a basis for his study. Schools were divided into five divisions, according to enrollment. While this study was more extensive in that it covered reports from the third to the twelfth grades, inclusive, that part which dealt with secondary school subjects indicated that the same conditions seemed to exist in Ohio as in Kansas. The larger schools rated higher in achievement than did the smaller schools, and the differences were much more marked than those found in the study by Schrammel and McIntosh.[3]

The study made by Schrammel[4] in 1932 was for the purpose of checking the reliability of results obtained in the study of the previous year. He says in concluding:

> In conclusion it may be stated that the findings of this study clearly indicate that larger schools according to enrollment excel in achievement as measured by the Every Pupil Scholarship Tests. The advantage of the larger schools is most marked when comparing Division I, or schools of 250 or more population, with schools in the lower brackets of population. While the differences between two adjoining size divisions of the smaller schools are not great, they are sufficiently noteworthy to merit consideration. The findings of this study, therefore, verify the findings of the previous study.

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

[3] Schrammel and McIntosh, loc. cit.

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

It would seem that the above findings are rather significant and one might be inclined to make predictions on the basis of what has been discovered, but a study made by Fulmer[5] in 1933 on a related subject, "A Study of the College Success of Graduates of Kansas High Schools," seemed to indicate that advantages, when measured in terms of college success as judged by scholastic achievement in college, seemed to be distinctly in favor of the smaller high schools. Thus the present study was undertaken with the idea, in part at least, of determining with which studies agreement might be found.

THE SCOPE OF THE STUDY

The present study is based on results obtained in the Nation-wide Every Pupil Scholarship Tests, sponsored by the Kansas State Teachers College of Emporia, of January, 1935, April, 1935, and January, 1936. Comparisons among schools according to classification by state departments are based entirely on records made by the schools of Kansas. Comparisons among schools according to size by enrollment are based on all scores received by the Bureau of Educational Measurements of the Kansas State Teachers College of Emporia from schools of the states of Kansas, Minnesota, Iowa, Montana, Colorado, and Missouri. The subjects selected for this study and for which data were gathered from all three of the above named Scholarship Tests are Freshman English, Sophomore English, Algebra, Geometry, American History, Biology, Typewriting, and World History. These subjects

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[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, pp. 51.

were selected because more persons participated in the Tests in these subjects than in any others.

A general idea of the number of schools participating may be gained from a study of the reports for Freshman English which show that a total of 371 schools with 14,048 students participated in the January, 1935, test and are included in this study; 367 schools with 13,263 students are included in the study from the records of the April, 1935, reports; while the schools included in the study from the January, 1936, reports are 381 in number, and include 11,995 students. A total of 39,306 students are included in the study of Freshman English over the three test periods. Thus, it becomes apparent that any findings which may be made in this study should be significant on account of the scope of the study.

THE SOURCE OF THE DATA

No questionnaires were sent out and no special tests were given as a basis for this study. All of the reports made by all of the schools in the above named states were secured from the Bureau of Educational Measurements of the Kansas State Teachers College of Emporia. These reports were compiled and divided according to the size and the classification of the schools making the reports, and used as the basis of this study. Only those reports that could not be clearly classified as belonging to some group being studied, were discarded.

THE RELIABILITY OF THE STUDY

Many of those who work at making the tests for the Nation-wide Every Pupil Scholarship Tests have been working at this business for a number of years, and it has been their constant aim to make tests that

adequately cover the subject-matter of the various subjects in which pupils are being tested. While no reliability studies have been made covering the non-standardized tests used in this particular study, such studies have been made on the tests previously used in the Nation-wide Every Pupil Tests.

Schrammel[6] reports on these studies, which included quite a range of subjects, some of which are included in the present study and some of which are not included. It is noteworthy that the range of reliability coefficients of the tests for those on which studies have been made was from .74 to .94 and that for the subjects included in this study, none has a reliability coefficient less than .80. Thus, if there is a fair degree of consistency in the making of these tests, the tests used in this study will rank favorably with standardized tests.

For a few subjects, tests which had been standardized or were in the process of standardization were used in these testing programs. Their reliability is known to be satisfactory. These tests are: Barrett-Ryan English, Taylor-Schrammel World History, Becker-Schrammel Plane Geometry, and Colvin-Schrammel Algebra. The first two were used in all three Tests included in this study; the third was used in the two Tests of 1935; and the last, in the Test of 1936.

METHOD OF PROCEDURE

For the first part of this study, dealing with schools according to classification, all schools of the state of Kansas were included, and were divided into classes according to classification by the State Department of Education. The official directory published by the State Department of

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[6] H. E. Schrammel, "Tests Provided for Contests," Teaching, No. 85, pp. 40-41, December, 1931.

Education was used in obtaining the ratings. The North Central Association Quarterly for July, 1935, was used to check membership in that association. The latter part of the study deals with schools entirely from the standpoint of enrollment. This latter part is divided into two divisions, one dealing with Kansas schools only, and the other being a sum total of all reports received from all of the schools of the states outside of Kansas, included in this study. The various divisions recognized and recorded in this paper are, therefore, as follows:

Division I	Class A schools of Kansas.
Division II	Class B schools of Kansas.
Division III	Class C schools of Kansas.
Division IV	Class A schools of Kansas belonging to the North Central Association.
Division V	Class A schools of Kansas not belonging to the North Central Association.
Division VI	North Central Schools with 250 or more students, all states included.
Division VII	North Central Schools, with less than 250 students, all states included.
Division VIII	Kansas schools with 250 or more students.
Division IX	Kansas schools of 120-249 students.
Division X	Kansas schools of 70-119 students.
Division XI	Kansas schools of 0-69 students.
Division XII	Total from all states except Kansas of all schools of 250 or more students.

Division XIII	Total from all states except Kansas of all schools of 120-249 students.
Division XIV	Total from all states except Kansas of all schools of 70-119 students.
Division XV	Total from all states except Kansas of all schools of 0-69 students.

DEFINITION OF TERMS

In Tables I to VI it is to be noted that the measure of central tendency used as a basis for comparisons was the average. The average was used because it is the only measure of central tendency wherein all scores are given equal weight, and also because it gives a higher reliability than either of the other measures. The short method of computing the average was used as it saved laborious calculations and gave reliable results.

The sigma was used as the most reliable measure of dispersion that was available. Its purpose is to show us the upper limits and the lower limits within which approximately the middle two-thirds of the cases under consideration will fall. Thus an average of 100 and a sigma of 10 would mean that two-thirds of the cases would fall between approximately the limits of 90 and 110.

The sigma-average is used to measure the standard error of the mean or average. An average of 100 with a sigma-average of .5 would mean that the chances are 68 in 100 that the obtained average does not diverge from the true average by more than .5 in either direction, and the chances would be 100 in 100 that the obtained average would not diverge from the

true average by more than three times .5 or by 1.5. Thus in this case we could be sure that the true average would fall within the limits of 98.5 to 101.5.

"N" in each case refers to the total number of students involved in the particular problem under discussion.

Tables VII, VIII, and IX are calculated in terms of the differences between the scores computed in the first six tables. Tables X, XI, and XII are figured in terms of the sigma of the differences found in the tables preceding them. Tables XIII, XIV, and XV are computed by dividing the differences found in Tables VII, VIII, and IX by the sigma-differences found in Tables X, XI, and XII. This ratio is the basis for the statistical calculation of the chances shown in Tables XVI, XVII, and XVIII.

CHAPTER II

BASIC DATA FOR COMPARING THE ACHIEVEMENT OF SCHOOLS OF VARIOUS SIZES AND CLASSES

The original reports, sent in by the schools participating in the Nation-wide Every Pupil Scholarship Tests, were used as the source of all tabular material contained in this chapter and in the chapters following. This original material was much too bulky to include in this paper so was tabulated and the results compiled into tabular form.

The reports were first divided according to subjects, and were then subdivided according to sizes and classifications. After proper classification of all reports, averages were calculated for each division in each subject being studied. The sigma of the distribution was then worked out. The reliability of the average was next determined by calculating the sigma of the average. Table I contains all basic data from the January, 1935, Every Pupil Test for Divisions I to VII, inclusive. Table II contains like data from the April, 1935, Every Pupil Test for the same divisions, and Table III, like data from the January, 1936, Test.

The tables following Table III in this chapter are similar to those already mentioned, except that they apply to different divisions. Table IV contains the basic data for Divisions VIII to XV, inclusive, from the January, 1935, Test. Table V contains like data from the April, 1935, Test, and Table VI, the data from the January, 1936, Test. "N" in each case refers to the total number of pupils participating in the group under consideration.

Thus, by keeping in mind that Divisions I, II, and III refer to the Class A, Class B, and Class C schools of Kansas, respectively, one can easily draw a comparison of the achievement of these schools in any of the subjects being studied. Divisions IV and V will serve to give a quick comparison of Kansas schools that belong to the North Central Association against those that do not belong. Likewise, Divisions VI and VII give us a side by-side-comparison of all North Central Schools of 250 or more population, appearing in this study, against those of less than 250 population.

