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A COMPARATIVE STUDY OF THE INTELLIGENCE QUOTIENTS AND GRADES OF HIGH SCHOOL PUPILS ON SPECIAL COURSES AND THOSE ON ACADEMIC COURSES

by

Dale Prout

Contributions of the Graduate School
Indiana State Teachers College
Number 81

Submitted in Partial Fulfillment
of the Requirements for the
Master of Science Degree
in Education

1932

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The writer wishes to express his grateful appreciation to Mr. E. L. Abell and to Dr. J. R. Shannon for their many and valued suggestions. The writer also wishes to express his appreciation to Mr. E. E. Ramsey, who aided the writer in gaining access to the various schools. The schools, from which the data for this thesis were collected, are: Manual Training, Arsenal Technical, and George Washington High School of Indianapolis; Gerstmeyer of Terre Haute; and the Logansport High School. The superintendents, principals, and office staffs, of the above schools, have been extremely courteous and helpful in permitting and facilitating in every way possible the writer's use of their records.

Dale Prout

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I. INTRODUCTION

A. Considerations Leading to Study

Several times during his under-graduate course, the writer has heard the following question inferred, if not openly asked: "Are the students on vocational courses as intelligent as the students on academic courses?" The writer, having a second major in industrial arts, naturally resented the above assertion, and so determined to investigate the question, if the opportunity ever presented itself. The writer also has taught students who were good in an academic subject, but poor in a special subject, and vice versa. Therefore, he wondered whether academic students taking special subjects made lower grades (on the average) in the special work than they did in the academic work. Also, he wondered whether special students taking academic work made lower grades (on the average) in the academic work than they did in the special work.

B. Review of Literature in the Field

Intelligence testing, as a part of high-school procedure, began only five or six years ago. Even to-day there are city high schools that do not give intelligence tests, and very few of the small high schools have or maintain a regular testing program. Consequently, the literature available in this field is limited.

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Mr. Pintner says, "Intelligence varies according to the course of study elected in high school, those scoring highest tending to be found in the more abstract courses and those scoring lowest in the more practical courses, with much overlapping among all courses."[1]

In one discussion of intelligence among high-school pupils, Dr. R. S. Clark says, "The above figure seems to indicate that pupils who have survived the requirements of the General Course are a more intelligent and homogeneous group than were those who graduated from the specialized High School courses which require less academic training."[2] Clark gives the average I. Q.'s of those graduating from various courses:

Course	Average I. Q.	N.
General	114.5	151
Commercial	109.4	102
Technical	108.9	100
Ind. Arts	103.1	34
Dressmaking	97.4	51

In another discussion, Dr. Clark states, "In conclusion one may state that the High School Academic Course adapts itself to students with intelligence above the average for

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1 Rudolph Pinter, Intelligence Testing Methods and Results (New York: Henry Holt and Co., 1931) p. 283

2 Dr. Ruth Swan Clark, "Some Results of Psychological Tests Given to Groups of Public School Pupils of New York City," Contributions to Education, N. Y. Soc. for the Exper. Study of Ed., Vol. 1, p. 105.

those of their age. Moreover, selection within the course seems to be based upon the possession of general intelligence. On the other hand, while special courses such as the Commercial, the Technical, the Industrial Arts, and the Dressmaking require general intelligence of an average and high average degree, selection within these courses does not seem to be based upon this factor alone. In general, it is apparent that high schools are not adapting their courses to train students of a general intelligence below the average. Such a student has one chance in 150 to graduate from a Academic Course, but three times as many chances to graduate from a Technical Course and five times as many chances to graduate from a Commercial Course."[3]

The St. Louis Report gives the median I. Q.'s for those entering the various courses:[4]

Course	Median I. Q.	N.
Scientific	109.8	228
General	106.3	2,107
Classical	106.1	52
Commercial	103.2	806
Manual Training	102.5	655
Art	102.1	235
Home Economics	100.5	296

Dr. W. F. Book says, "That the classical, academic, and

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3 Dr. Ruth Swan Clark, "A Glimpse of High School Courses as Measured by the Otis Test," Journal of Applied Psychology, June, 1922, p. 191.

4 Division of Tests and Measurements, Public School Messenger. Board of Education, St. Louis. Vol. 23, No. 1, PP. 45-47.

scientific courses, if taken as a whole, attracted the ablest students graduating from the high schools of the state last year, that the group of students completing a vocational course rank lowest on the intelligence test, and that the students electing a general and college preparatory or commercial course rank somewhere between these other groups."[5]

Mr. Proctor lists the mental age of pupils selecting the various courses[6]:

Course	Mental Age
Four Year Latin	15 - 1
Four Year Modern Language	14 - 11
Four Year Commercial	14 - 9
Four Year Technical	14 - 5
Two Year Commercial	13 - 7
Two Year Technical	13 - 5

C. The Problem

The problem is a comparison of the intelligence quotients of pupils majoring in special courses, namely, industrial arts and commerce, with those majoring in academic subjects.

The problem is also a comparison of the pupils' grades in the special subjects with their grades in the academic subjects.

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5 Dr. W. F. Book, The Intelligence of High School Seniors (New York: The MacMillan Co., 1922) p. 156.

6 W. M. Proctor, "Psychological Tests and Guidance of High School Pupils," Journal of Educational Research, Mon. I, 1921, p. 16.

D. Method of Procedure

Take a letter to the superintendent of the schools selected for the study asking his coöperation in the enterprize.

Collect the I. Q.'s and grades of such schools as have determined the I. Q.'s of their pupils and have fully organized departments in the special subjects.

Organization and statistical treatment of data as follows:

a. If a student has taken six or more terms of work in a special subject, count that subject his major.

b. Illustration of data by means of tables and figures.

c. Discussion of data and statistical treatment of same.

Draw conclusions.

II. A COMPARISON OF THE INTELLIGENCE QUOTIENTS OF ACADEMIC, COMMERCIAL, AND INDUSTRIAL ARTS STUDENTS

A. Discussion of Distribution of Data

Academic. Table I, page 7, shows that there is an unequal number of academic students from each school. Also that the means and medians of the I. Q.'s of these students vary with the school; schools A, B, and C (which are located in the same city) having higher means and medians than schools D and E.[1] The total number of academic students studied was 198, there being 107 students from school A, 11 from school B, 17 from school C, 3 from school D, and 60 from school E. The means and medians of the academic students are discussed later in relation to the means and medians of the commercial and industrial arts students.

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[1] This difference in intelligence may be due to the fact that the tests were given by the school authorities of each school. Each school did not give the same intelligence tests, although there was some duplication. Again this difference may actually exist, for Dr. W. F. Book in, "The Intelligence of High School Seniors", says, on page 264, that there is not only a difference in intelligence between communities, but also between schools in the same community.

TABLE I

DISTRIBUTION OF INTELLIGENCE QUOTIENTS OF ACADEMIC STUDENTS OF SCHOOLS A, B, C, D, AND E

I.Q.'s	A	B	C	D	E	Total in all schools
150-159	1					1
140-149	3					3
130-139	15		2			17
120-129	16	1	6		1	24
110-119	30	5	5	2	6	48
100-109	26	4	3		16	49
90- 99	6	1	1	1	15	24
80- 89	9				19	28
70- 79	1				2	3
60- 69					1	1
Total	107	11	17	3	60	198
Mean	113.56	109.95	117.44	107.33	95.33	108.08
Median	113.83	111.00	119.00	112.50	95.33	108.77

Commercial. Table II, page 9, shows the frequency distribution for the commercial students of each school. This table shows the same thing as Table I in regard to the number of cases and their means and medians, i.e., the means and medians of schools, A, B, and C are higher than the means and medians of schools, D and E. There are 33 commercial students from school A, 84 from school B, 71 from school C, 15 from school D, and 17 from school E, or a total of 220 commercial students. The means and medians of the commercial students are discussed later in relation to the means and medians of the academic and industrial arts students.

TABLE II

DISTRIBUTION OF INTELLIGENCE QUOTIENTS OF COMMERCE STUDENTS OF SCHOOLS A, B, C, D, AND E

I.Q.'s	A	B	C	D	E	Total in all schools
150-159						
140-149	1	2	2			5
130-139		5	2			7
120-129	4	10	12	1		27
110-119	15	27	9		1	52
100-109	7	27	28	7	2	71
90- 99	5	12	9	5		31
80- 89	1	1	7	1	14	24
70- 79			2	1		3
Total	33	84	71	15	17	220
Mean	110.56	111.16	107.03	99.16	88.62	107.18
Median	112.33	110.74	106.25	100.71	88.07	107.32

Industrial Arts. Table III, page 11, shows the frequency distribution of all the industrial arts students. Here, as in Tables I, and II, the means and the medians of schools, A, B, and C are higher than the means and the medians of schools, D and E. There are 17 students from school A, 104 from school B, 30 from school C, 32 from school D, and 11 from school E, making a total of 198 industrial arts students. The I. Q.'s of the industrial arts students are compared later with the I. Q.'s of the academic and commercial students.

TABLE III

DISTRIBUTION OF INTELLIGENCE QUOTIENTS OF INDUSTRIAL ARTS STUDENTS OF SCHOOLS A, B, C, D, AND E

I.Q.'s	A	B	C	D	E	Total in all schools
150-159		1				1
140-149		1				1
130-139		2				2
120-129	1	16	4	2		23
110-119	4	27	6	4		41
100-109	6	39	12	6	3	66
90- 99	4	13	3	8		28
80- 89	1	5	4	5	6	21
70- 79	1		1	6	2	10
60- 69				1		1
Total	17	104	30	32	11	194
Mean	102.73	109.40	104.50	94.50	87.23	104.60
Median	104.17	108.72	105.83	96.25	85.83	105.61

B. School A

Academic. According to Figure 1, page 13, there are 107 academic students from school A. The range in the distribution of I. Q.'s is from 70 to 160, the arithmetic mean being 113.566. The median (Table I, page 7) is 113.83.

Commercial. There are 33 commercial students (Figure 2, page 14) in school A. The range in the distribution of I. Q.'s is 80 to 150, the arithmetic mean being 110.56. The median (Table II, page 9) is 112.33.

Industrial Arts. The range of I. Q.'s of industrial arts students of school A (Figure 3, page 14) is from 70 to 130. The mean of the 17 students is 102.735, while the median is 112.33 (Table III, page 11).

