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A Study of The Relative Achievement of Pupils In Class A, Class B, and Class C High Schools In The State of Kansas

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A STUDY OF THE RELATIVE ACHIEVEMENT OF PUPILS IN CLASS A, CLASS B, AND CLASS C HIGH SCHOOLS IN THE STATE OF KANSAS

being

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by

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TABLE OF CONTENTS

LIST OF TABLES

CHAPTER I

INTRODUCTION

The Department of Education of the State of Kansas classifies high schools of the State into three groups, namely, class A, class B, and class C. This classification is based on teaching staff, supervision and administration, furnishings and equipment, records and reports, promotion and graduation.[1] The public is generally of the opinion that the pupil achievement in a class A high school is better than in a class B high school, and in a class B high school better than in a class C high school. An examination of the above standards for classifying high schools also leads one to the same conclusion.

Whether any difference of achievement exists between these three classes of high schools has lead the writer to study the question. Specifically stated the problem of this thesis concerns itself with the relative achievement of pupils in class A, B, and C high schools in the State of Kansas, as measured by the students entrance exam-

1. Handbook of Organization and Practices, 1934, for the Secondary Schools of Kansas, Kansas State Board of Education, pp. 49-58.

inations and their grades made in the Fort Hays Kansas State College at Hays, Kansas.

However, the thesis does not include all of the high schools of the state but only high schools from which students were enrolled in regular work at the Fort Hays Kansas State College. The number of students included in this survey is 1204 from 224 different high schools from all sections of the State of Kansas. However, 184 of the high schools represented were in the western half of the State. In this study the word "achievement" is interpreted to mean mastery of subject matter.

The writer wishes to call attention to a similar study dealing with similar aspects of this thesis. Harry L. Bos[2] conducted a similar survey among the men students of the freshman class of 1932 at the University of Michigan, in which he concluded,

> "The students from the larger high schools were somewhat superior both in results of a psychological examination and in honor point achievement in various subjects on entrance examinations, but the students from the smaller schools made more progress and surpassed the students from the larger schools."

Beginning the the fall semester of 1930 the Fort Hays Kansas State College gave entrance examinations to all

2. Bos, Henry L., A study of the comparative honor points made during the freshman year at the University of Michigan by graduates of small high schools and large high schools. Master's Thesis, 1932, University of Michigan.

freshmen who enrolled for work in the college. The tests were administered to all freshmen under uniform conditions regardless of the class of high school from which they came. The tests were scored and the scores recorded in the office of the registrar. The statistics used in this thesis were taken from this source and covered the five year period from 1930 to 1934, inclusive.

The entrance examinations for the years 1930 to 1933, inclusive, were the Sones-Harry High School Achievement Tests. The intelligence tests used in conjunction with the Sones-Harry High School Achievement Tests were for the year of 1930, the Army Group Examination Alpha, for the years of 1931 and 1932, the Psychological Examination for High School Graduates and College Freshmen, for the year of 1933, the Henmon-Nelson Tests of Mental Ability. The tests for the school year of 1934 were composed by the different faculty groups of the Fort Hays Kansas State College. The mental test used in conjunction with these tests was the Henmon-Nelson Tests of Mental Ability.

The data were divided into three divisions for this thesis. The first division consists of comparisons in achievement, division two is a comparison of college grade points, and division three is a comparison of correlations of achievements with mental test scores.

The scores on the tests for each subject were grouped

into groups A, B, and C, which groups corresponded to the classifications of the high schools from which the students were graduated. The scores for each subject in each group for each year were put into separate distributions. From these distributions the mean grades and the standard deviations were computed. From these facts comparisons were made between class A, class B, and class C students in each subject score, total score and mental test score.

The total achievement score and mental score of each student from each group of the same year were put into a scatter diagram. From this scatter diagram the coefficient of correlation between achievement and mental test was computed. From these facts comparisons were made between groups of the same year.

The college grade points for each group for the entire five years were put into separate distributions. From these distributions the mean grades and the standard deviations were computed. Comparisons of these facts were made and the reliability of all the comparisons was computed.

It is from these figures and facts that the writer hopes to come to some conclusions as to the relative achievement of pupils in class A, class B, and class C high schools in Kansas.

CHAPTER II

COMPARISONS OF ACHIEVEMENT

Test Results - 1930

The entrance examinations were given to all freshmen who entered in the fall semester of 1930 and covered the following subjects: English, mathematics, science, and social science together with the mental test. In order adequately to compare the achievement of these students from these three classes of high schools they were divided into three groups. The scores made in each test in each subject by each of the groups were placed in separate distributions. From these distributions the mean and standard deviations for each subject in each class were determined. In Table I are shown the results of these distributions and the schools are compared with each other, that is, school A with B, school B with C, and school A with C. The footnote for Table I explains how it is read.

Comparing the means of the scores in the same subjects for the different classes in the five tests given the writer finds the following differences between Class A and class B in favor of class A: English 5.32, science 1.87, social science 7.39, mental 5.81. The subjects that showed any appreciable difference are English and social science.