TABLE I

BASIC DATA FOR COMPARING THE ACHIEVEMENT OF SCHOOLS ACCORDING TO CLASSIFICATION, DIVISIONS I TO VII, INCLUSIVE, ON THE EVERY PUPIL SCHOLARSHIP TEST OF JANUARY, 1935.

Subjects and Measures	Divisions						
	I	II	III	IV	V	VI	VII
English IX							
Average	82.28	78.84	80.86	83.40	77.68	84.65	81.20
Sigma	14.95	13.70	15.40	14.65	13.10	15.85	14.00
Sigma-ave.	.285	.463	.951	.327	.477	.397	.490
N	2750	874	262	2000	750	1595	814
English X							
Average	93.47	89.26	86.59	93.56	93.24	94.70	93.09
Sigma	18.40	17.10	16.60	18.25	18.05	17.95	18.25
Sigma-ave.	.373	.611	1.021	.440	.674	.500	.627
N	2432	785	264	1715	717	1286	846
Algebra							
Average	41.09	40.09	39.27	41.48	40.04	40.22	39.41
Sigma	12.95	12.45	12.95	12.90	13.20	12.65	12.60
Sigma-ave	.249	.392	.632	.289	.491	.310	.378
N	2702	1007	402	1980	722	1661	1091
Geometry							
Average	61.44	54.58	56.11	62.00	59.48	61.80	46.38
Sigma	21.65	21.50	20.55	21.25	22.35	20.60	19.15
Sigma-ave.	.493	.853	1.194	.552	1.060	.611	2.196
N	1927	634	296	1482	444	1135	76
Am. History							
Average	67.99	66.62	61.67	68.04	68.04	71.19	66.38
Sigma	15.55	14.10	13.85	15.65	15.70	14.75	14.95
Sigma-ave.	.333	.562	.895	.386	.658	.413	.611
N	2210	629	241	1641	569	1272	598
Biology							
Average	68.80	68.73	67.64	68.05	69.15	69.16	71.32
Sigma	10.75	10.85	10.15	11.55	10.30	10.30	10.15
Sigma-ave.	.330	.535	.840	.621	.385	.381	.606
N	1057	410	146	544	713	729	280
Typewriting							
Average	67.75	67.36	70.17	65.90	68.21	65.60	68.01
Sigma	26.30	26.85	25.50	26.80	24.75	26.95	24.75
Sigma-ave.	.662	1.219	2.512	.804	1.144	.947	1.059
N	1575	485	103	1107	468	809	545
W. History							
Average	46.62	43.50	41.15	46.70	46.38	47.70	41.94
Sigma	10.15	9.25	10.00	9.90	10.85	9.50	8.65
Sigma-ave.	.998	.498	.899	.376	.750	.361	.588
N	900	345	126	691	209	690	216

Read table thus: The average score for all pupils in Division I taking the test in English IX was 82.28; the sigma of the distribution was 14.95; the sigma of the average was .285; and the number of pupils taking the test was 2750

TABLE II

BASIC DATA FOR COMPARING THE ACHIEVEMENT OF SCHOOLS ACCORDING TO CLASSIFICATION, DIVISIONS I TO VII, INCLUSIVE, ON THE EVERY PUPIL SCHOLARSHIP TEST OF APRIL, 1935.

Subjects and Measures	Divisions						
	I	II	III	IV	V	VI	VII
English IX							
Average	92.70	88.41	76.87	93.54	89.18	94.26	90.82
Sigma	18.90	19.30	19.85	19.15	17.55	18.15	17.75
Sigma-ave.	.409	.734	1.268	.452	.970	.434	.478
N	2123	690	245	1786	327	1744	1374
English X							
Average	101.85	96.85	85.99	102.12	100.32	99.15	104.58
Sigma	19.65	21.75	20.05	19.30	21.50	18.60	19.85
Sigma-ave.	.455	.909	1.367	.491	1.217	.450	.747
N	1857	484	215	1545	312	1709	706
Algebra							
Average	27.55	25.90	22.91	28.06	25.74	26.18	25.90
Sigma	11.50	11.65	10.05	11.25	11.95	12.45	10.95
Sigma-ave.	.251	.464	.626	.274	.584	.313	.348
N	2089	628	257	1677	418	1581	987
Geometry							
Average	61.98	50.36	53.66	62.06	61.60	59.16	59.63
Sigma	20.25	19.55	19.80	20.00	20.05	19.80	22.05
Sigma-ave.	.468	.916	1.492	.507	1.138	.572	.772
N	1865	455	176	1555	310	1231	815
Am. History							
Average	61.90	56.44	58.34	62.43	59.89	61.45	60.82
Sigma	12.55	11.05	11.00	12.60	11.20	12.15	12.85
Sigma-ave.	.288	.495	.796	.319	.615	.343	.488
N	1894	497	191	1553	331	1255	691
Biology							
Average	63.98	66.77	68.93	62.95	70.18	58.02	67.47
Sigma	12.00	10.55	8.60	10.95	9.80	9.65	10.20
Sigma-ave.	.315	.657	.938	.314	.677	.283	.479
N	1447	274	84	1208	209	1160	452
Typewriting							
Average	63.46	68.24	57.35	62.44	66.86	61.78	66.06
Sigma	28.40	24.75	27.20	28.85	26.65	28.75	26.35
Sigma-ave.	.710	1.165	2.693	.821	1.387	.897	.995
N	1603	451	102	1234	369	1026	701
W. History							
Average	85.08	80.17	76.50	86.72	84.54	84.67	82.75
Sigma	14.10	16.70	15.85	14.15	13.90	15.45	14.20
Sigma-ave.	.523	.970	1.258	.543	1.985	.477	.801
N	727	296	125	678	49	1047	315

Read table thus: The average score for all pupils in Division I taking the test in English IX was 92.70; the sigma of the distribution was 18.90; the sigma of the average was .409, and the number of persons taking the test was 2123.

TABLE III

BASIC DATA FOR COMPARING THE ACHIEVEMENT OF SCHOOLS ACCORDING TO CLASSIFICATION, DIVISIONS I TO VII, INCLUSIVE, ON THE EVERY PUPIL SCHOLARSHIP TEST OF JANUARY, 1936.

Subjects and Measures	Divisions						
	I	II	III	IV	V	VI	VII
English IX							
Average	90.32	85.62	84.87	90.67	86.92	95.53	88.76
Sigma	17.75	19.25	16.25	17.45	17.25	17.90	15.25
Sigma-ave.	.395	.656	.857	.483	.647	.608	.495
N	2019	914	359	1303	710	865	947
English X							
Average	98.82	94.88	92.87	99.70	97.32	100.45	98.42
Sigma	17.90	18.80	16.45	18.25	17.20	18.05	16.75
Sigma-ave.	.415	.605	.934	.530	.655	.547	.656
N	1855	965	310	1167	688	1080	650
Algebra							
Average	51.39	50.13	48.04	51.65	50.87	50.99	48.43
Sigma	13.50	12.80	12.25	13.30	13.95	12.20	10.65
Sigma-ave.	.289	.371	.572	.347	.518	.368	.564
N	2183	1187	457	1458	725	1098	356
Geometry							
Average	53.88	50.96	46.20	54.34	54.72	54.25	54.83
Sigma	15.25	16.95	14.40	14.90	15.65	15.50	15.50
Sigma-ave.	.388	.607	.909	.459	.705	.533	.598
N	1542	631	250	1047	499	856	670
Am. History							
Average	70.03	67.09	66.98	69.94	70.13	69.89	69.82
Sigma	16.45	16.45	15.30	16.40	16.00	16.80	15.50
Sigma-ave.	.432	.599	.971	.549	.666	.638	.579
N	1446	754	248	897	579	692	715
Biology							
Average	59.82	63.36	64.26	59.10	61.21	58.91	58.92
Sigma	14.95	13.25	13.15	13.40	13.10	12.45	11.85
Sigma-ave.	.481	.625	1.247	.566	.646	.481	.574
N	966	449	111	560	411	669	425
Typewriting							
Average	70.04	70.28	70.74	66.44	71.52	64.75	57.18
Sigma	23.80	24.00	22.30	28.30	21.80	27.95	21.30
Sigma-ave.	.584	.928	1.435	.873	.885	.987	2.682
N	1655	668	242	1047	608	817	63
W. History							
Average	44.25	45.89	41.96	44.90	45.00	45.89	43.66
Sigma	9.45	9.20	9.80	9.55	9.20	9.75	8.45
Sigma-ave.	.338	.512	.740	.400	.631	.452	.464
N	781	322	175	569	212	454	331

Read table thus: The average score of all pupils in Division I taking the test in English IX was 90.32; the sigma of the distribution was 17.75; the sigma of the average was .295; and the number of persons taking the test was 2019.