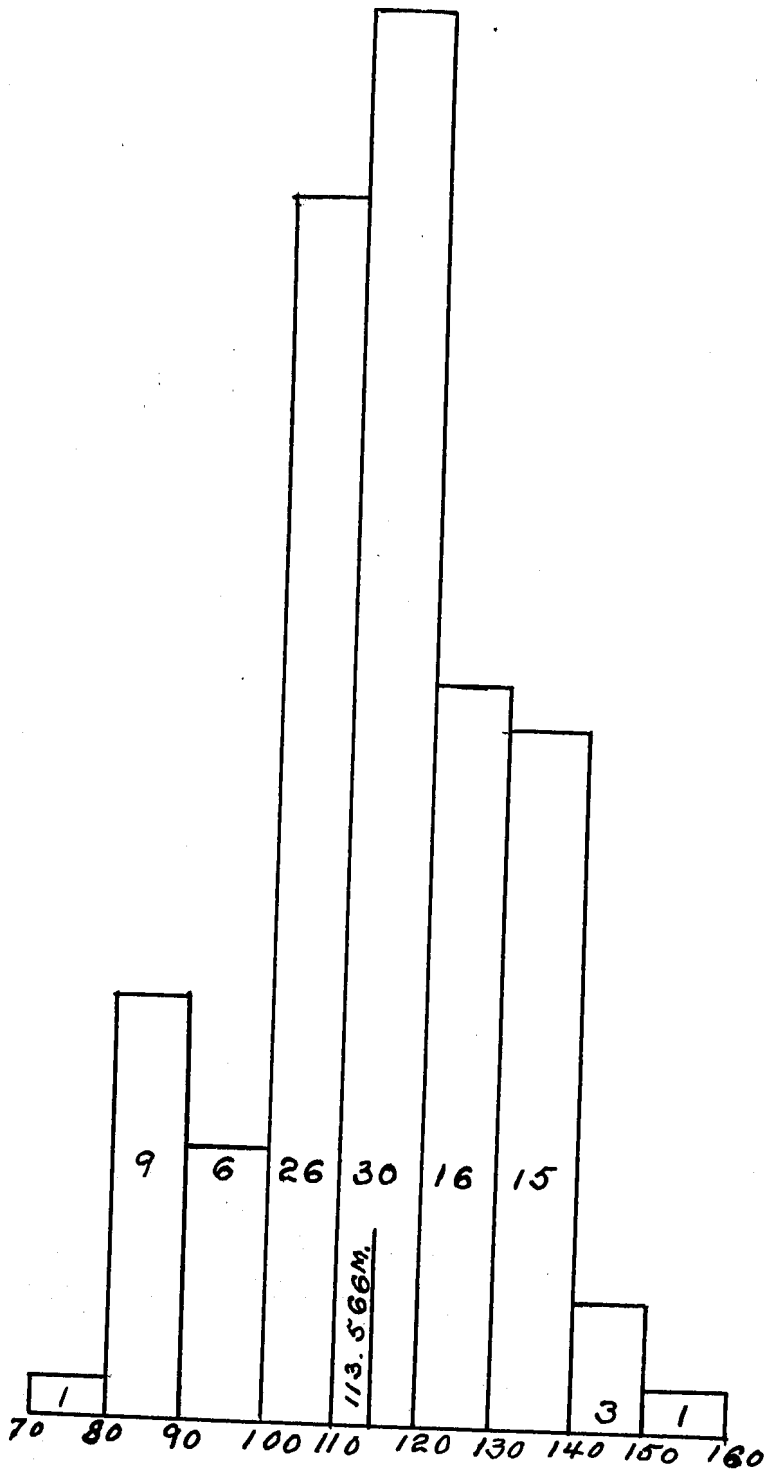

Figure 1. Distribution of intelligence quotients of 107 academic students of school A.

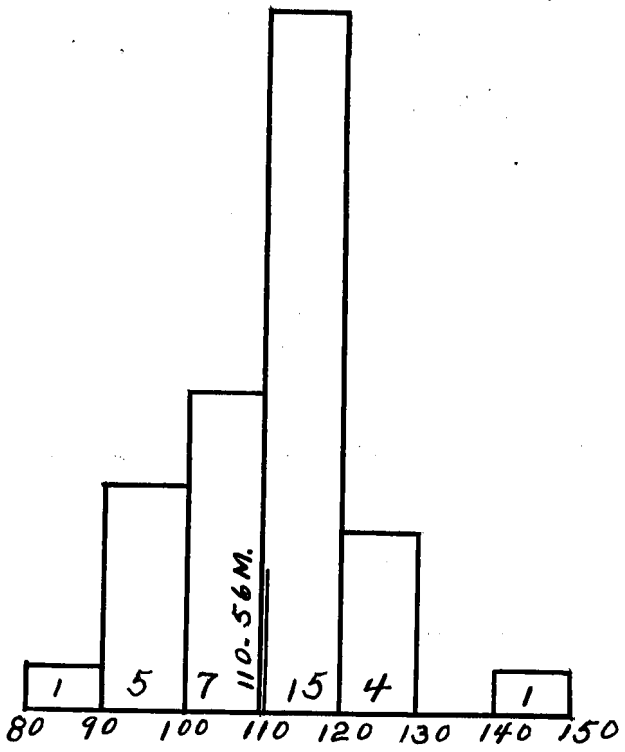

Figure 2. Distribution of intelligence quotients of 33 commercial students of school A.

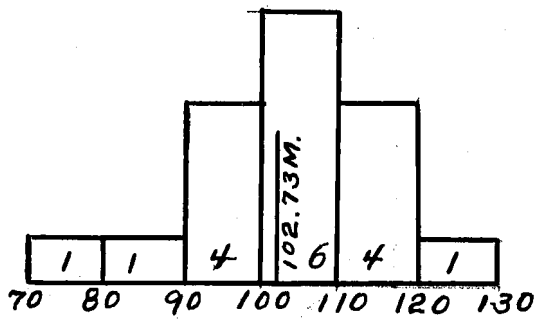

Figure 3. Distribution of intelligence quotients of 17 industrial arts students of school A.

TABLE IV

PERCENTAGE DISTRIBUTION OF INTELLIGENCE QUOTIENTS OF SCHOOL A

Number of students	Academic 107	Commercial 33	Industrial Arts 17
I.Q.'s	%	%	%
150-159	.93		
140-149	2.80	3.03	
130-139	14.02		
120-129	14.95	12.12	5.88
110-119	28.04	45.45	23.52
100-109	24.30	21.21	35.29
90- 99	5.61	15.15	23.52
80- 89	8.41	3.03	5.88
70- 79	.93		5.88
Total	99.99	99.99	99.97

A General Discussion of Table IV. As we have already said, the number of students in the various courses of school A are of an unequal number. Would the results have been the same if there had been the same number of students in each course? We do not have any method of answering this question. Therefore, Table IV, page 15, which shows the per cent of I. Q.'s in each step interval was prepared. The step-interval 110-119 was chosen for purposes of comparison because it contains the means and medians of two of the courses, namely academic and commercial students. According to the table, 32.70% of the I. Q.'s of the academic students are above this interval, while only 15.15% of the commercial students are above the same step-interval. The industrial arts students have 5.88% of their I. Q.'s above the interval. The range above this step-interval is more scattered, i.e., extends higher in the academic field than it does in either the commercial or industrial arts field. In the academic field, 39.25% of the I. Q.'s are below the interval. There are 39.39% of the commercial I. Q.'s below the step-interval, and 70.57% of the industrial arts I. Q.'s below the interval.

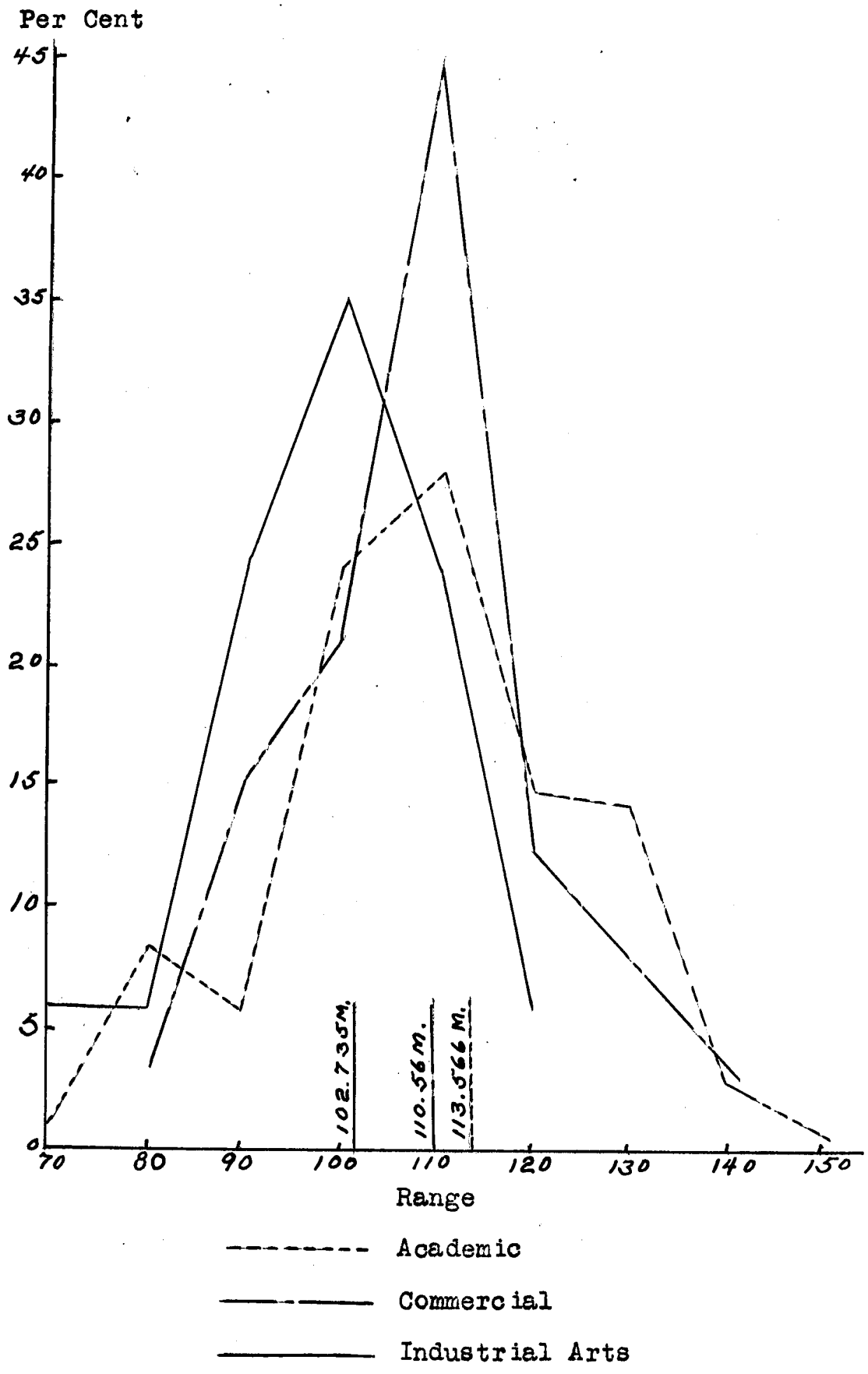

Figure 4. Percentage distribution of intelligence quotients of school A. (Figure 4 is based upon Table IV).

A Discussion of Figure 4. Figure 4 is based upon the percentage distribution of I. Q.'s as given in Table IV, page 17. This figure does not require a detailed explanation, for it is self-explanatory. Furthermore, it shows the same thing as Table IV, except that it is in graphic form. The vertical scale represents the percentage of I. Q.'s, while the base line represents the distribution of I. Q.'s. The academic students have the broadest base, their range being from 70-150. The commercial students are next with a range extending from 80-140. The range of the industrial arts students is 70-120. Figure 4 also gives the arithmetic mean of each of the courses.

Discussion of Data of School A. Undoubtedly, the unequal number of students has some effect upon the means and medians of the different courses. The academic students, numbering 107, have the largest number, the commercial are next with 33, while there are only 17 industrial arts students.