TABLE I

RESULTS OF THE COLLEGE ENTRANCE EXAMINATIONS FOR 1930[1]

Comparisons between students from
class A schools and class B schools

	English	Mathematics	Science	Social Science	Totals	Mental T	Cases
Class A Mean	56.05	29.62	32.95	43.50	159.50	125.55	120
Class A Sigma	20.30	10.02	9.90	14.50	443.20	35.60	
Class B Mean	50.73	30.69	31.08	36.11	146.64	119.74	76
Class B Sigma	19.10	10.80	9.27	15.55	46.50	25.25	
Diff. of Means	5.32	1.07	1.87	7.39	12.86	5.81	
Critical Ratio	1.85	.69	1.29	3.32	1.93	1.33	

1. The table is read horizontally across the page as follows: the first line represents freshmen from class A high schools who made a mean or average score of 56.05 in English, 29.62 in mathematics, 32.95 in science, and so on across the page. These averages were obtained from a group of 120 cases as shown by the last vertical column. Line 2, students from class A high schools had the following standard deviations, English 20.30, etc The next two lines give the means and standard deviations for the class B schools. Line 5 is the difference obtained between the means or average grade of Class A schools and class B schools. Subtracting class B mean (50.73) from class A mean (56.05 we get 5.32, the difference between the means. The same process is followed for each test given. The last line, critical ratio, is a measure of the reliability of the difference between the means. This is obtained by dividing the difference obtained between the means by the standard error of the difference. To be reliable this ratio should be 3.

TABLE I (Continued)

RESULTS OF THE COLLEGE ENTRANCE EXAMINATIONS FOR 1930

Comparisons between students from class B schools and class C schools

	English	Mathematics	Science	Social Science	Totals	Mental T	Cases
Class B Mean	50.73	30.69	31.08	36.11	146.64	119.74	76
Class B Sigma	19.10	10.80	9.27	15.55	46.55	25.25	
Class C Mean	61.50	30.40	31.00	48.50	172.50	118.50	10
Class C Sigma	20.60	7.08	10.80	8.91	45.45	25.45	
Diff. of Means	10.77	.29	.08	12.39	25.86	1.24	
Critical Ratio	1.56	.11	.02	3.72	1.90	.14	

Comparisons between students from class A schools and class C schools

	English	Mathematics	Science	Social Science	Totals	Mental T	Cases
Class A Mean	56.05	29.62	32.95	43.50	159.50	125.55	120
Class A Sigma	20.30	10.02	9.90	14.50	43.20	35.60	
Class C Mean	61.50	30.40	31.00	48.50	172.50	118.50	10
Class C Sigma	20.60	7.08	10.80	8.91	45.45	25.45	
Diff. of Means	5.45	.78	1.95	5.00	13.00	7.05	
Critical Ratio	.80	.32	.60	1.61	1.00	.81	

The critical ratio, which is a measure of the reliability of the difference of the means, is for English 1.85 and, for social science 3.32. According to Garrett[2] and as shown in Table II this means that there are 96 chances out of 100 that class A students are better than class B students in English. This is not reliable but does show a trend. In social science there are 99.9 chances out of 100.0 that the class A students are better than class B students. This is significant and it can safely be said that for this year's tests in social science the students from the class A high schools were better prepared than the students from the class B high schools.

The students from the class A high schools having established themselves as superior in the social sciences, the next question to consider is: how did the two classes compare mentally? The class A studentshad a higher average score by 5.81 in the mental test. Interpreted this means there are 90 chances out of 100 that the class A students were endowed with a greater mentality. With these facts in mind one should expect the students from the class A high schools to do better than the students from the class B high schools.

Comparing the means of the scores of the same subjects

2. Garrett, Henry E., Statistics in Psychology and Education. New York, Longmans Green and Co., 1926. p. 134.

TABLE II

CHANCES OUT OF 100 THAT A TRUE DIFFERENCE EXISTS BETWEEN CLASSES[2]

1930

	English	Mathematics	Science	Social Science	Totals	Mental Test
A better than B	96	25	90	99	97	90
B better than A	04	75	10	01	03	10
B better than C	06	46	50	01	03	45
C better than B	94	54	50	99	97	55
A better than C	22	38	72	06	16	79
C better than A	78	62	28	94	84	21

2. The table is read as follows: in the first line there are 96 chances out of 100 that a true difference exists between students from class A high schools and class B high schools in English in favor of class A. This also means if a similar test were to be given to the same group or a similar group there would be 96 chances out of 100 that the same results would be obtained. While this does not indicate perfect reliability it does indicate a trend. The remaining portion of the table is similarly read.

in the five tests given the following notable differences occur in favor of class C: English 10.77 and social science 12.39. There are 94 chances out of 100 that class C is better in English and 99.9 chances out of 100 that they are better in the social sciences. Classes B and C are as near equal mentally as two unselected groups of this size could be expected to be.

The only appreciable difference that occurs between class A and class C is in social science in favor of class A. This difference is not significant but does indicate a trend.

Summarizing the results of the tests given in the fall semester of 1930 the only significant difference that occurred is that students from the class A and C high schools have a better knowledge of the social sciences than the students from the class B high schools. Other differences occur but are not large enough to be reliable.