TABLE IV

BASIC DATA FOR COMPARING THE ACHIEVEMENT OF SCHOOLS ACCORDING TO SIZE, BY ENROLLMENT, DIVISIONS VIII TO XV, INCLUSIVE, ON THE EVERY PUPIL SCHOLARSHIP TEST OF JANUARY, 1935.

Subjects and Measures	Divisions							
	VIII	IX	X	XI	XII	XIII	XIV	XV
English IX								
Average	84.49	80.04	80.06	79.37	85.79	83.56	80.59	82.16
Sigma	16.50	14.35	15.55	13.90	15.75	14.00	14.80	14.00
Sigma-ave.	.454	.473	.419	.556	.808	.828	.832	1.096
N	1315	918	1040	625	380	248	316	163
English X								
Average	95.17	92.92	90.38	87.43	96.26	94.83	88.86	86.38
Sigma	18.90	18.20	17.45	16.15	16.00	16.05	16.45	15.70
Sigma-ave.	.588	.591	.581	.660	.946	1.565	1.055	1.377
N	1032	947	900	599	286	105	243	130
Algebra								
Average	41.22	41.41	39.07	41.36	39.76	35.67	37.26	39.93
Sigma	13.25	12.90	12.45	12.75	12.35	10.60	10.80	11.40
Sigma-ave.	.406	.572	.364	.488	.486	.634	.503	.861
N	1064	1199	1169	682	643	279	401	175
Geometry								
Average	62.76	59.39	57.93	56.40	60.36	55.44	46.26	50.69
Sigma	20.25	22.45	22.05	21.55	23.20	19.35	18.30	19.15
Sigma-ave.	.686	.828	.847	.897	1.559	1.218	1.095	1.426
N	871	735	677	577	252	252	279	180
Am. History								
Average	68.89	68.93	65.21	64.94	66.59	67.38	58.97	65.28
Sigma	15.60	14.95	14.15	15.00	15.35	15.65	13.95	14.25
Sigma-ave.	.458	.573	.512	.689	.955	.991	.796	1.317
N	1153	680	765	474	258	249	307	117
Biology								
Average	68.47	70.14	65.91	70.05	70.88	63.05	64.59	69.93
Sigma	10.15	10.85	11.50	10.10	10.10	10.50	9.90	9.25
Sigma-ave.	.459	.515	.610	.571	.586	.800	.748	1.089
N	488	443	355	312	296	172	175	72
Typewriting								
Average	65.64	66.45	68.41	65.93	65.72	62.50	72.32	69.64
Sigma	27.30	25.75	26.25	28.10	22.75	28.70	18.75	21.05
Sigma-ave.	1.056	.995	1.105	1.699	1.654	1.957	2.044	3.248
N	667	668	563	274	189	215	84	42
W. History								
Average	47.33	46.56	43.42	42.76	47.86	39.42	43.66	42.88
Sigma	10.05	10.20	9.25	9.25	7.40	8.30	9.00	8.85
Sigma-ave.	.425	.747	.453	.632	.574	.647	.904	2.451
N	557	186	419	214	166	164	99	13

Read table thus: The average score of all pupils in Division VIII taking the test in English IX was 84.49; the sigma of the distribution was 16.50; the sigma of the average was .454; and the number of pupils taking the test was 1315.

TABLE V

BASIC DATA FOR COMPARING THE ACHIEVEMENT OF SCHOOLS ACCORDING TO SIZE, BY ENROLLMENT, DIVISIONS VIII TO XV, INCLUSIVE, ON THE EVERY PUPIL SCHOLARSHIP TEST OF APRIL, 1935.

Subjects and Measures	Divisions							
	VIII	IX	X	XI	XII	XIII	XIV	XV
English IX								
Average	94.94	91.61	89.35	81.17	92.85	88.96	89.61	88.22
Sigma	20.00	17.90	18.15	20.55	17.00	17.25	17.40	13.10
Sigma-ave.	.698	.547	.734	.913	.606	.706	.910	..751
N	875	1067	612	506	787	457	365	304
English X								
Average	102.26	105.17	98.92	89.05	98.23	90.39	95.74	91.98
Sigma	17.10	20.15	19.55	22.30	18.65	18.95	19.75	18.75
Sigma-ave.	.585	.730	.906	1.076	.644	1.256	1.453	1.205
N	852	761	465	429	837	227	185	242
Algebra								
Average	28.87	26.46	26.09	23.97	22.47	22.20	20.82	20.45
Sigma	11.45	11.25	11.45	11.40	10.95	12.10	11.20	10.50
Sigma-ave.	.392	.356	.459	.509	.395	.502	.708	.585
N	851	997	622	500	768	580	250	322
Geometry								
Average	63.04	61.45	55.20	53.04	51.31	46.13	45.26	45.60
Sigma	19.25	20.50	21.20	19.80	18.30	19.30	18.70	20.20
Sigma-ave.	.649	.715	1.015	1.014	.784	.804	1.129	1.428
N	879	820	436	381	544	412	274	200
Am. History								
Average	63.55	60.85	57.39	57.40	56.65	54.35	51.47	48.63
Sigma	12.55	12.25	11.70	11.05	13.70	12.45	12.10	11.40
Sigma-ave.	.406	.455	.541	.534	.688	.771	1.004	1.081
N	954	723	467	434	390	260	145	111
Biology								
Average	61.71	68.00	65.47	68.38	63.40	67.20	66.46	57.93
Sigma	10.85	10.30	10.45	10.00	10.10	9.90	9.30	9.65
Sigma-ave.	.360	.523	.735	.653	.563	.628	.803	.753
N	906	387	202	234	321	248	134	164
Typewriting								
Average	60.76	65.42	67.81	65.41	64.94	59.51	67.93	65.23
Sigma	29.45	27.05	25.70	25.35	24.95	27.75	22.20	24.20
Sigma-ave.	1.074	1.042	1.234	1.441	1.324	1.641	2.051	2.018
N	752	673	433	309	355	286	117	143
W. History								
Average	86.94	86.34	80.78	77.58	82.49	80.94	73 45	72.73
Sigma	14.45	15.15	16.50	14.60	15.75	15.00	16.60	15.20
Sigma-ave.	.600	1.355	1.081	.992	.725	.777	1.127	.944
N	576	125	233	216	471	372	217	259

Read table thus: The average score of all pupils in Division VIII taking the test in English IX was 94.94; the sigma of the distribution was 20.00; the sigma of the average was .698; and the number of persons taking the test was 875.

TABLE VI

BASIC DATA FOR COMPARING THE ACHIEVEMENT OF SCHOOLS ACCORDING TO SIZE BY ENROLLMENT, DIVISIONS VIII TO XV, INCLUSIVE, ON THE EVERY PUPIL SCHOLARSHIP TEST OF JANUARY, 1936.

Subjects and Measures	Divisions							
	VIII	IX	X	XI	XII	XIII	XIV	XV
English IX								
Average	96.12	88.24	84.85	86.10	92.52	87.79	85.73	85.74
Sigma	16.40	16.05	19.35	16.50	15.00	14.00	16.65	15.40
Sigma-ave.	.698	.509	.640	.626	.928	.588	.819	.985
N	694	994	912	694	261	566	413	244
English X								
Average	102.43	97.13	95.15	96.03	100.35	94.63	95.43	92.32
Sigma	19.30	16.25	17.80	18.25	16.80	16.00	16.55	15.10
Sigma-ave.	.752	.556	.595	.692	.845	.830	.916	1.067
N	658	851	893	695	349	371	326	193
Algebra								
Average	51.50	51.97	48.89	50.85	53.21	47.67	45.84	47.50
Sigma	13.45	13.40	12.90	13.00	11.70	12.00	11.70	12.25
Sigma-ave.	.439	.450	.368	.471	.716	.431	.512	.680
N	801	1022	1226	771	267	775	512	324
Geometry								
Average	54.91	54.55	50.90	49.37	53.31	55.69	50.55	43.18
Sigma	15.30	15.20	16.90	15.20	15.45	17.15	15.05	16.10
Sigma-ave.	.657	.556	.625	.749	1.081	.868	.935	.978
N	543	747	730	411	204	390	259	271
Am. History								
Average	69.78	70.52	67.66	68.19	70.42	64.54	62.65	59.50
Sigma	17.50	16.30	16.65	15.25	14.65	16.75	15.50	15.80
Sigma-ave.	.803	.641	.569	.743	.886	.732	.842	1.079
N	474	645	857	415	273	516	338	214
Biology								
Average	58.69	62.06	60.60	64.85	60.17	55.54	56.39	53.03
Sigma	12.85	13.60	13.20	12.85	11.95	10.25	12.80	13.85
Sigma-ave.	.870	.635	.636	.753	.602	.572	.919	.985
N	352	458	430	291	394	321	194	197
Typewriting								
Average	67.27	70.86	72.39	68.74	55.23	63.19	65.57	65.65
Sigma	26.95	22.55	20.20	26.60	28.65	28.50	24.90	25.00
Sigma-ave.	1.063	.850	.701	1.345	3.054	1.700	1.764	2.321
N	642	703	829	391	88	281	199	116
W. History								
Average	44.52	44.63	44.32	43.87	40.43	40.61	42.62	40.24
Sigma	10.10	8.80	9.40	9.80	5.80	8.05	8.80	7.60
Sigma-ave.	.515	.495	.558	.570	.692	.422	.514	.602
N	384	315	283	296	70	363	292	159

Read table thus: The average score of all pupils in Division VIII taking the test in English IX was 96.12; the sigma of the distribution was 16.40; the sigma of the average was .698; and the number of persons taking the test was 694.