The means and medians of school A, in the order of their rank, are:

Course	Mean	Median
1. Academic	113.56	113.83
2. Commercial	110.56	112.33
3. Ind. Arts	102.75	104.17

The reliability of the difference between the means was calculated by the formula given by Garrett.[2] The results of the true difference was referred to Table XIV of Garrett.[3]

According to a comparison of the means, the chances are 88 in 100 (in favor of the academic students) that the true difference between the academic and the commercial students is "significant". The academic students are also ahead of the industrial arts students. The chances are 100 in 100 that the true difference is "significant".

The commercial students have a higher mean than do the industrial arts students. Here the chances are 99 in 100 that the true difference is "significant".

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2 Henry E. Garrett, Statistics in Psychology and Education (New York: Longmans and Co., 1931), p. 130.

3 Ibid., p. 134.

In other words, we must rank the academic students first, the commercial second, and the industrial arts third in the order of their general intelligence as a group when we compare the data of school A.

C. School B

Academic. According to Figure 5, page 22, there are 11 academic students from school B. The range in the distribution of I. Q.'s is from 90-130. The arithmetic mean is 109.955, while the median is 111.00 (Table I, page 7).

Commercial. There are 84 commercial students (Figure 6, page 22) in school B. The range in the distribution of I. Q.'s is 80-150. The arithmetic mean is 111.167, while the median (Table II, page 9) is 110.74.

Industrial Arts. The range of the I. Q.'s of industrial arts students of school B (Figure 7, page 23) is from 80-160. The arithmetic mean of the 104 students is 109.404, while the median is 108.72 (Table III, page 11).

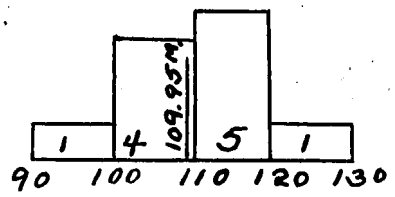

Figure 5. Distribution of intelligence quotients of 11 academic students of school B.

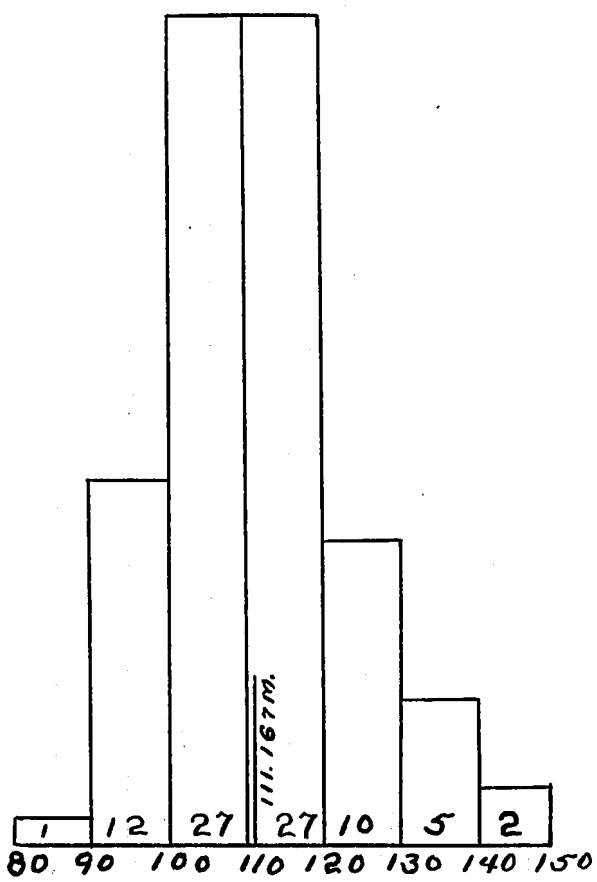

Figure 6. Distribution of intelligence quotients of 84 commercial students of school B.

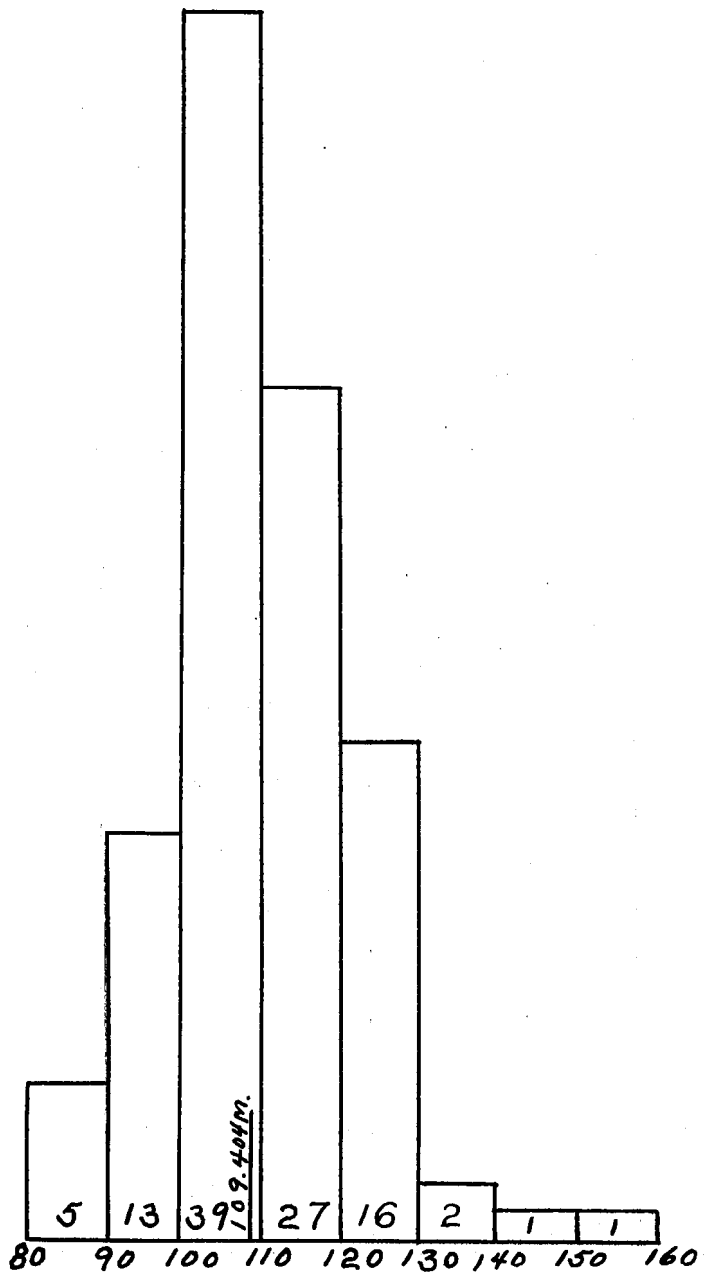

Figure 7. Distribution of intelligence quotients of 104 industrial arts students of school B.

TABLE V

PERCENTAGE DISTRIBUTION OF INTELLIGENCE QUOTIENTS OF SCHOOL B

Number of students	Academic 11	Commercial 84	Industrial Arts 104
I.Q.'s	%	%	%
150-159			.96
140-149		2.38	.96
130-139		5.95	1.92
120-129	9.09	11.90	15.38
110-119	45.45	32.13	25.95
100-109	36.36	32.13	37.48
90- 99	9.09	14.28	12.49
80- 89		1.19	4.81
70- 79			
Total	99.99	99.99	99.97

A General Discussion of Table V. Table V, page 24, is a percentage distribution of the I. Q.'s of school B. This table was prepared in order to equalize, if posible, the number of I. Q.'s from each course. According to the table, there are only 9.09% of the I. Q.'s of the academic students above the step-interval 110-119, while there are 20.23% of the commercial I. Q.'s above the interval. The industrial arts students have 19.22% of their I. Q.'s above the same step-interval. This seems to give the advantage in rank to the commercial and industrial arts students. However, there are 45.45% of the I. Q.'s of the academic students below this interval, while the commercial students have 47.60% below the step-interval. There are 54.78% of the industrial arts students below the interval.

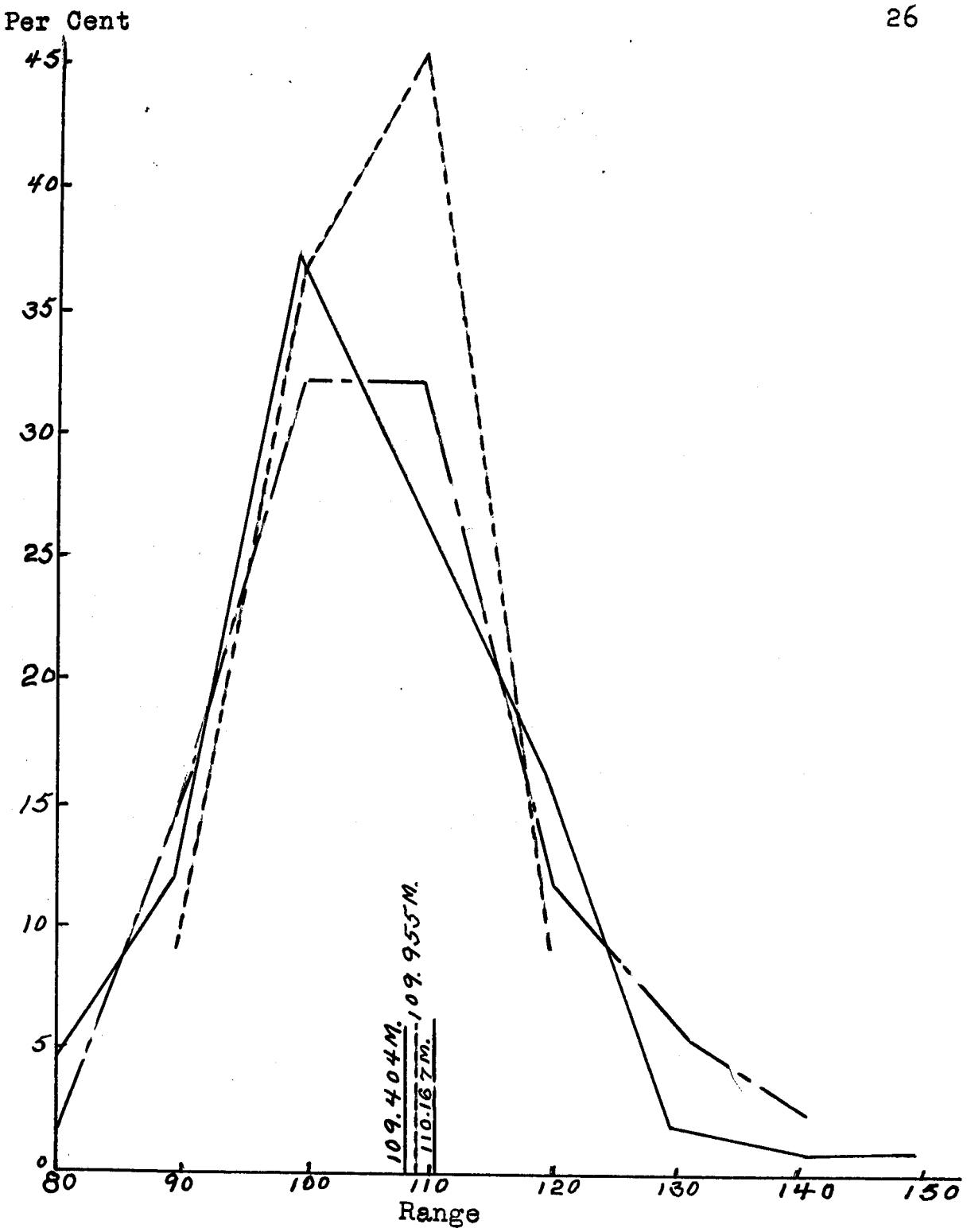

Figure 8. Percentage distribution of intelligence quotients of school B. (Figure 8 is based upon Table V).