Test Results - 1931

In the fall semester of 1931 achievement tests were given to all freshmen. The tests were the Sones-Harry High School Achievement Tests. The Psychological Examination for High School Graduates and College Freshmen was used in conjunction with the other tests. The results of these tests are given in Tables III and IV. These tables are read the same as Tables I and II.

TABLE III

RESULTS OF THE COLLEGE ENTRANCE EXAMINATIONS FOR 1931

Comparisons between students from class A schools and class B schools

	English	Mathematics	Science	Social Science	Totals	Mental T.	Cases
Class A Mean	47.71	25.00	26.18	32.29	133.60	110.00	114
Class A Sigma	18.50	10.26	8.82	14.70	41.80	46.50	
Class B Mean	49.00	24.90	30.80	37.40	141.00	124.70	64
Class B Sigma	24.40	9.42	9.80	15.50	45.00	51.00	
Diff. of Means	1.29	.10	4.62	5.11	7.40	14.70	
Critical Ratio	.41	.06	3.10	2.15	1.08	1.90	

Comparisons between students from class B schools and class C schools

	English	Mathematics	Science	Social Science	Totals	Mental T.	Cases
Class B Mean	49.00	24.90	30.80	37.40	141.00	124.70	64
Class B Sigma	20.40	9.42	9.80	15.50	45.00	51.00	
Class C Mean	55.40	27.00	27.50	45.40	152.50	128.75	12
Class C Sigma	18.50	9.30	6.80	19.00	46.00	49.50	
Diff. of Means	6.40	2.10	3.30	8.00	11.50	4.05	
Critical Ratio	1.08	.71	1.44	1.38	.76	.26	

TABLE III (Continued)

RESULTS OF THE COLLEGE ENTRANCE EXAMINATIONS FOR 1931

	English	Mathematics	Science	Social Science	Totals	Mental T.	Cases
Class A Mean	47.71	25.00	26.18	32.29	133.50	110.00	114
Class A Sigma	18.50	10.26	8.82	14.70	41.80	46.50	
Class C Mean	55.40	27.00	27.50	45.40	152.50	128.75	12
Class C Sigma	18.50	9.30	6.80	19.00	46.00	49.50	
Diff. of Means	7.69	2.00	1.32	13.11	18.90	18.75	
Critical Ratio	1.36	.70	.62	2.32	1.36	1.25	

It is interesting to note that the findings for the year 1930 are reversed for 1931. While classes A and C excelled class B the previous fall the reverse is true for most cases in the fall of 1931.

Differences that are great enough to be significant between class A and class B were in science and social science where the critical ratios were 3.1 and 2.15 respectively in favor of class B. The chances are 99 and 98 out of 100, respectively, that a true difference existed

Between class B high schools and class C high schools no significant differences occur. Class C shows a trend to be better than class B in the social sciences.

Comparing class A high schools and class C high schools the only differences occurring that are reliable are in English and social science in favor of class C. In English the difference is not so significant but indicates a trend while in social science there are 98 chances out of 100 that the difference in favor of class C is reliable.

Comparing the three groups as to native intelligence the students from the class B schools appear to have the advantage. There are 97 chances out of 100 in favor of class B over class A. This is a reliable difference and class B would be expected to do better.

Summarizing, it is interesting to note that where any reliable difference occurs class B leads in science and

TABLE IV

CHANCES OUT OF 100 THAT A TRUE DIFFERENCE EXISTS BETWEEN CLASSES

1931

	English	Mathematics	Science	Social Science	Totals	Mental Test
A better than B	35	52	01	02	15	13
B better than A	65	68	99	98	85	97
B better than C	15	24	92	09	23	60
C better than B	85	76	08	91	77	40
A better than C	09	25	27	02	09	11
C better than A	91	75	73	98	91	89

class C in social science and English. The differences between the three classes of schools in the other subjects are not large enough to be reliable.

Test Results - 1932

The achievement tests used the fall of 1932 were the Sones-Harry High School Achievement Tests. The mental test used was the Psychological Examination for High School Graduates and College Freshmen. The tests were given to all freshmen in the following subjects: English, mathematics, science, social science, and the mental test. The results of these tests are shown in Tables V and VI. These tables are read in the same manner as Tables I and II.

Comparing the means of the scores of the same subjects in the five tests between class A and class B, the only differences that approach a reliability are in English and mathematics. The students from the class A high schools averaged 6.91 and 3.36 respectively higher than the students from the class B high schools. This means there are 99 and 98 chances respectively out of 100 that the difference is reliable. While this is not perfect reliability it does show that students from the class A schools have a better knowledge of the two subjects mentioned.