It is to be noted in Tables I, II, and III, that Division I, representing the Class A schools of Kansas, Division II, representing the Class B schools of Kansas, and Division III, the Class C schools of Kansas, form the basis of one comparison. In the same tables, Division IV, representing the Class A schools of Kansas that belong to the North Central Association, and Division V, representing the Class A schools of Kansas that do not belong to the North Central Association, form the basis of a second comparison. Division VI, representing all of the North Central schools included in this study, with a population of 250 or more, and Division VII, all North Central schools included in this study that have a population of less than 250, form the basis of the third comparison.

In like manner in Tables IV, V, and VI, Division VIII, representing schools of Kansas with 250 or more students, Division IX, schools of Kansas with 120 to 249 students, Division X, schools of Kansas with 70 to 119 students, and Division XI representing schools of Kansas with 0 to 69 students form the basis of a single comparison. Also, in the same tables, Division XII, representing all schools outside of Kansas with 250 or more students that are included in this study, Division XIII, schools outside of Kansas with 120 to 249 students, Division XIV, schools outside of Kansas with 70 to 119 students, and Division XV, all schools outside of Kansas with 0 to 69 students, included in this study, form the basis of another comparison.

CHAPTER III

COMPARISONS

In Tables VII, VIII, and IX, are listed the differences between the various groups between which comparisons are made in this study. A careful study of these tables will show something of the size of the differences between the various divisions being compared, and the consistency with which certain groups outscored other groups. It will be noted that these tables cover similar material, Table VII being a summary of the differences found between the average scores computed from the January, 1935, Tests; Table VIII, being a summary of the differences found between the average scores calculated from the April, 1935, Tests, and Table IX, being a summary of all differences computed from the average scores of the January, 1936, Tests.

COMPARISONS OF KANSAS SCHOOLS ACCORDING TO CLASSIFICATION

In the comparisons which were based entirely on classification, these being Divisions I to III, inclusive, and including only the schools of the state of Kansas, it is noticeable that the school of higher classification outscored the school of lower classification 20 times out of 24 in Table VII, 18 times out of 24 in Table VIII, and 19 times out of 24 in Table IX, or a total of 57 times out of 72 comparisons.

In totaling the comparisons made between Division I, representing the Class A schools of Kansas, and Division II, the Class B schools of Kansas, in all three tables, it is noted that Division I outscored Division II in 19 out of 24 chances. In a comparison between Division I and Divi-

sion III, which represents the Class C schools of Kansas, it is noteworthy that Division I excelled in 20 out of 24 times. The comparisons between the divisions representing the two lower groups, Divisions II and III, show Division II winning in only 16 out of 24 times. The chances that Division II will outscore Division III are, therefore, a little less than the chances that Division I will outscore either of the two lower divisions.

There seems to be no consistency in the size of the differences although the data in Table VII seem to indicate that the differences between the group of highest classification and the other two are a little larger than between the two groups of lower classification.

COMPARISONS OF SCHOOLS ACCORDING TO SIZE

Comparisons based on size by enrollment, Divisions VIII to XI, inclusive, show that in the Kansas schools the larger schools outscored the smaller schools 35 times out of 48 comparisons in Table VII, 37 times out of 48 in Table VIII, and 32 times out of 48 in Table IX, or a total of 104 times out of 144 comparisons. Here, again, there seems to be no degree of consistency with which certain groups have outscored other groups according to size.

Divisions XII to XV, inclusive, represent out-of-Kansas schools included in this study, Division XII being the larger schools and Division XV the smallest ones. Data in the same tables used in the comparisons above show that in these out-of-state comparisons the larger schools had the advantage in 31 out of 48 comparisons in Table VII; in Table VIII the larger schools were ahead 38 out of 48 times; and in Table IX they won 33 out of

48 times, or a total of 102 times out of 144 comparisons.

It would seem there is a fair degree of consistency here. In Kansas the larger schools won in 104 out of 144 comparisons, while the schools outside of Kansas, when classified according to size, show the larger schools winning in 102 out of 144 comparisons.

COMPARISONS OF SCHOOLS BY SUBJECTS

In making a comparison, by subjects, of results compiled in Tables VII, VIII, and IX, it is evident that the schools of higher classification, or of greater enrollments, excelled 14 out of 17 times in comparisons in English IX according to Table VII; 16 out of 17 times in Table VIII; and 15 out of 17 times in Table IX, or a total of 45 times out of 51 comparisons in English IX. Following the same order in presenting the other subjects, it is shown by the tables that in English X the larger schools won in 17 out of 17, 13 out of 17, and in 15 out of 17, or a total of 45 times out of 51 comparisons. In Algebra the figures are 10 out of 17, 17 out of 17, and 14 out of 17, or a total of 41 times out of 51 chances in favor of the larger schools. In Geometry the larger schools win 15 out of 17, 14 out of 17, and 14 out of 17, or a total of 43 out of 51 times.

In American History the larger schools have the advantage in 14 out of 17 attempts, 15 out of 17, and 14 out of 17, respectively, or a total of 46 out of 51 times. In Biology the scores are more favorable to the smaller schools and this favor seems fairly consistent throughout the study. The larger schools excel in Biology 9 out of 17, 5 out of 17, and 5 out of 17 times, or a total of 19 out of 51 times. In Typewriting the contrast in favor of the smaller schools is even more marked and a little more consist-

ent even than in Biology. In Typewriting the smaller schools outscored the larger schools. The larger schools won only in 4 out of 17, 6 out of 17, and 3 out of 17, or a total of 13 out of 51 comparisons. In World History the advantage reverts back to the larger schools. The larger schools won in 15 out of 17, 17 out of 17, and 12 out of 17, or a total of 44 out of 51 times.

Tables VII, VIII, and IX follow in order so the reader may make his own comparisons and note the consistency of any advantages which may be found.

TABLE VII

THE DIFFERENCE BETWEEN THE AVERAGE SCORES OF VARIOUS DIVISIONS OF SCHOOLS ON THE JANUARY, 1936, EVERY PUPIL SCHOLARSHIP TEST

	Eng. IX	Eng. X	Alg.	Geom.	Am. Hist.	Biol.	Type.	World Hist.
I and II	3.44	4.21	1.00	6.86	1.37	.07	.39	3.12
I and III	1.42	6.88	1.82	5.53	6.32	1.16	-2.42	5.46
II and III	-2.02	2.67	.82	-1.53	4.95	1.09	-2.81	2.35
IV and V	5.72	.32	1.44	2.52	0	-1.10	-2.31	.32
VI and VII	3.45	1.61	.91	15.42	4.81	-2.16	-2.41	5.76
VIII and IX	4.45	2.25	-.19	3.37	-.04	-1.67	-.81	.77
VIII and X	4.43	4.79	2.15	4.83	3.68	2.56	-2.77	3.91
VIII and XI	5.12	7.74	-.14	6.36	3.95	-1.58	-.29	4.57
IX and X	-.02	2.54	2.54	1.46	3.72	4.23	-1.96	3.14
IX and XI	.67	5.49	.05	2.99	3.99	.09	.52	3.80
X and XI	.69	2.95	-2.24	1.53	.27	-4.14	-2.48	.66
XII and XIII	2.25	1.43	4.09	4.92	-.79	7.83	3.22	3.44
XII and XIV	5.20	7.40	2.50	14.10	7.62	6.29	-6.60	4.20
XII and XV	3.63	9.88	-.17	9.67	1.31	.95	-3.92	4.98
XIII and XIV	2.97	5.97	-1.59	9.18	8.41	-1.54	-9.82	-4.24
XIII and XV	1.40	8.45	-4.26	4.75	2.10	-6.38	-7.14	-3.46
XIV and XV	-1.57	2.48	-2.67	-4.43	-6.31	-5.54	2.68	.78

Read table thus: The difference between the average scores of Division I and Division II was 3.44 in English IX, 4.21 in English X, etc.

All differences preceded by a minus sign are in favor of the second group named, while all others favor the first group named.