A Discussion of Figure 8. Figure 8, page 26, is based upon the percentage distribution of I. Q.'s as given in Table V, on page 24. This figure does not require any detailed explanation, since it shows the same thing as Table V, except that it is in graphic form. The vertical scale represents the per cent of I. Q.'s, while the base line represents the distribution range. Figure 8 also portrays the arithmetic means of each group.

Discussion of Data of School B. There is a total of 199 students in school B. Of these, 11 are academic, 84 commercial, and 104 industrial arts students. This is exactly opposite to school A, which had a larger number of academic students.

The means and medians of school B are:

Course	Mean	Median
Academic	109.955	111.00
Commercial	111.167	110.74
Ind. Arts	109.404	108.72

If we rank the courses by their means, without taking into consideration the reliability of the difference, we must rank the commercial students first. However, if we judge the courses by their medians, without taking into consideration the reliability of the difference, we must rank the academic students first.

The reliability of the difference between the means was calculated by the formula given by Garrett.[4] The results of the true difference was referred to Table XIV of Garrett.[5]

According to the data obtained from school B, there are only 67 chances in 100 that the true difference is "significant". This is in favor of the commercial students when compared with the academic students. However, the chances are 91 in 100 that the true difference is "significant", when we compare the commercial students with the industrial arts students.

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4 Henry E. Garrett, op. cit., p. 130.

5 Ibid., p. 134.

There are only 58 chances in 100 that the true difference (in favor of the academic students, when compared with the industrial arts students) is "significant".

Evidently, sampling has entered into the results of the data of school B, for if we briefly look at the results in the other schools, we find that the academic students in those schools are first with a much higher reliability when compared with the commercial students, than the commercial students, in this school (B) show over the academic students. In school B, the chances are only 58 in 100 that the true difference (in favor of the academic students when compared with the industrial arts students) is "significant". In the other schools, the chances are 90 or more in 100 that the true difference (in favor of the academic students) is "significant". However, in school B, the commercial students have a slight difference in their favor, so we must rank the academic students second. The industrial arts students are again third.

D. School C

Academic. According to Figure 9, page 31, there are 17 academic students from school C. The range in the distribution of I. Q.'s is from 90-140. The arithmetic mean is 117.441, while the median is 119.00 (Table I, page 7).

Commercial. There are 71 commercial students from school C (Figure 11, page 31). The range in the distribution of I. Q.'s is from 70-150. The arithmetic mean is 107.17. The median (Table II, page 9) is 106.25.

Industrial Arts. The range of I. Q.'s of industrial arts students of school C (Figure 10, page 31) is from 70-130. The arithmetic mean of the 30 students is 104.50, while the median (Table III, page 11) is 105.83.

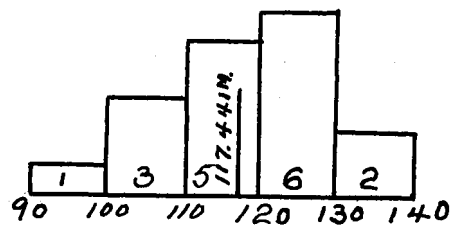

Figure 9. Distribution of intelligence quotients of 17 academic students of school C.

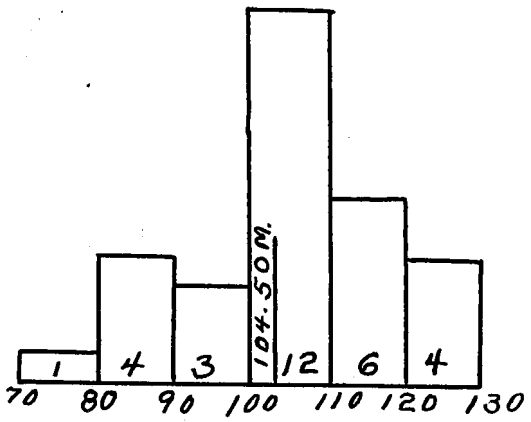

Figure 10. Distribution of intelligence quotients of 30 industrial arts students of school C.

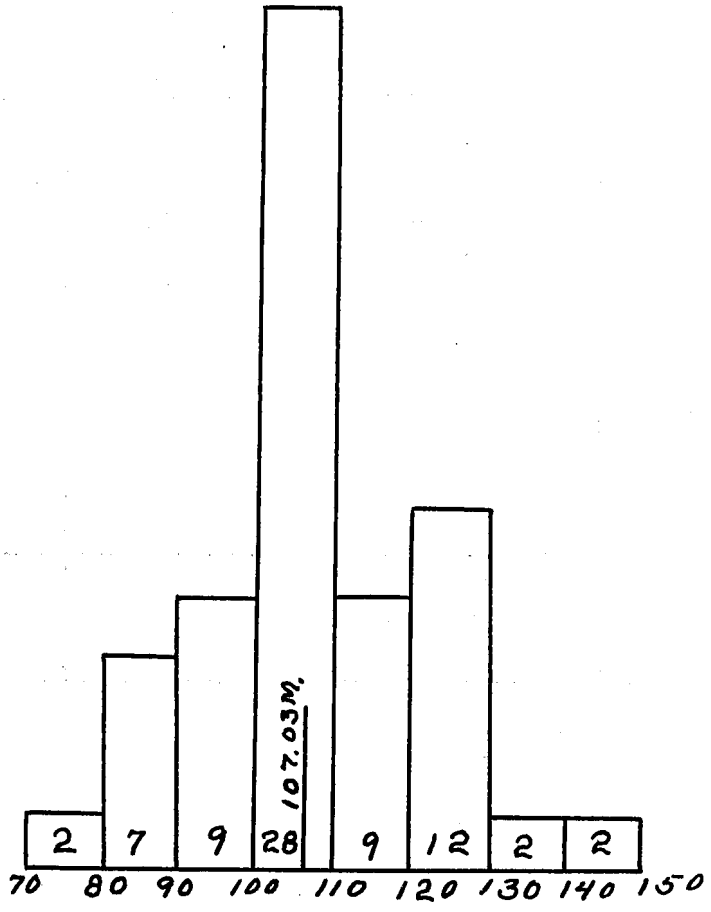

Figure 11. Distribution of intelligence quotients of 71 commercial students of school C.

TABLE VI

PERCENTAGE DISTRIBUTION OF INTELLIGENCE QUOTIENTS OF SCHOOL C

Number of students	Academic 17	Commercial 71	Industrial Arts 30
I.Q.'s	%	%	%
140-149		2.82	
130-139	11.76	2.82	
120-129	35.29	16.90	16.95
110-119	29.41	12.67	20.00
100-109	17.65	39.42	36.66
90- 99	5.88	12.67	10.00
80- 89		9.86	13.33
70- 79		2.82	3.33
Total	99.99	99.98	99.97

A General Discussion of Table VI. Since there is not the same number of students in the various courses in school C, Table VI, page 32, which shows the percentage of cases, in each step-interval, was prepared. According to this table, 76.46% of the I. Q.'s of the academic students are above the step-interval of 100-109, while only 5.88% of the I. Q.'s are below it. This step-interval was chosen because it contains the means and medians of two of the courses, namely commercial and industrial arts, 35.21% of the commercial students' I. Q.'s are above the interval, while 25.35% of the I. Q.'s are below the interval. In the industrial arts course, 36.65% of the I. Q.'s are above the interval and 26.66% of the I. Q.'s are below the interval. According to this table, the academic students undoubtedly rank first. There is not a great deal of difference between the commercial and the industrial arts students on the basis of the percentage of cases above or below the step-interval. Therefore, we must consider the step-interval itself. There are 39.42% of the cases of commercial students in this interval, and 36.66% of the industrial arts cases are found in this interval. This gives a slight preference in favor of the commercial students.

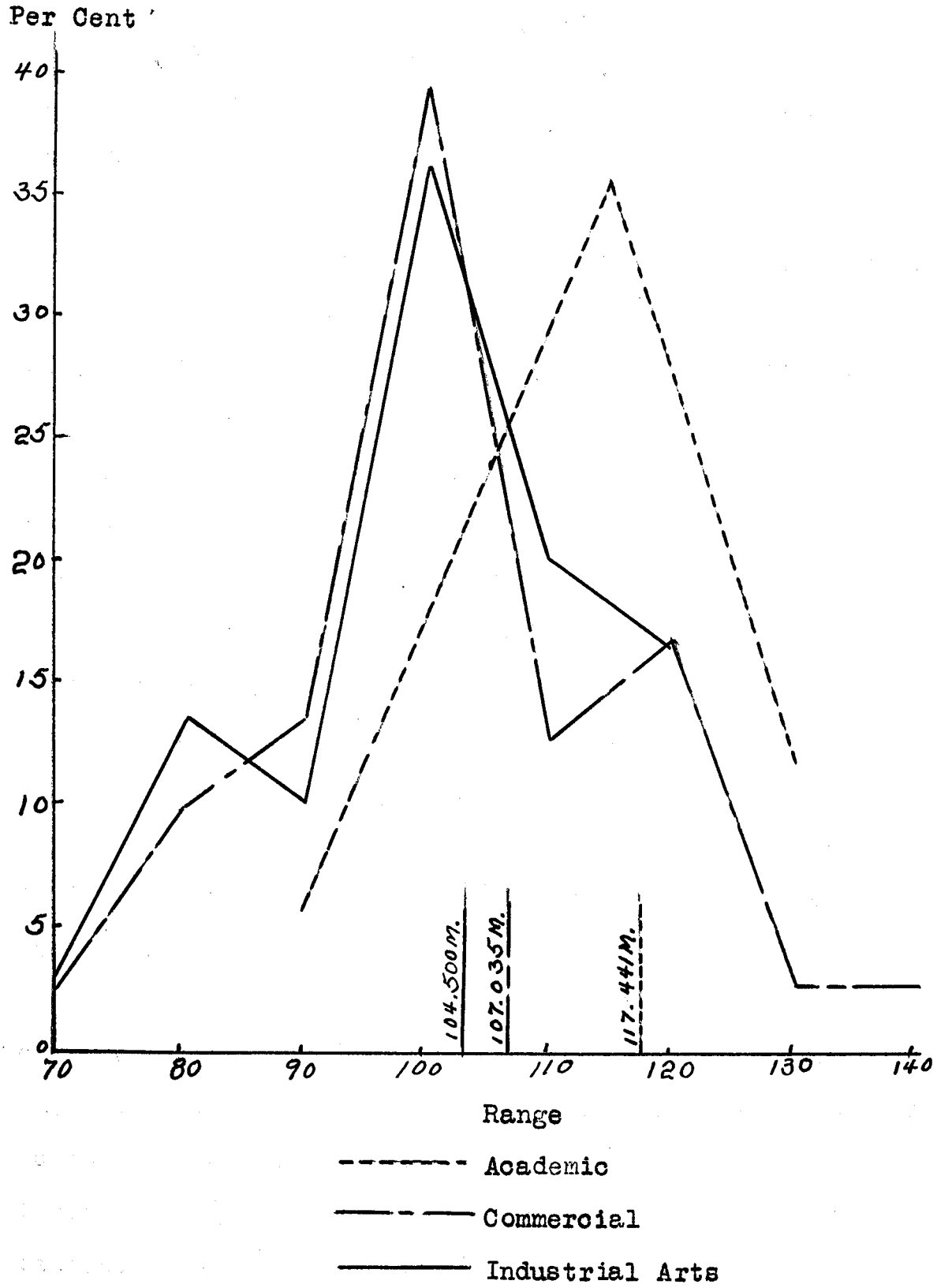

Figure 12. Percentage distribution of intelligence quotients of school C. (Figure 12 is based upon Table VI).