Comparing the menas of the scores in the same subjects between class B and class C the only difference that ap-

TABLE V

RESULTS OF THE COLLEGE ENTRANCE EXAMINATIONS FOR 1932

Comparisons between students from class A schools and class B schools

	English	Mathematics	Science	Social Science	Totals	Mental T.	Cases
Class A Mean	51.16	28.10	30.33	39.69	148.22	139.89	131
Class A Sigma	21.20	10.10	10.35	15.96	45.90	47.80	
Class B Mean	44.25	24.74	29.73	38.12	136.07	135.00	56
Class B Sigma	13.54	10.14	9.93	15.87	52.35	45.00	
Diff. of Means	6.91	3.36	.60	1.57	12.15	4.89	
Critical Ratio	2.65	2.07	.36	.79	1.54	.66	

Comparisons between students from class B schools and class C schools

	English	Mathematics	Science	Social Science	Totals	Mental T.	Cases
Class B Mean	44.25	24.74	29.73	38.12	136.07	135.00	56
Class B Sigma	13.54	10.14	9.93	15.87	52.35	45.00	
Class C Mean	42.77	29.17	30.00	39.17	140.00	113.80	18
Class C Sigma	8.90	10.05	9.75	15.30	44.50	36.10	
Diff. of Means	1.48	4.43	.27	1.55	3.93	21.20	
Critical Ratio	.53	1.63	.10	.40	.31	2.04	

TABLE V (Continued)

RESULTS OF THE COLLEGE ENTRANCE EXAMINATIONS FOR 1932

Comparisons between students from
class A schools and class B schools

	English	Mathematics	Science	Social Science	Totals	Mental T.	Cases
Class A Mean	51.16	28.10	30.33	39.69	148.22	139.89	131
Class A Sigma	21.20	10.10	10.35	15.96	45.90	47.80	
Class C Mean	42.77	29.17	30.00	39.67	140.00	113.80	18
Class C Sigma	8.90	10.05	9.75	15.30	44.50	36.10	
Diff. of Means	8.39	1.07	.33	.02	8.22	26.09	
Critical Ratio	2.96	.46	.13	.01	.74	2.76	

TABLE V (Continued)

RESULTS OF THE COLLEGE ENTRANCE EXAMINATIONS FOR 1932

Comparisons between students from
class A schools and class B schools

	English	Mathematics	Science	Social Science	Totals	Mental T.	Cases
Class A Mean	51.16	28.10	30.33	39.69	148.22	139.89	131
Class A Sigma	21.20	10.10	10.35	15.96	45.90	47.80	
Class C Mean	42.77	29.17	30.00	39.67	140.00	113.80	18
Class C Sigma	8.90	10.05	9.75	15.30	44.50	36.10	
Diff. of Means	8.39	1.07	.33	.02	8.22	26.09	
Critical Ratio	2.96	.46	.13	.01	.74	2.76	

proaches reliability is in mathematics. The students from the class C schools averaged 4.43 higher than did the class B students. There are 94 chances out of 100 that the class C students have a better knowledge of mathematics. It is interesting to note that class C's difference over B is greater than class A's difference over B, yet the reliability of C's difference is less. This is due to the difference in numbers of the three classes. Class C may show a larger average score yet have a smaller critical ratio due to the fact that there are quite a few less class C students in the survey.

Comparing the menas of the scores for all subjects between class A and class C the only difference that approaches reliability is in English. Class A have a higher average score of 8.39 which means there are 99 chances out of 100 that they are better in English. The differences of the means of the other subjects do not show any appreciable difference.

Comparing the results of the mental test between the three classes no great difference occurs between Class A and class B. Both classes A and B have a higher mental score than class C. There are 99 and 98 chances, respectively, out of 100 that classes A and B have a greater mental ability. From these facts it would appear that classes

TABLE VI

CHANCES OUT OF 100 THAT A TRUE DIFFERENCE EXISTS BETWEEN CLASSES

	English	Mathematice	Science	Social Science	Totals	Mental T.
A better than B	99	98	64	81	93	74
B better than A	01	02	36	19	07	26
B better than C	70	06	47	35	38	98
C better than B	30	94	53	65	62	02
A better than C	99	34	55	50	77	99
C better than A	01	66	45	50	23	01

A and B should have shown better average scores in all subjects. This they failed to do except in English.

Test Results - 1933

The achievement tests used in the fall of 1933 were the Sones-Harry High School Achievement Tests. The mental test used was the Henmon-Nelson Tests of Mental Ability. The tests were given to all freshmen in the following subjects: English, mathematics, science, social science and the mental test. The results of these tests are shown in Tables VII and VIII. These tables are read in the same manner as Tables I and II.

Comparing the means of the scores for all subjects between class A and class B no appreciable difference occurs. Class A have a slightly higher mean score in all subjects but in none of the subjects is this difference reliable. The mental score of class B is 3.8 higher than class A which indicates that there are 98 chances out of 100 that the difference obtained between class C and class B is reliable. The results of the mental test are not indicative of any difference of mentality between the two groups.

Between class A and class C the only differences that approach reliability are in English and social science in favor of class C. The difference of the means of the scores in English is 7.22 and in social science 7.55. In English

Comparisons between students from
class A schools and class B schools

	English	Mathematics	Science	Social Science	Totals	Mental T.	Cases
Class A Mean	41.64	30.32	31.50	46.05	149.70	59.70	144
Class A Sigma	15.00	12.55	10.45	16.25	45.90	13.48	
Class B Mean	40.27	29.79	30.32	44.05	140.74	53.50	94
Class B Sigma	13.55	10.65	8.90	15.10	40.65	12.24	
Diff. of Means	1.37	.62	1.18	2.00	8.96	3.80	
Critical Ratio	.67	.41	.93	.97	1.58	2.26	