TABLE VIII

THE DIFFERENCE BETWEEN THE AVERAGE SCORES OF VARIOUS DIVISIONS OF SCHOOLS ON THE APRIL, 1935, EVERY PUPIL SCHOLARSHIP TEST

	Eng. IX	Eng. X	Alg.	Geom.	Am. Hist.	Biol.	Type.	World Hist.
I and II	4.29	4.99	1.65	11.62	5.46	-2.79	-4.78	4.91
I and III	15.83	15.76	4.64	8.32	5.56	-4.95	6.11	8.58
II and III	11.54	10.87	2.99	-3.36	-1.90	-2.16	10.89	3.67
IV and V	4.16	1.80	2.32	.46	2.54	-7.23	-4.42	2.18
VI and VII	3.44	-5.43	.28	-.47	.63	-9.45	-4.28	1.92
VIII and IX	3.33	-2.91	2.41	1.59	2.70	-6.29	-4.66	.60
VIII and X	5.59	3.34	2.78	9.84	6.16	-3.76	-7.05	6.16
VIII and XI	13.77	13.21	4.90	10.00	6.15	-6.67	-4.65	9.36
IX and X	2.26	6.25	.37	8.25	3.46	2.53	-2.59	5.56
IX and XI	10.44	16.12	2.49	8.41	3.45	-.38	.01	8.76
X and XI	8.18	9.87	2.12	.16	-.01	-2.91	2.40	3.20
XII and XIII	3.89	7.84	.27	5.18	2.30	-3.80	5.43	1.55
XII and XIV	3.24	2.49	1.65	6.05	5.18	-3.06	-2.99	9.04
XII and XV	4.63	6.25	2.02	5.71	8.02	5.47	-.29	9.76
XIII and XIV	-.65	-5.35	1.38	.87	2.88	.74	-8.42	7.49
XIII and XV	.74	-1.59	1.75	.53	5.72	9.27	-5.72	8.21
XIV and XV	1.39	3.76	.37	-.34	2.84	8.53	2.70	.72

Read table thus: The difference between the average scores of Division I and Division II was 4.29 in English IX, 4.99 in English X, etc.

All differences preceded by a minus sign are in favor of the second group named, while all others favor the first group named.

TABLE IX

THE DIFFERENCE BETWEEN THE AVERAGE SCORES OF VARIOUS DIVISIONS OF SCHOOLS ON THE JANUARY, 1936, EVERY PUPIL SCHOLARSHIP TEST

	Eng. IX	Eng. X	Alg.	Geom.	Am. Hist.	Biol.	Type.	World Hist.
I and II	4.70	3.94	1.26	2.92	2.94	-3.54	-.24	-1.64
I and III	5.46	5.95	3.35	7.68	3.05	-4.44	-.70	2.29
II and III	.75	2.01	2.09	4.76	.11	-.90	-.46	3.93
IV and V	3.75	2.38	.78	-.38	-.19	-2.11	-4.88	1.90
VI and VII	6.57	2.03	2.56	-.58	.07	-.01	7.57	.23
VIII and IX	7.88	5.30	-.37	.36	-.74	-3.37	-3.59	-.11
VIII and X	11.27	7.28	2.71	4.01	2.12	-1.91	-5.12	.20
VIII and XI	10.02	6.40	.75	6.54	1.59	-6.16	-1.47	.65
IX and X	3.39	1.98	3.08	3.65	2.86	1.46	-1.53	.31
IX and XI	2.14	1.10	1.12	5.18	2.33	-2.79	2.12	.76
X and XI	-1.25	-.88	-1.96	1.53	-.53	-4.25	3.65	.45
XII and XIII	4.73	5.72	5.54	-2.38	6.08	-4.63	-7.96	-.18
XII and XIV	9.79	4.92	7.37	2.76	7.77	3.78	-10.34	-2.19
XII and XV	9.78	8.03	5.71	10.13	11.12	7.14	-10.42	.17
XIII and XIV	2.06	-.80	1.83	5.14	1.69	-.85	-2.38	-2.01
XIII and XV	2.05	2.31	.17	12.51	5.04	2.51	-2.46	.37
XIV and XV	-.01	3.11	-1.66	7.37	3.35	3.36	-.08	2.38

Read table thus: The difference between the average scores of Division I and Division II was 4.70 in English IX, 3.94 in English X, etc.

All differences preceded by a minus sign are in favor of the second group named, while all others favor the first group named.

The standard deviation, or sigma, was used as the measure of variability in making this study, for the reasons that it is a more stable measure of dispersion than is the average deviation, and is less affected by chance fluctuations. Tables X, XI, and XII follow in sequence and should be studied in their relation to Tables VII, VIII, and IX, which have been given previously.

Tables X, XI, and XII are calculated in terms of the sigma of the differences between the average scores which were stated in Tables I to VI, inclusive. A large sigma would, of course, mean a great fluctuation of scores around an average score, while a smaller sigma would indicate a stronger central tendency among the scores found. It is noticeable that in Table X the sigma of the difference exceeds 1 in only 68 out of 136 times. In Table XI the sigma of the difference is larger than 1 in 83 out of 136 times, and in Table XII the sigma of the difference exceeds 1 in only 60 out of 136 times, or a total of 211 out of 408 times.

These figures, of course, have no meaning until each separate sigma of the difference is compared with the obtained difference in score which accompanies it; however, they do show that in general the sigma of the difference is around 1 while the actual difference varies greatly from -10.42 in one case to 15.83 in another.

TABLE X

THE SIGMA OF THE DIFFERENCE BETWEEN THE AVERAGE SCORES OF VARIOUS DIVISIONS OF SCHOOLS ON THE JANUARY, 1935, EVERY PUPIL SCHOLARSHIP TEST

	Eng. IX	Eng. X	Alg.	Geom.	Am. Hist.	Biol.	Type.	World Hist.
I and II	.544	.716	.464	.966	.653	.629	1.387	1.115
I and III	.995	1.087	.679	1.292	.955	.903	2.598	1.341
II and III	1.058	1.190	7.44	1.467	1.057	.996	2.792	1.025
IV and V	.578	.805	.570	1.195	.765	.751	1.398	.839
VI and VII	.631	.802	.489	2.279	.737	.716	1.421	.690
VIII and IX	.656	.854	.551	1.075	.732	.690	1.451	.859
VIII and X	.618	.827	.545	1.090	.686	.765	1.528	.621
VIII and XI	.711	.884	.635	1.129	.826	.733	2.000	.761
IX and X	.632	.829	.520	1.184	.768	.798	1.487	.874
IX and XI	.730	.886	.614	1.221	.896	.769	1.969	.978
X and XI	.696	.879	.609	1.254	.858	.836	2.027	.778
XII and XIII	1.156	1.829	.799	1.978	1.376	.992	2.562	.865
XII and XIV	1.160	1.417	.699	1.905	1.248	.950	2.629	1.071
XII and XV	1.362	1.670	.989	2.113	1.627	1.237	3.645	2.517
XIII and XIV	1.174	1.887	.810	1.638	1.271	1.095	2.850	1.156
XIII and XV	1.374	2.085	1.069	1.875	1.648	1.351	3.792	2.535
XIV and XV	1.376	1.735	.997	1.798	1.539	1.321	3.837	2.612

Read table thus: The Sigma of the differences between the average scores of Division I and Division II are .544 for English IX, .716 for English X, etc.

TABLE XI

THE SIGMA OF THE DIFFERENCE BETWEEN THE AVERAGE SCORES OF VARIOUS DIVISIONS OF SCHOOLS ON THE APRIL, 1935, EVERY PUPIL SCHOLARSHIP TEST

	Eng. IX	Eng. X	Alg.	Geom.	Am. Hist.	Biol.	Type.	World Hist.
I and II	.840	1.017	.528	1.029	.573	.711	1.364	1.102
I and III	1.332	1.441	.674	1.564	.846	.989	2.785	1.344
II and III	1.465	1.642	.779	1.751	.937	1.154	2.934	1.573
IV and V	1.070	1.312	.645	1.246	.693	.746	1.612	2.058
VI and VII	.646	.872	.468	.961	.588	.556	1.340	.952
VIII and IX	.887	.938	.530	.966	.610	.635	1.496	1.482
VIII and X	1.013	1.078	.604	1.205	.677	.818	1.636	1.256
VIII and XI	1.149	1.225	.642	1.204	.671	.746	1.797	1.159
IX and X	.915	1.164	.581	1.242	.707	.902	1.815	1.755
IX and XI	1.064	1.300	.621	1.241	.702	.837	1.778	1.679
X and XI	1.171	1.407	.685	1.455	.760	.983	1.897	1.467
XII and XIII	.930	1.412	.659	1.123	1.033	.843	2.108	1.063
XII and XIV	1.093	1.589	.811	1.375	1.217	.981	2.441	1.340
XII and XV	.965	1.564	.706	1.629	1.281	.940	2.414	1.190
XIII and XIV	1.152	1.921	.868	1.386	1.266	1.019	2.627	1.369
XIII and XV	1.031	1.738	.771	1.639	1.328	.980	2.601	1.223
XIV and XV	1.180	1.886	.918	1.820	1.475	1.101	2.877	1.470

Read table thus: The sigma of the differences between the average scores of Division I and Division II are .840 for English IX, 1.017 for English X, etc.