A Discussion of Figure 12. Figure 12, page 34, is based upon the percentage distribution of I. Q.'s as given in Table VI, page 34. This table does not require a detailed explanation, for it is not only self-explanatory, but it also shows the same thing as Table VI, except that it is in graphic form. The vertical scale represents the per cent of I. Q.'s, while the base line represents the distribution of I. Q.'s. The academic students have the highest mean, for the line representing academic students starts at 90 and, with a peak almost as high as that of the commercial and industrial arts students, continues to 130. The line representing the commercial students has a higher peak and a wider base line than have the academic students, but the commercial line starts at 70 and goes to 140. In other words it has a good many I. Q.'s below 90, while the academic students do not have any below 90. It is true that the academic students do not have any I. Q.'s above 130, but the commercial students, have only 2.82% of their I. Q.'s above 130. This does not offset the per cent of I. Q.'s they (the commercial students) have below 90. The industrial arts students are third because their peak is not as high as the peak of the commercial students and their range (70-120) starts as low as that of the commercial students, but does not continue as far.

Discussion of Data of School C. In school C, the commercial students, numbering 71, have the largest number. The industrial arts students with 30 are next, while there are only 17 academic students. Since this is the first time we have had a larger number of commercial students, will the results be the same as in school A, or as in school B?

The means and medians of school C, in the order of their rank, are:

Course	Mean	Median
1. Academic	117.441	119.00
2. Commercial	107.035	106.25
3. Industrial Arts	102.735	105.83

The reliability of the difference between the means was calculated by the formula given by Garrett.[6] The results of the true difference was referred to Table XIV of Garrett.[7]

According to a comparison of the means, the chances are 99 in 100 (in favor of the academic students) that the true difference between the academic students and the commercial students is "significant". The academic students are also ahead of the industrial arts students. Here the chances are 100 in 100 that the true difference is "significant".

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6 Henry E. Garrett, op. cit., p. 130.

7 Ibid., p. 134.

The commercial students have a higher mean than do the industrial arts students. The chances are 80 in 100 that the true difference is "significant".

According to the data of school C, we must rank the academic students first, the commercial students second, and the industrial arts third, in the order of their general intelligence as a group. This compares very favorably with the results found in school A. It also compares favorably with school B, as far as industrial arts students are concerned.

E. Schools A, B, and C Combined

Academic. According to Figure 13, page 39, there are 135 academic students from schools A, B, and C. The range in the distribution of I. Q.'s is from 70-160. The arithmetic mean is 114.426, while the median is 114.13.

Commercial. There are 188 commercial students (Figure 14, page 40) in the combined schools. The range in the distribution of I. Q.'s is from 70-150. The arithmetic mean is 109.50, while the median is 109.19.

Industrial Arts. The range of I. Q.'s of the industrial arts students of schools, A, B, and C combined (Figure 15, page 41) is from 70-160. The arithmetic mean of the 151 students is 107.81, while the median is 107.63.

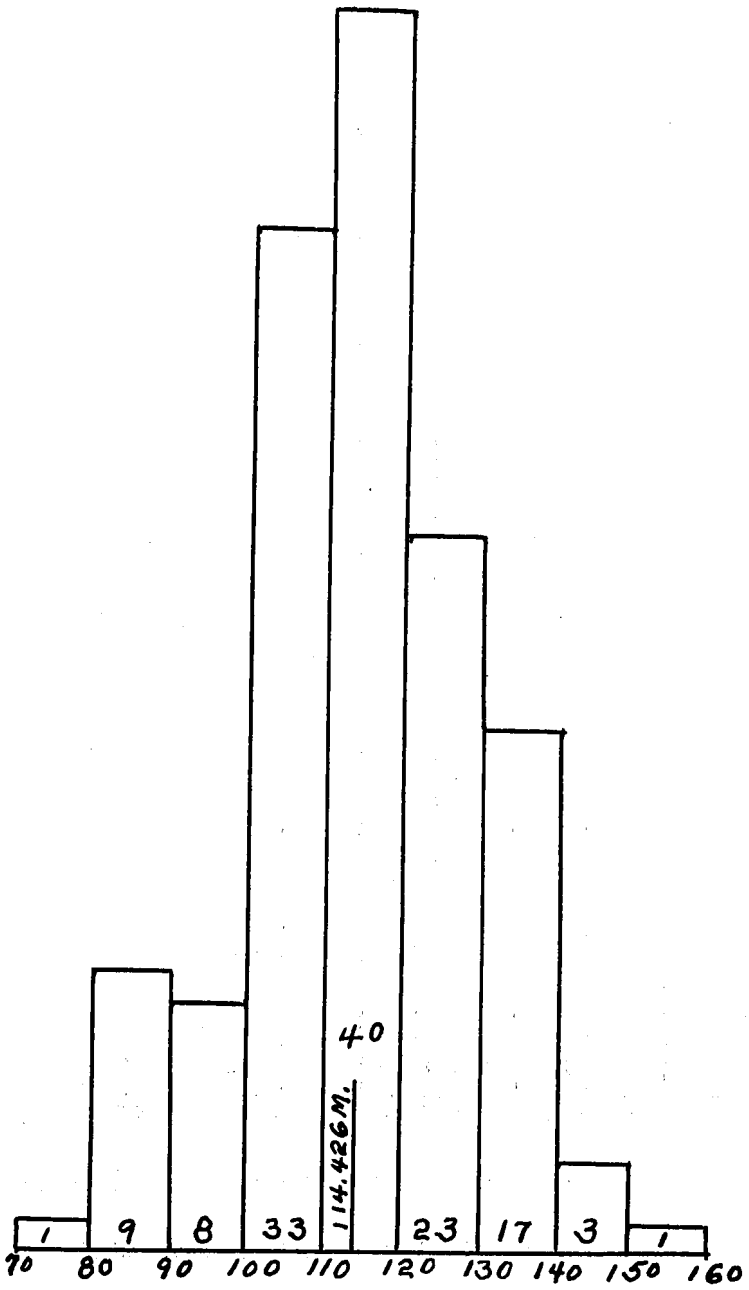

Figure 13. Distribution of intelligence quotients of 135 academic students of schools A, B, and C combined. (These schools are located in the same city).

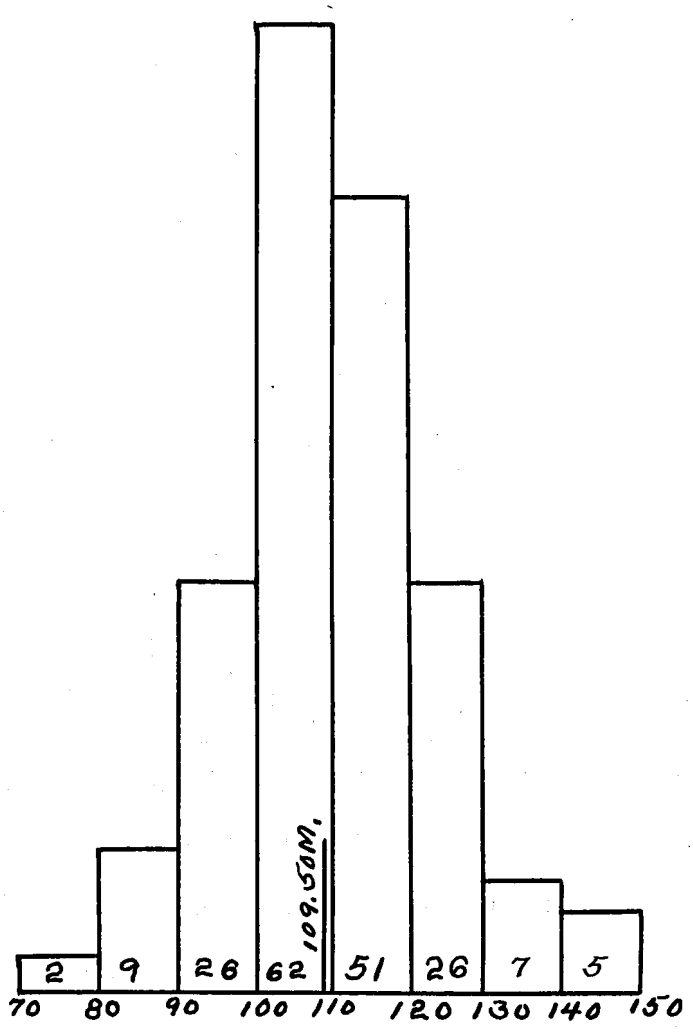

Figure 14. Distribution of intelligence quotients of 188 commercial students of schools A, B, and C combined.

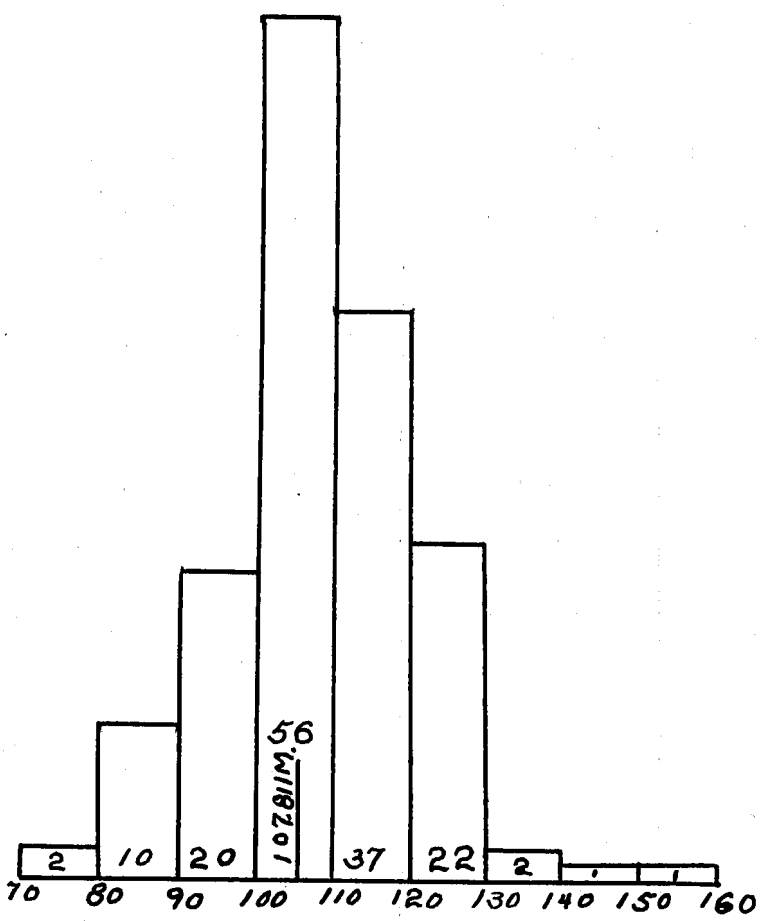

Figure 15. Distribution of intelligence quotients of 151 industrial arts students of schools A, B, and C combined.