Comparisons between students from
class B schools and class C schools

	English	Mathematics	Science	Social Science	Totals	Mental T.	Cases
Class B Mean	40.27	29.70	30.32	44.05	140.74	63.50	94
Class B Sigma	13.55	10.65	8.90	15.10	40.65	12.24	
Class C Mean	48.86	31.20	32.23	53.60	164.10	61.33	19
Class C Sigma	15.40	8.05	7.90	14.45	29.90	15.30	
Diff. of Means	8.59	1.50	1.91	9.55	23.36	2.17	
Critical Ratio	2.17	.65	.92	2.55	2.84	.57	

TABLE VII (Continued)

RESULTS OF THE COLLEGE ENTRANCE EXAMINATIONS FOR 1933

Comparisons between students from
class A schools and class C schools

	English	Mathematics	Science	Social Science	Totals	Mental T.	Cases
Class A Mean	41.64	30.32	31.50	46.05	149.70	59.70	144
Class A Sigma	15.00	12.55	10.45	16.25	45.90	13.48	
Class C Mean	48.86	31.20	32.23	53.60	164.10	61.63	19
Class C Sigma	15.40	8.05	7.90	14.45	29.90	15.30	
Diff. of Means	7.22	.88	.73	7.55	14.40	1.63	
Critical Ratio	1.88	.40	.35	2.06	1.79	.46	

TABLE VIII

CHANCES OUT OF 100 THAT A TRUE DIFFERENCE EXISTS BETWEEN CLASSES

1933

	English	Mathematics	Science	Social Science	Totals	Mental T.
A better than B	74	65	82	83	94	02
B better than A	26	35	18	17	06	98
B better than C	02	25	18	01	01	71
C better than B	98	75	82	99	99	29
A better than C	04	35	37	02	04	33
C better than A	96	65	63	98	96	67

this difference shows a trend in favor of class C. The difference in social science is indicative of some difference as shown in Table VIII.

Summarizing the results of the tests given the fall of 1933 the students from the class C high schools have the advantage in English and in social science and class A students have the lowest mental grade and therefore would not be expected to do quite as good work.

Test Results - 1934

The achievement tests given to all freshmen in the fall of 1934 were composed by the various faculty groups. Tests were given in English, humanities, social science, biological science, physical science, and the mental test. Results of the scores on these tests are given in Tables IX and X. They are read in the same manner as Tables I and II.

Comparing the means for all subjects between class A and class B, an appreciable difference occurs in only two subjects. In English the class A mean exceeds that of class B by 3.21 with a critical ratio of 1.33. There are 90 chances out of 100 that this difference is reliable. This is indicative of a trend in favor of class A in English. In social science the class B mean exceeds that of class A by 6.10 with a critical ratio of 3.06. There are 99 chances

RESULTS OF THE COLLEGE ENTRANCE EXAMINATIONS FOR 1934

Comparison between students from class A schools and class B schools

	Humanities	English	Social Science	Biologic. Science	Physical Science	Totals	Mental T.	Cases
Class A Mean	60.07	89.93	44.00	51.20	33.72	293.33	57.50	217
Class A Sigma	21.70	18.70	16.35	11.49	14.20	66.00	13.53	
Class B Mean	56.86	91.32	50.10	51.50	32.80	284.30	55.00	118
Class B Sigma	20.65	18.20	16.85	12.36	11.45	28.60	13.52	
Diff.of Means	3.21	1.39	6.10	.30	.92	9.03	2.50	
Critical Ratio	1.33	.66	3.06	.31	.64	1.72	1.61	

Comparisons between students from class B schools and class C schools

	Humanities	English	Social Science	Biologic. Science	Physical Science	Totals	Mental T.	Cases
Class B. Mean	56.68	91.32	50.10	51.50	32.80	284.30	55.00	118
Class B Sigma	20.65	18.20	16.85	12.36	11.45	29.60	13.52	
Class C Mean	55.00	88.80	48.90	49.60	36.84	277.40	51.80	30
Class C Sigma	18.30	21.25	16.10	11.82	14.80	62.00	15.00	
Diff. of Means	1.86	2.52	1.20	1.90	4.04	6.90	3.20	
Critical Ratio	.48	.59	.37	.78	1.39	.59	1.06	

TABLE IX (Continued)

RESULTS OF THE COLLEGE ENTRANCE EXAMINATIONS FOR 1934

Comparisons between students from
class A schools and class C schools

	Humanities	English	Social Science	Biologic. Science	Physical Science	Totals	Mental T.	Cases
Class A Mean	60.07	89.93	44.00	51.20	33.72	293.33	57.50	217
Class A Sigma	21.70	18.70	16.35	11.49	14.20	66.00	13.53	
Class C Mean	55.00	88.00	48.90	49.60	36.84	277.40	51.80	30
Class C Sigma	18.30	21.25	16.10	11.82	14.80	62.00	15.00	
Diff. of Means	5.07	1.93	4.90	1.60	3.12	15.93	5.70	
Critical Ratio	1.39	.47	1.65	.74	1.09	1.31	1.96	

out of 100 that the obtained difference is reliable. From this it is reliable to say that the students from class B schools for the year of 1934 had more knowledge of the social sciences.