TABLE XII

THE SIGMA OF THE DIFFERENCE BETWEEN THE AVERAGE SCORES OF VARIOUS DIVISIONS OF SCHOOLS ON THE JANUARY, 1926, EVERY PUPIL SCHOLARSHIP TEST

	Eng. IX	Eng. X	Alg.	Geom.	Am. Hist.	Biol.	Type.	World Hist.
I and II	.749	.734	.470	.720	.759	.789	1.096	.614
I and III	.944	1.022	.641	.988	1.063	1.337	1.548	.814
II and III	1.067	1.113	.682	1.093	1.141	1.395	1.707	.900
IV and V	.807	.843	.623	.841	.863	.859	1.242	.747
VI and VII	.784	.854	.673	.801	.862	.749	2.856	.648
VIII and IX	.864	.935	.629	.861	1.027	1.077	1.361	.714
VIII and X	.947	.959	.573	.907	.984	1.078	1.273	.759
VIII and XI	.938	1.022	.644	.996	1.094	1.151	1.714	.768
IX and X	.818	.814	.581	.837	.857	.899	1.102	.746
IX and XI	.807	.888	.651	.953	.981	.985	1.591	.765
X and XI	.895	.913	.598	.976	.956	.986	1.517	.798
XII and XIII	1.099	1.184	.836	1.386	1.149	.831	3.495	.810
XII and XIV	1.238	1.246	.880	1.429	1.222	1.009	3.527	.862
XII and Xv	1.353	1.377	.987	1.458	1.396	1.154	3.836	.917
XIII and XIV	1.008	1.236	.669	1.276	1.116	1.082	2.460	.665
XIII and XV	1.147	1.368	.805	1.308	1.304	1.139	2.877	.735
XIV and XV	1.281	1.422	.851	1.353	1.365	1.347	2.915	.792

Read table thus: The sigma of the differences between the average scores of Division I and Division II are .749 for English IX, .734 for English X, etc.

Tables XIII, XIV, and XV convey the same general information as that contained in the earlier tables, except that they are computed on the basis of a ratio, the obtained difference divided by the sigma of the difference. Among statisticians this ratio is commonly referred to as the critical ratio. A critical ratio of 3.0 or more indicates complete reliability, and means that the comparison made in that particular case will come true in 100 out of 100 chances. A critical ratio of 2.0 indicates a very high degree of reliability, namely, that the relationship established in that particular case would come true in 98 out of 100 chances. A ratio of 1.0 means that the comparison would happen the same way in 84 out of 100 chances, while a ratio of 0 means that the chances are 50 out of 100, or exactly even, that neither has an advantage. The chances indicated by negative ratios are interpreted exactly as they are in the positive ratios, except that they indicate the advantage lies with the second division named instead of the first. In all of the tables which follow, a negative ratio may be construed to indicate that a division made up of smaller schools, or of schools with a lower classification, has exceeded a division made up of larger schools, or of schools with a higher classification.

TABLE XIII

BASIC DATA FOR COMPARING THE ACHIEVEMENT OF VARIOUS DIVISIONS OF SCHOOLS ON THE JANUARY, 1935, EVERY PUPIL SCHOLARSHIP TESTS, BY MEANS OF THE RATIO, $\frac{D}{\text{SIGMA (DIFF.)}}$

	Eng. IX	Eng. X	Alg.	Geom.	Am. Hist.	Biol.	Type.	World Hist.
I and II	6.52	5.88	2.16	6.96	2.10	.11	.28	2.80
I and III	1.43	6.33	2.68	4.13	6.62	1.28	-.93	4.07
II and III	-1.91	2.24	1.10	-1.04	4.68	1.09	-1.01	2.29
IV and V	9.90	.40	2.53	2.11	.00	-1.50	-1.65	.38
VI and VII	5.47	2.01	1.66	6.77	6.53	-3.37	-1.70	8.35
VIII and IX	6.78	2.70	-.34	3.13	-.05	-2.42	-.66	.90
VIII and X	7.17	5.79	3.94	4.43	5.36	3.36	-1.81	6.30
VIII and XI	7.20	8.76	-.22	5.63	4.77	-2.13	-1.45	6.00
IX and X	-.003	3.06	4.50	1.23	4.84	5.30	-1.33	3.59
IX and XI	.92	6.20	.08	2.45	4.45	.12	.26	3.89
X and XI	.99	3.36	-3.68	1.24	.31	-4.95	-1.22	.85
XII and XIII	1.93	.78	5.12	2.48	-.57	7.89	1.26	9.76
XII and XIV	4.48	5.22	3.58	7.40	5.13	6.62	-2.51	3.92
XII and XV	2.67	5.92	-.17	4.58	.81	.77	-1.08	1.98
XIII and XIV	2.53	3.16	-1.96	5.60	6.62	-1.41	-3.47	-3.67
XIII and XV	1.02	4.05	-3.99	2.53	1.27	-5.09	-1.88	-1.36
XIV and XV	-1.14	1.43	-2.68	-2.46	-4.10	-4.04	.70	.30

Read table thus: The ratio, $\frac{D}{\text{Sigma (diff.)}}$, between Division I and Division II is 6.52 in English IX, 5.88 in English X, etc. A ratio of 3.0 signifies complete reliability. Ratios marked with a minus sign indicate that the ratio is in favor of the second group named, while all other ratios are in favor of the first group named.

TABLE XIV

BASIC DATA FOR COMPARING THE ACHIEVEMENT OF VARIOUS DIVISIONS OF SCHOOLS ON THE APRIL, 1935, EVERY PUPIL SCHOLARSHIP TESTS, BY MEANS OF THE RATIO, $\frac{D}{\text{Sigma (Diff.)}}$

	Eng. IX.	Eng. X	Alg.	Geom.	Am. Hist.	Biol.	Type.	World Hist.
I and II	5.11	4.90	3.15	11.29	9.53	-3.92	-3.50	4.46
I and III	11.88	10.94	6.88	5.32	4.21	-5.01	2.19	6.38
II and III	7.88	6.62	3.84	-1.92	-2.03	-1.90	3.70	2.33
IV and V	3.89	1.37	3.60	3.69	3.67	-9.69	-2.74	1.06
VI and VII	5.33	-6.23	.60	-.49	1.07	-17.00	-3.19	2.06
VIII and IX	3.75	-3.11	4.55	1.65	4.45	-9.91	-3.11	.40
VIII and X	5.52	3.10	4.60	8.17	9.10	-4.60	-4.31	4.98
VIII and XI	11.98	10.78	7.63	8.31	9.17	-8.94	-2.59	8.08
IX and X	2.47	5.37	.64	6.64	4.89	2.80	-1.48	3.21
IX and XI	9.81	12.40	4.01	6.78	4.91	-.45	.06	5.22
X and XI	6.99	7.01	3.09	.11	-.01	-2.96	1.27	2.18
XII and XIII	4.18	5.52	.42	4.61	2.23	-4.51	2.58	1.46
XII and XIV	2.96	1.57	2.03	4.40	4.26	-3.12	-1.22	6.75
XII and XV	4.80	4.58	2.86	3.51	6.26	5.82	-.12	8.20
XIII and XIV	-.56	-2.79	1.59	.63	2.27	.73	-3.21	5.47
XIII and XV	.72	-.91	2.27	.52	4.31	9.48	-2.20	6.71
XIV and XV	1.18	1.99	.40	-.19	1.93	7.75	9.35	.49

Read table thus: The ratio, $\frac{D}{\text{Sigma (Diff.)}}$, between Division I and Division II is 5.11 for English IX, 4.90 for English X, etc. A ratio of 3.0 signifies complete reliability. Ratios marked with a minus sign indicate that the ratio is in favor of the second group named, while all other ratios are in favor of the first group named.