TABLE VII

PERCENTAGE DISTRIBUTION OF INTELLIGENCE QUOTIENTS OF SCHOOLS A, B, AND C COMBINED

Number of students	Academic 135	Commercial 188	Industrial Arts 151
I.Q.'s	%	%	%
150-159	.74		.66
140-149	2.22	2.66	3.66
130-139	12.59	3.72	1.32
120-129	17.04	13.83	14.57
110-119	29.63	27.13	24.50
100-109	24.44	32.98	37.08
90- 99	5.93	13.83	13.24
80- 89	6.67	4.79	6.62
70- 79	.74	1.06	1.32
Total	100.00	100.00	100.00

A General Discussion of Table VII. Table VII, page 42, is the percentage distribution of I. Q.'s of schools, A, B, and C combined. The step-interval 110-119 was selected for purpose of comparison because it contains the means and medians of two of the courses. The academic students have 32.59% of their I. Q.'s above the step-interval and 37.78% below, 20.21% of the commercial I. Q.'s are above the interval and 52.66% below. The industrial arts students have 20.21% of their I. Q.'s above the interval and 58.26% below. The academic students have a larger percentage of I. Q.'s above and a smaller percentage below the step-interval than either the commercial or industrial arts students. The commercial students have the same percentage of I. Q.'s above the interval that the industrial arts students have, but they (the commercial students) have a smaller percentage below the interval.

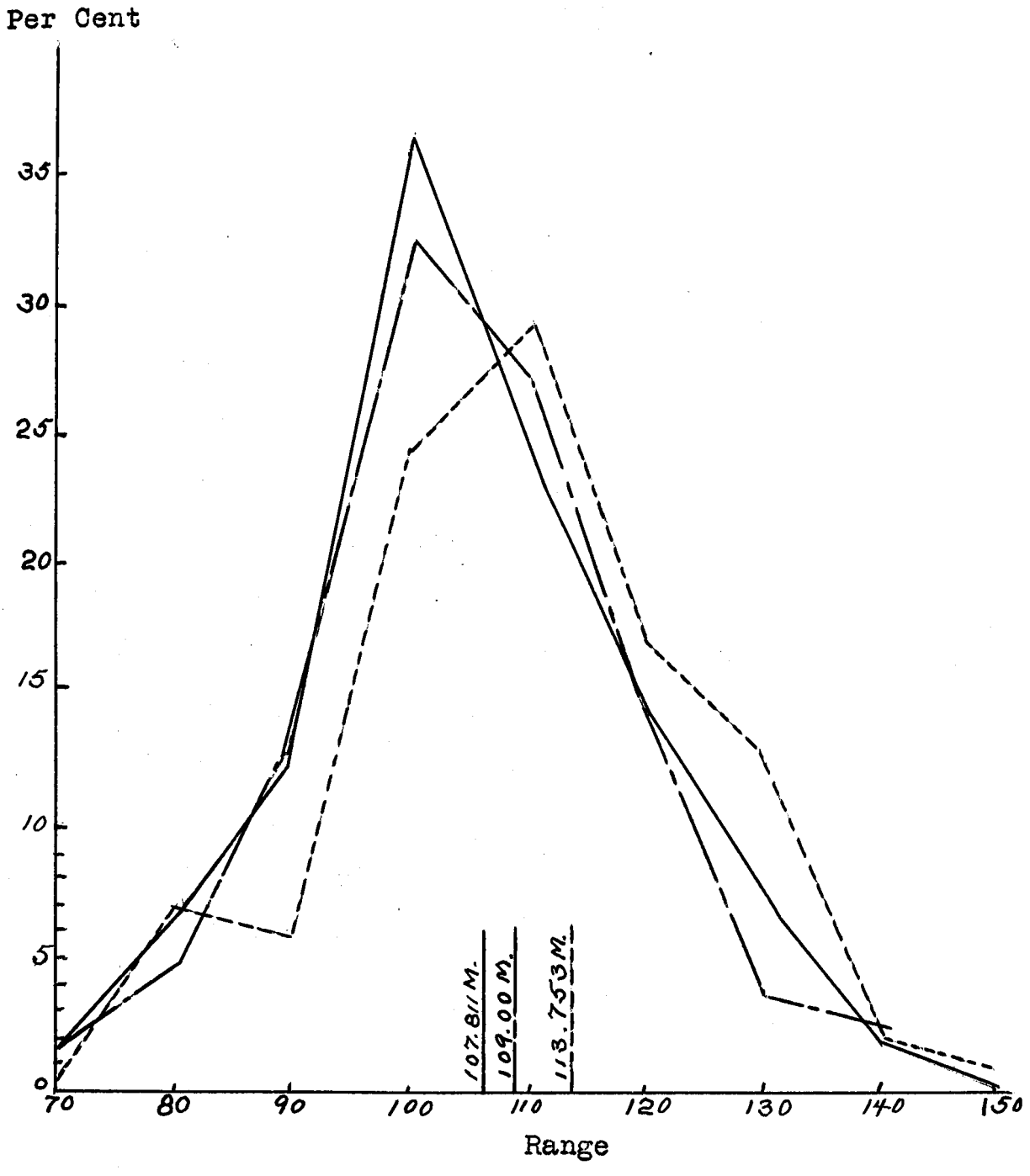

Figure 16. Percentage distribution of intelligence quotients of schools A, B, and C combined. (Figure 16 is based upon Table VII).

A Discussion of Figure 16. Figure 16, page 44, is based upon Table VII on page 43, and therefore does not require a detailed explanation. Besides the figure is self-explanatory. According to the peaks and the spread of the bases of Figure 16, the academic students have the highest means, for although the academic range is limited from 70-140, the peak is considerable to the right of the peak of the commercial or industrial arts students. The industrial arts students have a broader range (70-150) than do the commercial students (70-140). However, the industrial arts students have a larger per cent of their cases between 70 and 90 than do the commercial students.

Discussion of Data of Schools A, B, and C Combined. Schools A, B, and C are located in the same city. The number of students studied from these schools are:: Academic 135, commercial 188, and industrial arts 151. A comparison of these schools carries more meaning than a comparison between cases in the same schools, because of the larger number.

The means and medians of schools A, B, and C combined, in the order of their rank, are::

Course	Mean	Median
1. Academic	114.426	114.13
2. Commercial	109.500	109.19
3. Ind. Arts	107.810	107.63

The reliability of the difference between the means was calculated by the formula given by Garrett.[8] The results of the true difference was referred to Table XIV of Garrett.[9]

According to a comparison of the means, the chances are 100 in 100 in favor of the academic students that the true difference between the academic and commercial students is "significant". The academic students also have a higher mean than do the industrial arts students. Here the chances are again 100 in 100 that the true difference is "significant".

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[8] Henry E. Garrett, op. cit., p. 130.

[9] Ibid., p. 134.

The commercial students have a higher mean than do the industrial arts students. The chances are 88 in 100 that their true difference is "significant".

According to the data of the combined schools, the academic students are first, the commercial students second and the industrial arts students third in the order of their general intelligence as a group.

F. School D

Academic. According to Figure 17, page 49, there are only three academic students from school D. This number is entirely too small to draw any definite conclusions. The range is from 90-120. The arithmetic mean is 107.333, while the median (Table I, page 7) is 112.50.

Commercial. There are 15 commercial students (Figure 8, page 49) in school D. The range in the distribution of I. Q.'s is from 70-130 with an arithmetic mean of 99.167. The median (Table II, page 9) is 100.71.

Industrial Arts. The range of I. Q.'s of industrial arts students of school D (Figure 19, page 49) is from 60-130. The mean of the 32 students is 94.50, while the median (Table III, page 11) is 96.25.

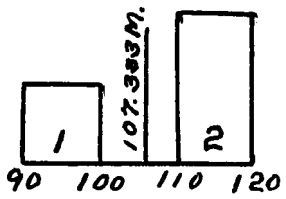

Figure 17. Distribution of intelligence quotients of 3 academic students of school D.

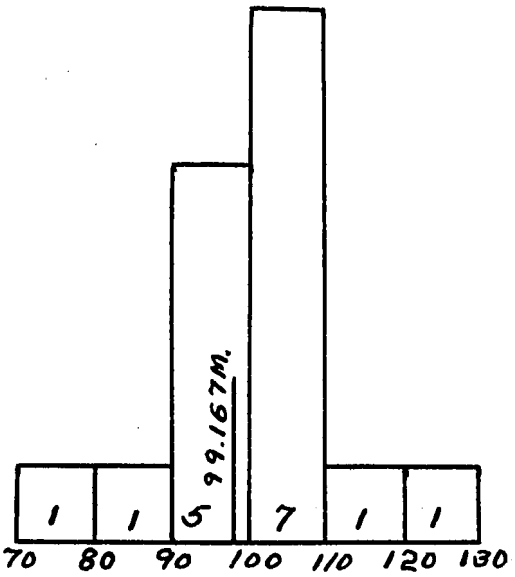

Figure 18. Distribution of intelligence quotients of 15 commercial students of school D.

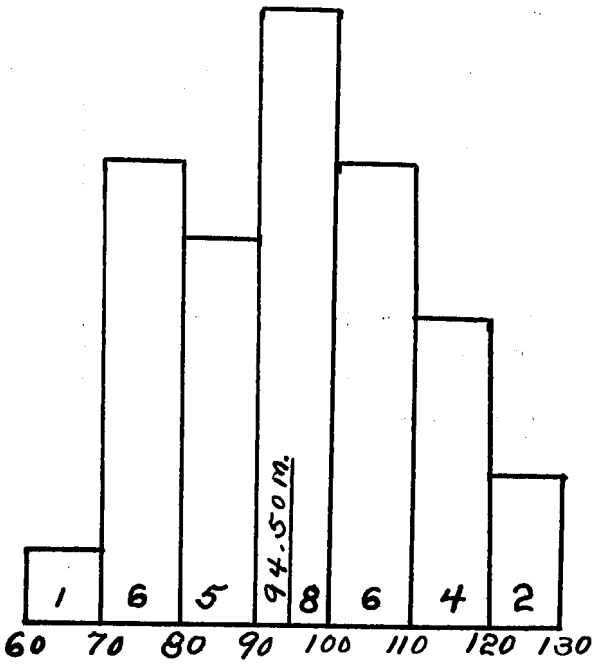

Figure 19. Distribution of intelligence quotients of 32 industrial arts students of school D.