Comparing the means for all subjects between class B and class C appreciable difference occurs only in physical science where the class C mean exceeds that of the class B mean by 4.04 with a critical ratio of 1.39. This is not indicative of any great difference but only points to a slight trend in favor of class C in physical science.

Comparing the means for all subjects between class A and class C appreciable differences occur only in two subjects. In English the class A mean exceeds that of class C by 5.07 with a critical ratio of 1.39. There are 94 chances out of 100 that the students from the class A schools are superior in English. This is not indicative of any great difference but only points to a trend in favor of class A. In social science the class C mean exceeds that of class A by 4.90 with a critical ratio of 1.65. There are 95 chances out of 100 that the obtained difference is true. Again this is not indicative of any great difference but indicates a trend in favor of class C.

Summarizing the results of the fall tests in 1934 the following facts are apparent, the students from class A high

TABLE I

CHANCES OUT OF 100 THAT A TRUE DIFFERENCE EXISTS BETWEEN CLASSES

1934

	Humanities	English	Social Science	Biologic. Science	Physical Science	Totals	Mental T.
A better than B	90	26	01	38	73	95	94
B better than A	10	74	99	62	27	05	06
B better than C	68	72	64	78	99	72	85
C better than B	32	28	34	22	91	28	15
A better than C	91	68	05	77	14	90	97
C better than A	09	32	95	23	86	10	03

schools were superior in humanities. The students from the class B high schools were superior in social science with class C a very few points behind. The students from class C high schools did better work in physical science. The results of the Henmon-Nelson Tests of Mental Ability show that the students from class A schools have the greater mental ability. There are 94 chances out of 100 that the students from the class A schools have more mental ability than the students from the class B schools. There are 97 chances out of 100 that the students from the class A schools have more mental ability than the students from the class C schools. From these facts we should expect the students from the class A high schools for this year to do a better grade of work and have higher average scores.

CHAPTER III

COLLEGE GRADE POINTS

To determine what degree of achievement the students from class A, class B, and class C high schools have attained in their college work, the college grade points of all students included in the survey for the years 1930 to 1934, inclusive, were investigated. This includes all the grades made by the students in the survey up to and including the spring semester grades in 1935. This survey includes 1204 students distributed as follows, 712 students from class A high schools, 405 students from class B high schools, and 87 students from class C high schools.

The college grade points for all students in each class for all years were put into separate distributions, that is, there were three distributions, one for class A, class B and class C. Each distribution had all grade points for the five years included. The college grade points were put into three distributions in order to get a greater number of cases in each distribution and thereby insure a higher degree of accuracy.

Comparing the means of the college grade points of class A, class B, and class C, the results are as follows, the students from the class C high schools have the high-

TABLE XI

COLLEGE GRADE POINTS FROM 1930 TO 1934 INCLUSIVE

Results of Distributions[1]

Class	Cases	Means	Standard Deviation
A	712	3.15	.71
B	405	3.21	.66
C	87	3.28	.73

Comparisons between students from[2] all three classes of high schools

Classes	Difference of Means	Critical Ratio	Chances out of 100	In Favor of
A & B	.06	1.46	92	B
B & C	.07	.85	80	C
A & C	.13	1.60	94	C

1. The table is read as follows beginning with line one across the page: There are 712 students from class A schools included in the survey who made an average grade point of 3.15. A grade of "A" made at the Fort Hays Kansas State College stands for 5 grade points. These same students had a standard deviation of .71. The other two lines are similarily read.
2. The table is read as follows beginning with line one across the page: The difference obtained between the average grade point of class A and class B is .06. They have a critical ratio of 1.46 which is a measure of the reliability of this difference. There are 92 chances out of 100 that the obtained difference in favor of class B is reliable. The rest of the table is similarily read.

est mean grade point, the students from the class B high schools have the second highest mean grade point and the students from the class A high schools have the lowest mean grade point.

The difference of the means between class A and class B is .06 with a critical ratio of 1.46. This means there are 92 chances out of 100 that the obtained difference between classes A and B in favor of B are reliable.

The difference of the means between class B and class C is .07 with a critical ratio of .85. The obtained difference is quite low and indicates very little if any difference between class B and class C.

The difference of the means between class A and class C is .13 with a critical ratio of 1.60. This means there are 94 chances out of 100 that the obtained difference in favor of class C is reliable. Again as in the other two comparisons this difference is not great but it is indicative of a trend in favor of class C.

From the above statistics it would seem that the classification of the high school from which the student attends has very little if any bearing on his achievement in college.

If there was any difference between students from class A, class B, and class C high schools who attended the Fort Hays Kansas State College from 1930 to 1934, inclusive, such difference did not occur in achievement as measured by college grade points.

CHAPTER IV

CORRELATION OF TOTAL ACHIEVEMENT SCORES AND MENTAL SCORES

All other factors being equal one would expect a student with a high mental score to achieve more in school than a student with a low mental score. Whether or not the students from class A, class B, or class C high schools were capitalizing on their mental abilities is the object of this chapter.

The total scores made on the achievement tests for each class for each year were put into separate scatter diagrams with the corresponding mental grade. Fifteen scatter diagrams were made, one for each class for each year of the survery.