TABLE XV

BASIC DATA FOR COMPARING THE ACHIEVEMENT OF VARIOUS DIVISIONS OF SCHOOLS ON THE JANUARY, 1936, EVERY PUPIL SCHOLARSHIP TESTS, BY MEANS OF THE RATIO, $\frac{D}{\text{SIGMA (DIFF.)}}$

	Eng. IX	Eng. X	Alg.	Geom.	Am. Hist.	Biol.	Type.	World Hist.
I and II	6.28	5.37	2.68	4.06	3.98	-4.49	-.22	-2.67
I and III	5.77	5.82	5.23	7.77	2.87	-3.21	-.45	2.81
II and III	.70	1.81	3.06	4.35	.10	-.65	-.27	4.37
IV and V	4.65	2.82	2.52	-.45	-.22	-2.46	-5.93	2.54
VI and VII	8.38	2.38	3.80	-.72	.08	-.01	2.65	.35
VIII and IX	9.12	5.67	-.59	.42	-.72	-3.13	-2.64	-.15
VIII and X	11.90	7.59	4.73	4.42	2.15	-1.77	-4.02	.26
VIII and XI	10.68	6.26	1.16	6.57	1.45	-5.35	-.86	.85
IX and X	4.14	2.43	5.30	4.36	3.34	1.62	-1.39	.41
IX and XI	2.65	1.24	1.72	5.55	2.38	-2.83	1.33	1.01
X and XI	-1.40	-.96	-3.28	1.57	-.57	-4.31	2.41	.56
XII and XIII	4.30	4.83	6.63	-1.72	5.29	-5.57	-2.28	-.22
XII and XIV	7.91	3.95	8.37	1.93	6.36	3.75	-2.93	-2.54
XII and XV	7.23	5.83	5.79	6.95	7.97	6.19	-2.72	.18
XIII and XIV	2.04	-.65	2.74	4.03	1.51	-.79	-.97	-3.02
XIII and XV	1.79	1.69	.21	9.56	3.87	2.20	-.86	.50
XIV and XV	-.07	2.19	-1.95	5.45	2.45	2.49	-.03	3.01

Read table thus: The ratio, $\frac{D}{\text{Sigma (Diff.)}}$, between Division I and Division II is 6.28 for English IX, 5.37 for English X, etc. A ratio of 3.0 signifies complete reliability. Ratios marked with a minus sign indicate that the ratio is in favor of the second group named, while all other ratios are in favor of the first group named.

Tables XVI, XVII, and XVIII show the comparisons made in this study figured out on the basis of the number of chances in 100 that the larger schools, or the schools of higher classification, will outrank the schools of less size, or of lower classification. It should be remembered in reading these tables that a score of 100 indicates complete reliability that the larger school will outscore the smaller one, while a score of 50 indicates that the chances are exactly even, or that the smaller school will win the same number of times as will the larger school.

In studying these last three tables, the reader is at once struck by the number of times the figure "100" is used in naming chances in 100 that the larger school will excel. The number is used a total of 200 times on the three tables combined, and it appears with a minus sign only 33 out of the 200 times. This seems to indicate a fairly constant tendency for the larger schools to outscore the smaller schools, or at least a tendency to outscore them more decisively.

Studying Tables XVI, XVII, and XVIII collectively, we find that Division I, the Class A schools of Kansas, outscored Division II, the Class B schools of Kansas in 19 out of 24 times. There was complete reliability in 13 out of these 19 times, while in the 7 times that the Class B schools excelled, there was complete reliability in only 3 cases. Division I outscored Division III, the Class C schools of Kansas, 20 times out of 24, the chances being 100 out of 100 in 14 of the 20 cases. The chances that Class C would excel were 100 out of 100 in only 2 of its 4 chances.

Division II exceeded Division III in 16 out of the 24 comparisons, there being complete reliability in 8 of the 16 cases. This would seem to

indicate that there is not as much difference between the two lower classified groups as there is between the Class A group and either the Class B or the Class C group.

Division IV, representing the Class A schools of Kansas that belong to the North Central Association, outscored Division V, the Class A schools of Kansas that do not belong to the North Central Association, 16 out of 24 times. Division VI, representing the North Central schools of 250 or more population from all of the six states used in this study, likewise outscored Division VII, the North Central Schools of less than 250 population, in 16 out of 24 chances. This seems to indicate a fairly definite trend among the schools of higher rank for the larger ones to outscore the smaller ones.

Divisions VIII to XI, inclusive, include all schools from the State of Kansas only, divided according to enrollment, Division VIII being the schools of 250 or more population, and Division XI representing the schools of 0 to 69 population. Tabulation shows that the larger schools held the advantage over the smaller schools in 104 out of 134 comparisons. There is no marked consistency with which groups of certain sizes outscored groups next in size, excepting that the differences between the two smallest groups seem to be a little less marked than that existing between the others.

Divisions XII to XV refer to all schools from outside of the state of Kansas, which were included in this study. Division XII represents the largest schools and Division XV the smallest ones. A comparison of these two divisions shows that the larger schools outscored the smaller schools in 102 out of the 134 chances, or in 76 per cent of the cases. The results

in this comparison are almost exactly like the results obtained when a comparison was made between the schools of Kansas, grouped according to size. This, again, indicates the consistency with which certain trends of the larger schools to outscore the smaller ones holds true. A total of all of the comparisons made in Tables XVI, XVII, and XVIII shows that the division containing the larger or higher classified schools exceeded the others in 295 out of 408 comparisons, or in 71⅓ per cent of the cases.

Studying these same tables from the standpoint of subjects shows fairly consistent results. We find that in English IX the larger schools excelled in 45 out of 51 chances, or in 88 per cent of the cases. In English X the larger schools excelled in 45 out of 51 chances. The larger schools outscored the smaller schools in 41 out of 51 chances in Algebra, and in 43 out of 51 comparisons in Geometry. In American History the larger schools excelled in 43 out of 51 chances or in 84 per cent of the cases.

Biology and Typewriting show a significantly different result in that the advantage swings sharply to the smaller schools. In Biology the larger schools exceeded the smaller schools in only 19 out of 51 comparisons, or in 37 per cent of the cases, while in Typewriting the larger schools outscored the smaller schools in only 13 out of 51 chances, or in 25 per cent of the cases. In World History the advantage goes back to the larger schools again by a score of 44 out of 51 cases. Figure 1, which follows, brings out this relationship between comparisons by subjects, in graphic form.

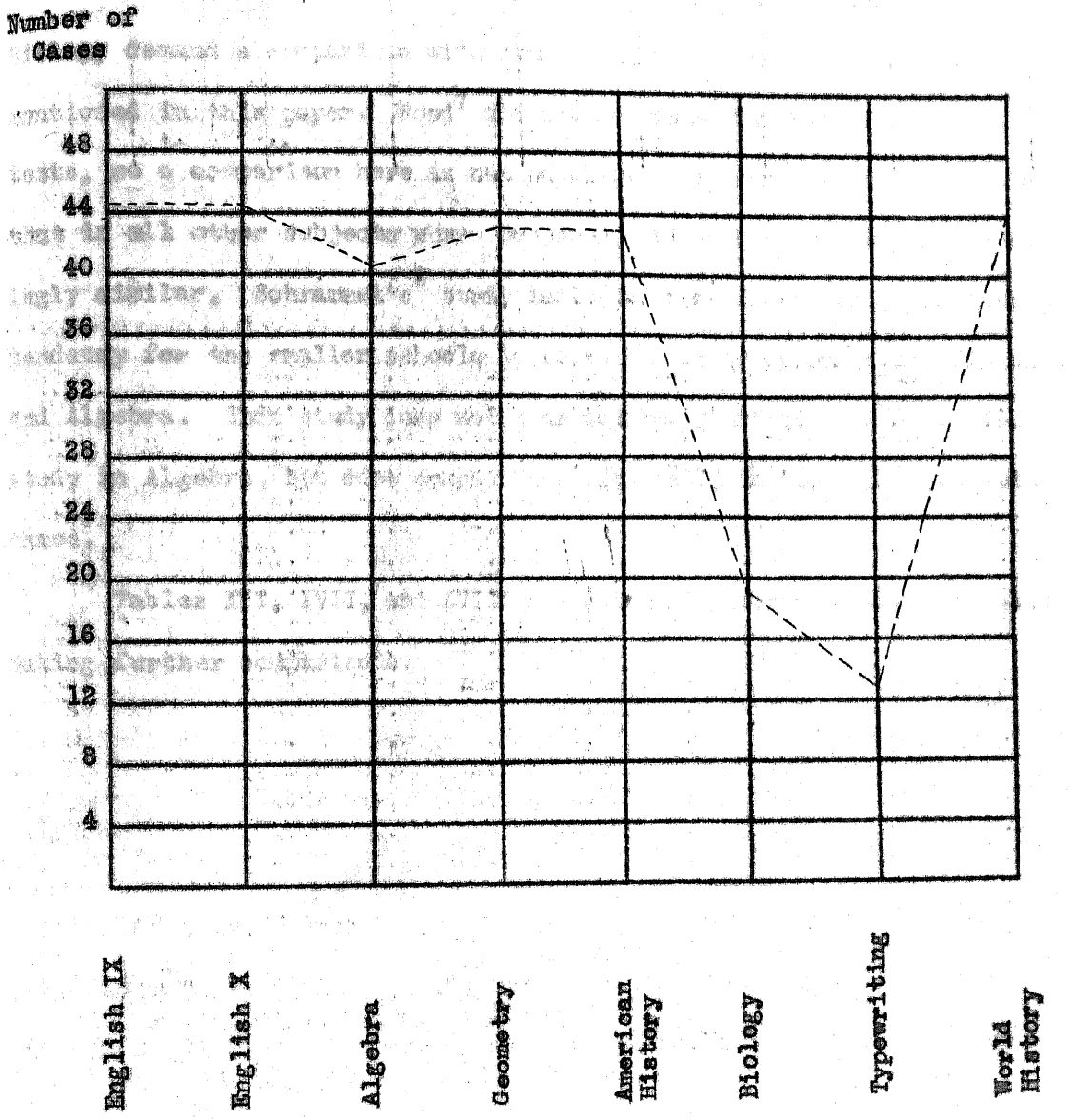

FIGURE 1

NUMBER OF TIMES, IN 51 COMPARISONS BY SUBJECTS, THAT A DIVISION CONTAINING THE LARGER OR HIGHER CLASSIFIED SCHOOLS HAS EXCELLED A DIVISION MADE UP OF SMALLER OR LOWER CLASSIFIED SCHOOLS

The information found concerning the scores in Typewriting and Biology demand a comparison with results found in other studies, previously mentioned in this paper. Wood[7] did not use these two subjects in his tests, so a comparison here is not possible. However, it is noticeable that in all other subjects where comparison is possible, results are strikingly similar. Schrammel's[8] study indicated that there was a persistent tendency for the smaller schools to score higher in Typewriting, Biology, and Algebra. This study does not bear out the findings of the previous study in Algebra, but does compare very favorably in the other subjects named.