TABLE VIII

PERCENTAGE DISTRIBUTION OF INTELLIGENCE QUOTIENTS OF SCHOOL D

Number of students	Academic 3	Commercial 15	Industrial Arts 32
I.Q.'s	%	%	%
120-129			6.25
110-119	66.67	6.67	12.50
100-109		44.66	18.75
90- 99	33.33	33.33	25.00
80- 89		6.67	15.63
70- 79		6.67	18.75
60- 69			3.12
Total	100.00	100.00	100.00

A General Discussion of Table VIII. Table VIII, page 50, is a percentage distribution of the I. Q.'s of school B. This table was prepared in order to equalize, if possible, the number of cases from each school. The step-interval 90-99 was selected for purpose of comparison, because it includes two of the means. There are 66.66% of the I. Q.'s of the academic students above this step-interval, while the commercial students have 51.33% above the interval. There are only 37.50% of the I. Q.'s of the industrial arts students above the interval. The academic students do not have any cases below the interval, while the commercial students have 13.34% of their I. Q.'s below the interval. The industrial arts students have 37.50% of their I. Q.'s below the interval. According to the percentage of I. Q.'s, both above and below the interval, the academic students are first, the commercial second, and the industrial arts students are third.

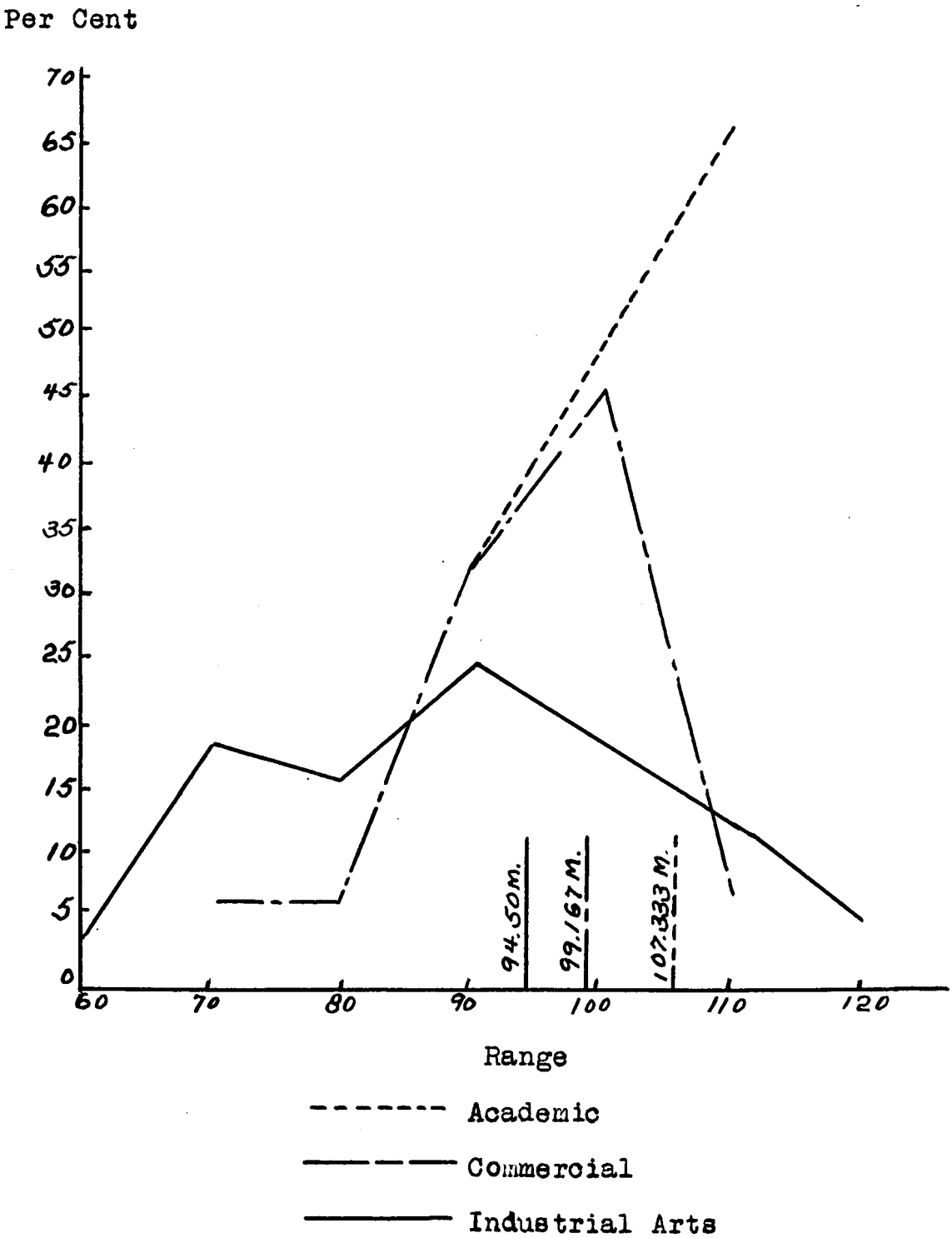

Figure 20. Percentage distribution of intelligence quotients of school D. (Figure 20 is based upon Table VIII).

A Discussion of Figure 20. Figure 20, page 52, is based upon the percentage distribution of I. Q.'s as given in Table VIII. The vertical scale at the left of the figure represents the percentage of cases. The base line represents the range of I. Q.'s. The line representing the academic students is a short straight line, because it is based upon only 3 students. It takes study to tell by this figure which course ranks first. However, the line representing the academic students starts at 33.33% and goes to 66.66%, with a range of 90-110. Therefore, we are rather safe in saying that the mean is above 100. While the line representing the industrial arts students has a larger range (60-120) than the line representing the commercial students (70-110), the industrial arts line is much lower than the commercial line. The lines representing the various courses show that the mean for the commercial students is less than that of the academic students, but greater than that of the industrial arts students, but the unequal numbers of students here represented makes any conclusion only suggestive.

Discussion of Data of School D. Undoubtedly the small number of cases, especially is this true of the academic students, has some effect upon the means and medians of the various courses of school D. However, to be consistent it is necessary to draw comparisons between courses in each individual school. A comparison between all the schools is made later.

The means and medians of school D, in the order of their rank, are::

Course	Mean	Median
1. Academic	107.333	112.50
2. Commercial	99.167	100.71
3. Ind. Arts	94.500	96.25

The reliability of the difference between the means was calculated by the formula given by Garrett.[10] The results of the true difference was referred to Table XIV of Garrett.[11]

According to the data obtained from school D, the chances are 91 in 100 that the true difference is "significant". This is in favor of the academic students when compared to the commercial students. The chances are 98 in 100 that the true difference (in favor of the academic students) is "significant" when we compare the academic students with the industrial arts students.

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10 Henry E. Garrett, op. cit., p. 130.

11 Ibid., p. 134.

The commercial students have a higher mean than do the industrial arts students. The chances are 88 in 100 that their true difference is "significant".

According to the data of school D, the academic students are first, the commercial second, and the industrial arts third in the order of their general intelligence as a group.

G. School E

Academic. According to Figure 23, page 57, there are 60 academic students in school E. The range in the distribution of I. Q.'s is from 60-130. There is a greater number of I. Q.'s in the interval 80-110 than in any other. In this case, the arithmetic mean and the median (Table I, page 7) are the same (95.33).

Commercial. There are 17 commercial students in school E (Figure 21, page 57). The range in the distribution of I. Q.'s is 80-120, with the majority of the I. Q.'s in the step-interval 80-90. The arithmetic mean is 88.618, while the median (Table II, page 9) is 86.07.

Industrial Arts. The range of I. Q.'s of industrial arts students of school E (Figure 22, page 57) is from 70-110, with the greater number of I.Q.'s found in the interval 80-90. The arithmetic mean of the 17 students is 87.23. The median (Table III, page 11) is 85.83.

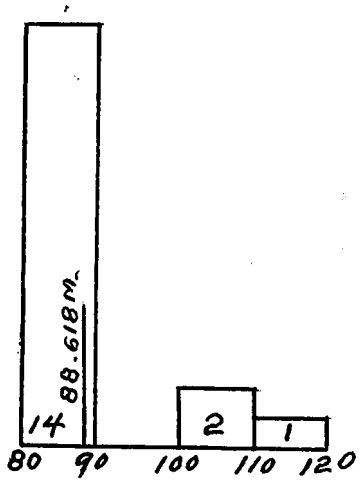

Figure 21. Distribution of intelligence quotients of 17 commercial students of school E.

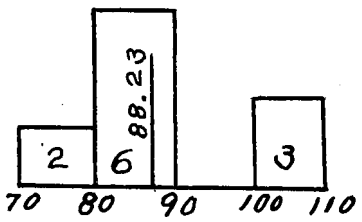

Figure 22. Distribution of intelligence quotients of 11 industrial arts students of school E.

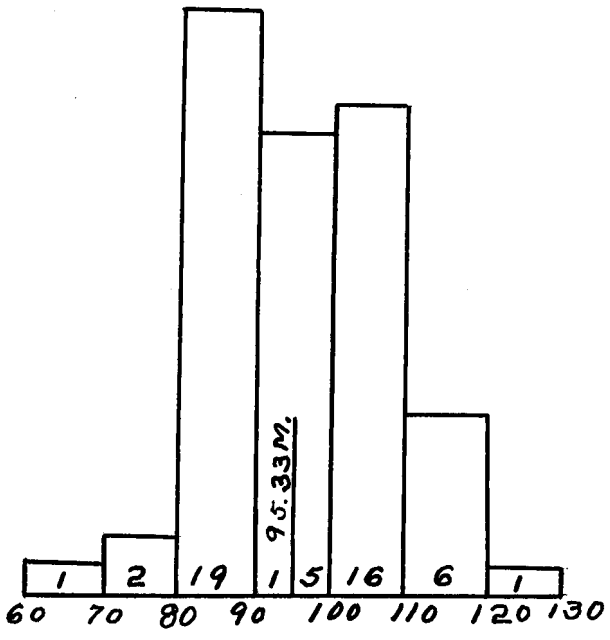

Figure 23. Distribution of intelligence quotients of 60 academic students of school E.

TABLE IX

PERCENTAGE DISTRIBUTION OF INTELLIGENCE QUOTIENTS OF SCHOOL E

Number of students	Academic 60	Commercial 17	Industrial Arts 11
I.Q.'s	%	%	%
120-129	1.67		
110-119	10.00	5.88	
100-109	26.66	11.76	27.27
90- 99	24.49		
80- 89	31.64	82.35	54.54
70- 79	3.33		18.18
60- 69	1.67		
Total	99.97	99.99	99.99

A General Discussion of Table IX. Since there is an unequal distribution of I. Q.'s in the various courses in school E, Table IX, page 58, was prepared. For purpose of comparison, the step-interval 80-89 was selected because it includes the means and medians of two of the courses, namely commercial and industrial arts students. 63.32% of the I. Q.'s of the academic students are above this interval, while only 17.64% of the I. Q.'s of the commercial students are above it. There are 27.27% of the I. Q.'s of the industrial arts students above the interval. Considering first, just the academic and the commercial students, we must place the academic students first, for although they have 4% of their I. Q.'s below the step-interval and the commercial students do not have any below, the academic students have 45.68% more I. Q.'s above the interval than do the commercial students. There is a difference of 9.63% in favor of the industrial arts students above this interval. However, the industrial arts students have 18.18% more I. Q.'s below the interval than do the commercial students. The commercial students also have a larger per cent of I. Q.'s within the interval itself, so again, although there is only a slight difference, we must place the commercial students ahead of the industrial arts students.