Results of Scatter Diagrams - 1930

The results of the scatter diagrams for 1930 are shown in Table XII. An explanation of how to interpret the table is given in a footnote below the table.

Comparing the differences of the coefficients between class A and class B no appreciable difference occurs.

Comparing the difference of the coefficients between class B and class C a difference of .22 in favor of class C

TABLE XII

CORRELATION OF ACHIEVEMENT SCORES AND MENTAL SCORES FOR 1930

Results of Scatter Diagrams[1]

Class	Cases	Coefficient of Correlation	Probable Error
A	120	.72	.03
B	76	.66	.05
C	10	.88	.05

Comparisons between students from[2] all three classes of high schools

Classes	Difference of Coefficients	Critical Ratio	Chances out of 100	In Favor of
A & B	.06	.83	72	A
B & C	.22	2.39	95	C
A & C	.16	2.00	91	C

1. The table is read as follows beginning with line one across the page, there are 120 class A students who had a coefficient of correlation of .72 between their total achievement scores and mental scores. Had they had a perfect correlation the coefficient would have been 1. The last number in the line, .03, is the probable error which means according to Garrett to quote "To be reasonably sure that there is some correlation present an obtained coefficient should be at least 4 times its (PE) probable error."
2. The table is read as follows beginning with line one across the page, the difference obtained between the coefficients of correlation between class A and class B is .06 with a critical ratio of .83 which is a measure of the reliability of this difference. There are 72 chances out of 100 in favor of class A that the obtained difference is reliable. The rest of the table is similarily read.

occurs. There are 95 chances out of 100 that this obtained difference is reliable. From this it may be said that the students from the class C high schools had a higher correlation between mental ability and achievement.

Comparing the difference of the coefficients of correlation between class A and class C a difference of .16 occurs in favor of class C. There are 91 chances out of 100 that the obtained difference is reliable. While this is not perfect reliability it indicates a rather strong trend in favor of class C.

Results of Scatter Diagram - 1931

The results of the scatter diagrams for 1931 are shown in Table XIII. This table is read in the same manner as Table XII.

Comparing the difference of the coefficients of correlation between all three classes only one difference occurs that is appreciable. The difference of the coefficients between class A and class B is .10 in favor of class B. This means that there are 88 chances out of 100 that the obtained difference is reliable. While this is not perfect reliability it does indicate a strong trend in favor of the students from the class B high schools.

Comparing the difference of the coefficients between class B and class C, and class A and class C, no reliable difference occurs.

TABLE XIII

CORRELATION OF ACHIEVEMENT SCORES AND MENTAL SCORES FOR 1931

Results of Scatter Diagrams

Class	Cases	Coefficient of Correlation	Probable Error
A	114	.71	.03
B	64	.81	.03
C	12	.78	.07

Comparisons between students from all three classes of high schools

Classes	Difference of Coefficients	Critical Ratio	Chances out of 100	In Favor of
A & B	.10	1.76	88	B
B & C	.03	.25	57	C
A & C	.07	.59	69	C

The results of the correlations between achievement scores and mental scores for 1931 give the students from class B high schools the highest correlation.

Results of Scatter Diagrams - 1932

The results of the scatter diagrams are given in Table XIV. This table is read the same as Table XII.

The difference of the coefficients of correlation between class A and class B is .10 with a critical ratio of 1.56. There are 85 chances out of 100 that the obtained difference in favor of class B is reliable.

The differences of the coefficients between class B and class C, class A and class C, are not appreciable.

The results of the correlations for 1932 give the students from the class B high schools the highest coefficient of correlation.

Results of Scatter Diagrams - 1933

The results of the scatter diagrams are given in Table XV. This table is read the same as Table XII.

The difference of the coefficients of correlation between class A and class B is .01. This difference is too small to be reliable and does not indicate any reliable difference.

The difference of the coefficients of correlation between class B and class C is .06 with a critical ratio of

TABLE XIV

CORRELATION OF ACHIEVEMENT SCORES AND MENTAL SCORES FOR 1932

Results of Scatter Diagrams

Class	Cases	Coefficients of Correlation	Probable Error
A	131	.67	.02
B	56	.77	.04
C	18	.75	.07

Comparisons between students from all three classes of high schools

Classes	Difference of Coefficients	Critical Ratio	Chances out of 100	In Favor of
A & B	.10	1.56	85	B
B & C	.02	.45	62	B
A & C	.08	.70	68	C

TABLE XV

CORRELATION OF ACHIEVEMENT SCORES AND MENTAL SCORES FOR 1933

Results of Scatter Diagrams

Class	Cases	Coefficients of Correlation	Probable Error
A	144	.71	.03
B	94	.70	.04
C	19	.64	.01

Comparisons between students from all three classes of high schools

Classes	Difference of Coefficients	Critical Ratio	Chances out of 100	In Favor of
A & B	.01	.15	54	A
B & C	.06	1.20	79	B
A & C	.07	1.47	84	A

1.20. There are 79 chances out of 100 that the obtained difference is reliable. This is not considered significant of any difference.

The difference of the coefficient of correlation between class A and class C is .07 with a critical ratio of 1.47. There are 84 chances out of 100 that the obtained difference is reliable. This difference shows a trend in favor of class A.