Tables XVI, XVII, and XVIII are given here for the reader's use in making further comparisons.

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[7] Wood, op. cit.

[8] Schrammel, op. cit.

TABLE XVI

BASIC DATA FOR COMPARING THE ACHIEVEMENT OF VARIOUS DIVISIONS OF SCHOOLS ON THE JANUARY, 1935, EVERY PUPIL SCHOLARSHIP TESTS, BY MEANS OF NUMBER OF CHANCES IN 100 OF A TRUE DIFFERENCE

	Eng. IX	Eng. X	Alg.	Geom.	Am. Hist.	Biol.	Type.	World Hist.
I and II	100	100	98.6	100	98	54	62	99.7
I and III	93	100	99.7	100	100	90	-83	100
II and III	-97	98.6	86	-85	100	86	-84	98.9
IV and V	100	65	99.4	98	50	-93	-95	65
VI and VII	100	98	96	100	100	-100	-96	100
VIII and IX	100	99.7	-64	100	-52	-99.2	-71	82
VIII and X	100	100	100	100	100	100	-96	100
VIII and XI	100	100	-58	100	100	-98.5	-93	100
IX and X	-51	100	100	89	100	100	-91	100
IX and XI	82	100	54	99.3	100	54	60	100
X and XI	84	100	-100	89	62	-100	-88	80
XII and XIII	98	79	100	99.4	-71	100	89	100
XII and XIV	100	100	100	100	100	100	-99.4	100
XII and XV	99.7	100	-56	100	79	77	-86	98
XIII and XIV	99.4	100	-98	100	100	-92	-100	-100
XIII and XV	84	100	-100	99.5	89	-100	-97	-91
XIV and XV	-87	93	-99.7	-99.4	-100	-100	76	62

Read table thus: In comparing Division I with Division II the chances are 100 in 100 that Division I will be better in English IX; 100 in 100 that Division I will be better than Division II in English X, 98.6 in 100 that Division I will exceed Division II in Algebra, etc.

A minus sign preceding a number indicates that the second named division is better than the first. In all others the advantage is in favor of the first division named.

TABLE XVII

BASIC DATA FOR COMPARING THE ACHIEVEMENT OF VARIOUS DIVISIONS OF SCHOOLS ON THE APRIL, 1935, EVERY PUPIL SCHOLARSHIP TESTS, BY MEANS OF THE NUMBER OF CHANCES IN 100 OF A TRUE DIFFERENCE

	Eng. IX	Eng. X	Alg.	Geom.	Am. Hist.	Biol.	Type.	World Hist.
I and II	100	100	100	100	100	-100	-100	100
I and III	100	100	100	100	100	-100	98.6	100
II and III	100	100	100	-97	-98	-97	100	98.9
IV and V	100	91	100	100	100	-100	-99.7	85
VI and VII	100	-100	73	-69	85	-100	-100	98
VIII and IX	100	98	100	95	100	-100	-100	65
VIII and X	100	100	100	100	100	-100	-100	100
VIII and XI	100	100	100	100	100	-100	-99.5	100
IX and X	99.3	100	74	100	100	99.7	-95	100
IX and XI	100	100	100	100	100	-67	52	100
X and XI	100	100	100	54	-51	-99.9	89	98.6
XII and XIII	100	100	65	100	98.7	-100	99.5	93
XII and XIV	99.9	94	98	100	100	-100	-88	100
XII and XV	100	100	99.8	100	100	100	-54	100
XIII and XIV	-71	-99.7	94	74	98.8	77	-100	100
XIII and XV	76	-82	98.9	62	100	100	-98.6	100
XIV and XV	88	98	65	-58	97	100	100	69

Read table thus: In comparing Division I with Division II the chances are 100 in 100 that Division I will excel Division II in English IX, 100 in 100 that Division I will excel Division II in English X, and 100 in 100 that they will be better than Division II in Algebra, etc.

A minus sign before a number indicates that the second named division excels the first named division. In all others the advantage is in favor of the first named division.

TABLE XVIII

BASIC DATA FOR COMPARING THE ACHIEVEMENT OF VARIOUS DIVISIONS OF SCHOOLS ON THE JANUARY, 1936, EVERY PUPIL SCHOLARSHIP TESTS, BY MEANS OF THE NUMBER OF CHANCES IN 100 OF A TRUE DIFFERENCE

	Eng. IX	Eng. X	Alg.	Geom.	Am. Hist.	Biol.	Type.	World Hist.
I and II	100	100	99.7	100	100	-100	-58	-99.7
I and III	100	100	100	100	99.8	-100	-67	99.7
II and III	76	96	100	100	54	-74	-60	100
IV and V	100	99.7	99.4	-67	-58	-99.3	-100	99.4
VI and VII	100	99.2	100	-76	54	-51	99.6	64
VIII and IX	100	100	-75	65	-76	-100	-99.6	-56
VIII and X	100	100	100	100	98.6	-96	-100	60
VIII and XI	100	100	87	100	93	-100	-80	80
IX and X	100	99.2	100	100	100	94	-92	65
IX and XI	99.6	89	96	100	99.2	-99.7	91	84
X and XI	-92	-83	-100	94	-71	-100	99.2	71
XII and XIII	100	100	100	-96	100	-100	-98.9	-58
XII and XIV	100	100	100	97	100	100	-99.8	-99.4
XII and XV	100	100	100	100	100	100	-99.7	58
XIII and XIV	98	-74	99.7	100	93	-79	-83	-100
XIII and XV	96	96	58	100	100	98.6	-80	69
XIV and XV	-52	98.6	-98	100	99.3	99.4	-52	100

Read table thus: In comparing Division I with Division II the chances are 100 in 100 that Division I will excel Division II in English IX, 100 in 100 that Division I will excel in English X, and 99.7 in 100 that Division I will be better than Division II in Algebra, etc.

A number preceded by a minus sign indicates that the advantage is in favor of the second division named. All others are in favor of the first named division.

CHAPTER IV

CONCLUSIONS

In conclusion, it may be stated that in achievement as measured on results obtained in the Nation-wide Every Pupil Scholarship Tests of January, 1935, April, 1935, and January, 1936, the larger schools seem to have very definitely outscored the smaller schools. The results are quite similar when measured on the basis of classification, which referred only to the schools of Kansas, or on size, which included all of the schools of the six states being studied in this thesis. It is obvious that in most cases the larger schools are also the higher classified schools, so there is certain to be some overlapping of comparisons when the various divisions are being studied.

On the basis of the eight subjects studied and the three testing periods covered, one must reach the obvious conclusion that the pupils from the larger and better classified schools have the advantage. It should be remembered that the exception in this study is in the subjects of Biology and Typewriting, where it has again been demonstrated that pupils from the smaller schools excel. In all other subjects, namely, English IX, English X, Geometry, American History, World History, and Algebra, the chances are definitely in favor of the larger schools, Algebra rating a little lower than the others named. A summary of the chances, heretofore listed, shows that the students from the larger schools hold the advantage in about the ratio of 71 to 29, or 7 to 3.

Why do the larger and better classified schools excel in these scholarship tests? It is not the purpose of this study to answer this question, although some of the possible reasons may be mentioned. Is it because the larger schools have better trained and more experienced teachers than do the smaller schools? Is it because the larger schools have more and better equipment? Is the longer tenure of teachers in the larger schools an advantage? Do pupils learn better in large classes? Are Biology and Typewriting subjects in which classes should be smaller, thus making it possible to give more personal attention to the student? Do the pupils who enter high school in the larger centers have a better background for high school work than those from smaller places? Does the difference exist because of better supervision in the larger schools? These and other questions that may arise can only be answered by another study. Suffice it to say that as far as this study is concerned, differences in achievement between pupils in large and small schools do exist, and the advantages for the most part lie with the pupil from the larger school.

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