The results of the correlations for 1933 show that the students from the class A high schools have the highest coefficient of correlation between achievement and mental score. However, class B is only .01 of a point below class A.

Results of Scatter Diagrams - 1934

The results of the scatter diagrams for the year 1934 are given in Table XVI. This table is read in the same manner as Table XII.

Comparing the differences of the coefficients of correlation between class A, class B, and class C in the three combinations no significant differences occur.

Class C has the highest correlation but the difference between class C and the other two classes is very small and not indicative of any reliable difference.

Considering all of the correlations for the five year period, trends do occur in favor of one or the other of the three classes of high schools in the comparisons of the dif-

TABLE XVI

CORRELATION OF ACHIEVEMENT SCORES AND MENTAL SCORES FOR 1934

Results of Scatter Diagrams

Class	Cases	Coefficient of Correlation	Probable Error
A	217	.69	.02
B	118	.65	.04
C	30	.71	.06

Comparisons between students from all three classes of high schools

Classes	Difference of Coefficients	Critical Ratio	Chances out of 100	In Favor of
A & B	.04	.70	68	A
B & C	.06	.58	66	C
A & C	.02	.21	55	C

ferences of the coefficients of correlation of the total achievement scores and mental scores. However, no absolute reliable significant differences occured.

CHAPTER V

SUMMARY AND CONCLUSIONS

In this the closing chapter the author presents his conclusions to the problem of the thesis as stated in the introduction. This being the first attempt made to test the relative achievement between the three classes (A, B, C) of high schools in Kansas as judged by standardized tests, the author believes the results are reliable for the following reasons. First, 1224 students from 224 high schools from all sections of the state were included in the survey. The students and schools were distributed as follows: 712 students from 101 class A high schools, 405 students from 72 class B high schools, and 87 students from 51 class C high schools. The writer believes this to be a fair sampling. Statistical treatment also proves reliability.

According to Garrett[1] when the obtained difference of two means is divided by the standard deviation of the difference if the resulting ratio is 3, it is indicative of complete reliability. Above this is to be taken as

1. Garrett, Henry E., Statistics in Psychology and Education. New York, Longmans Green and Co., 1926, p. 132.

indicating just so much added reliability, below this ratio arises the probabilities of reliability.

Comparing the freshman achievement tests between class A, class B, and class C high schools for the five years 63 comparisons were made. From these 63 comparisons only four had a ratio of 3 or larger which would indicate significant reliable differences. These four differences were distributed as follows: class A, 1; class B, 2; and class C, 1. Comparing the mental abilities of the different classes no significant reliable differences occurred.

The writer concludes when out of 63 comparisons between three classes only four significant differences occur and they were about equally distributed that no real difference of achievement exists between the students from the three classes (A, B, C) of high schools.

If one wishes to go into the probabilities of a difference occurring the following facts may be considered. Considering 97 chances out of 100 as reliable the results are 12 differences out of 63 comparisons. They are distributed as follows: class A, 4; class B, 3; and class C, 5. Carrying the probabilities of a difference to a still lower order of reliability, that of 75 chances out of 100 that a difference exists, one finds 37 differences out of 63 comparisons. They are distributed as follows: class A, 12; class B, 6; and class C, 19. A careful inspection of the

above possibilities of a difference occurring in favor of one class, none occur. Class C's chances rise but they are not reliable.

There are 10 differences when 75 chances out of 100 are considered reliable differences in mental ability. These 10 differences are distributed as follows: class A, 5; class B, 4; and class C, 1. If probable chances are to be considered concerning achievement and mental ability class C students are achieving more with less mentality.

Comparing the correlation of achievement scores and mental scores for the five years no significant reliable differences occur between class A, class B and class C. This means that in the application of their mental abilities to their school subjects no differences occur.

Considering the probabilities of a difference occurring the author finds that out of 75 chances out of 100 of a difference existing that 9 probabilities occur. They are equally distributed between the classes. There are then no probabilities of a difference existing between the classes of high schools in favor of one class in the correlation of total achievement scores and mental scores.

Comparing the college grade points made by the students in the survey no significant reliable differences occur in favor of any one class.

If probabilities are to be considered there are 94 chances out of 100 that the class C's achievement is greater than class A's. There are 80 chances out of 100 that class C's achievement is greater than class B's. There are 92 chances out of 100 that class B's achievement is greater than class A's.

If one wishes to consider probabilities the conclusion concerning them would be, students from class C high schools rank first in college achievement, students from the class B high schools rank second in college achievement, and the students from the class A high schools rank third in college achievement.

A final conclusion is, considering the instruments of measure reliable, the 1224 students from 224 high schools as a fair sampling that there are no appreciable differences in achievement between students from class A, class B and class C high schools in Kansas.

As the results of these conclusions the author does not recommend under any circumstances the lowering of the standards for classifying high schools in Kansas. There are in all probabilities other factors at work in our high schools that tend to level the average achievement. Differences might occur between class A, class B, and class C high schools in the development of leadership through extra-curricular activities or other methods. Such differences are beyond the scope of this thesis.

However, the author is of the opinion that too much stress has been placed on the differences between class A, class B, and class C high schools when the results of this thesis show that if any such differences exist they are not in the mastery of subject matter.

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