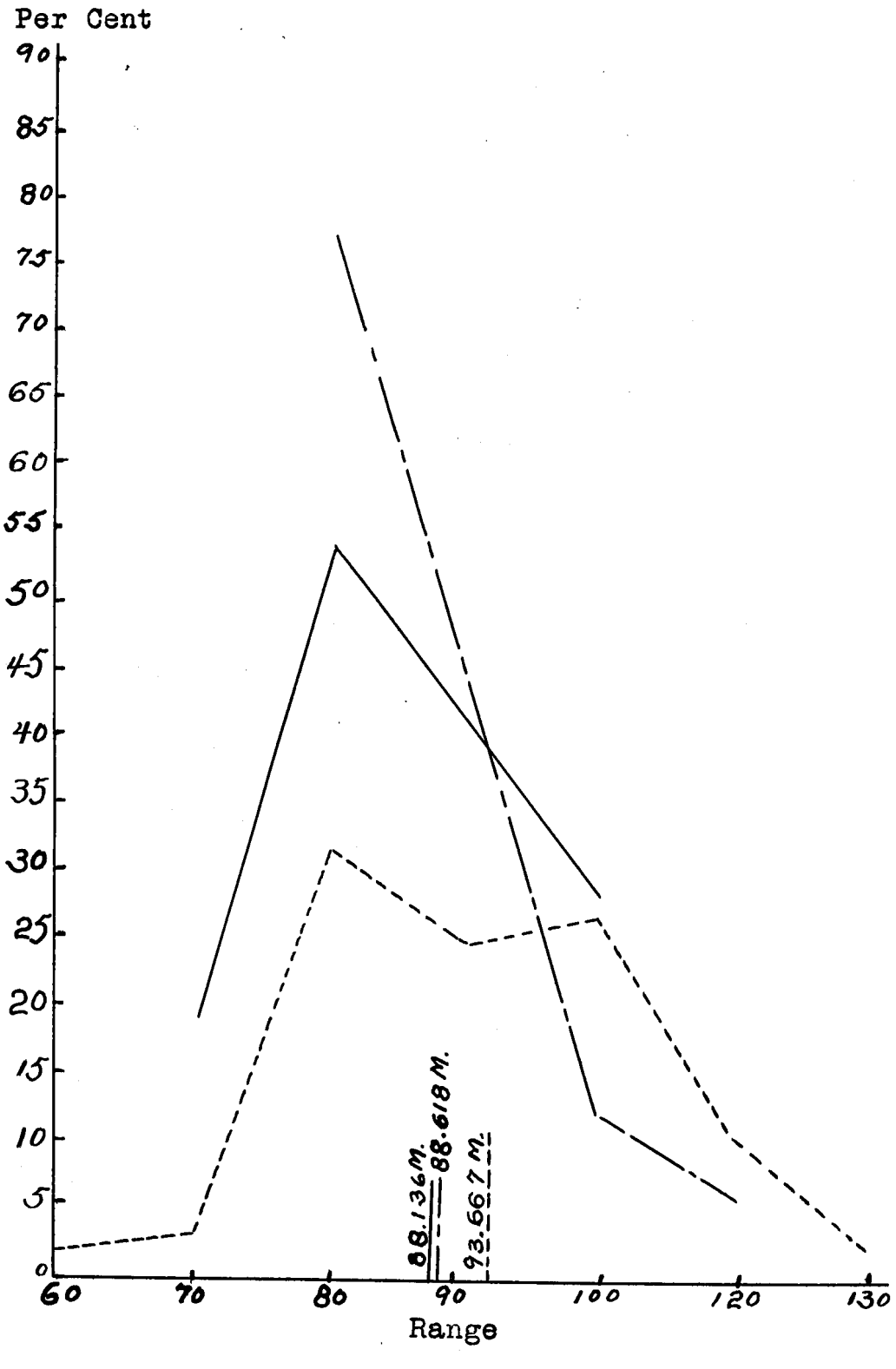

Figure 24. Percentage distribution of intelligence quotients of school E. (Figure 24 is based upon Table IX).

A Discussion of Figure 24. Figure 24, page 60, is based upon the percentage distribution of I. Q.'s as given in Table IX, page 58. This figure does not require any detailed explanation since it shows the same thing as Table IX, except that it is in graphic form. The vertical scale represents the percentage of cases found in each step-interval, and the base line represents the step-interval.

Discussion of Data of School E. In school E, there are 60 academic students, while the commercial and industrial arts students have 17 and 11 respectively.

The means and medians of school E, in the order of their rank, are:

Course	Mean	Median
1. Academic	95.33	95.33
2. Commercial	88.618	86.07
3. Ind. Arts	88.136	85.83

The reliability of the difference between the means was calculated by the formula given by Garrett.[12] The results of the true difference was referred to Table XIV of Garrett.[13]

The chances are 99 in 100 that the true difference (in favor of the academic students, when compared with the commercial students) is "significant". The chances are also 99 in 100 that the true difference is "significant", when we compare the academic students with the industrial arts students.

The chances are only 64 in 100 that the true difference (in favor of the commercial students, when compared with the industrial arts students) is "significant".

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12 Henry E. Garrett, op. cit., p. 130.

13 Ibid., p. 134.

In school E, the academic students are first, the commercial second, and the industrial arts students third.

H. Schools A, B, C, D, and E Combined

Academic. According to Figure 25, page 65, there are 198 academic students from all the schools visited. The range in the distribution of I. Q.'s is from 60-160. With the exception of the I. Q.'s found in the interval 80-90, there is a remarkably even distribution of I. Q.'s. The arithmetic mean is 108.086, while the median is 108.770 (Table I, page 7).

Commercial. There are 220 commercial students (Figure 26, page 66) in the schools visited. The range in the distribution of I. Q.'s is 70-150. The distribution is rather uniform. The arithmetic mean is 107.182. The median is 107.132 (Table I, page 9).

Industrial Arts. The range of I. Q.'s of industrial arts students of the schools visited (Figure 27, page 67) is from 60-160. The arithmetic mean is 104.603. The median is 105.61 (Table III, page 11).

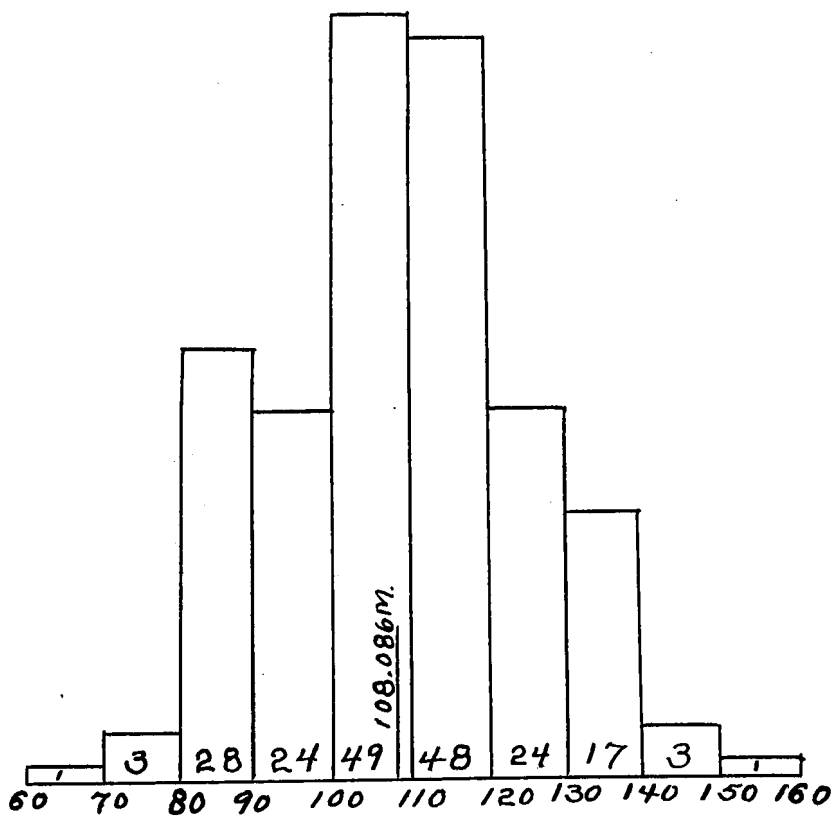

Figure 25. Distribution of intelligence quotients of 198 academic students of schools A, B, C, D, and E combined.

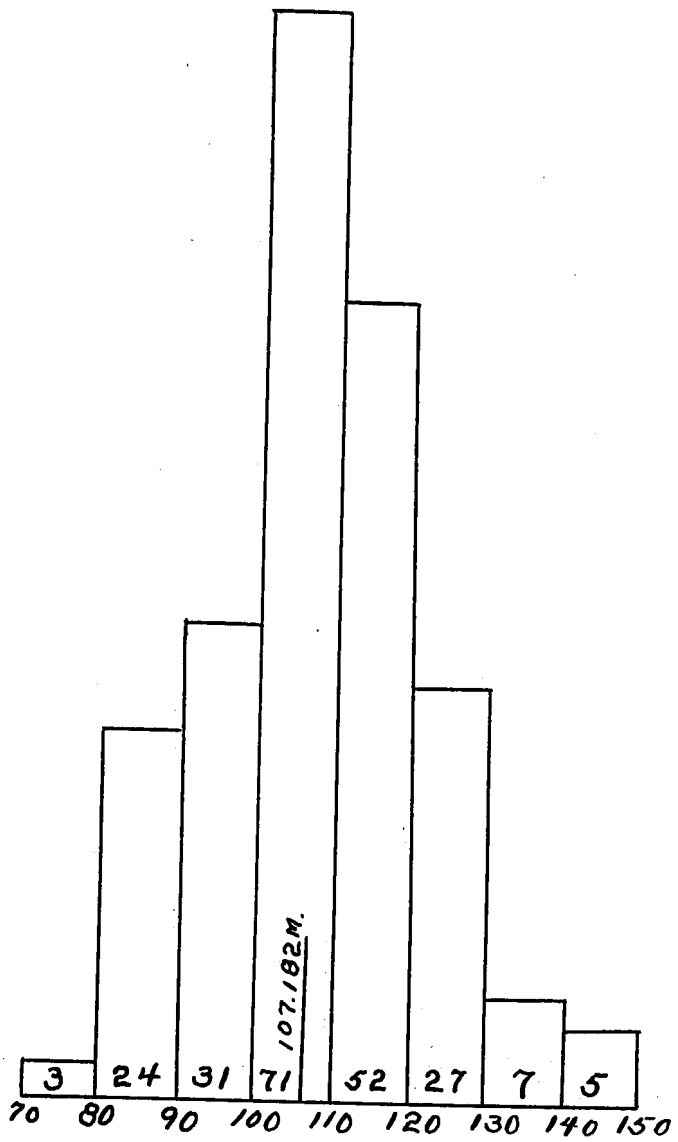

Figure 26. Distribution of intelligence quotients of 220 commercial students of schools A, B, C, D, and E combined.

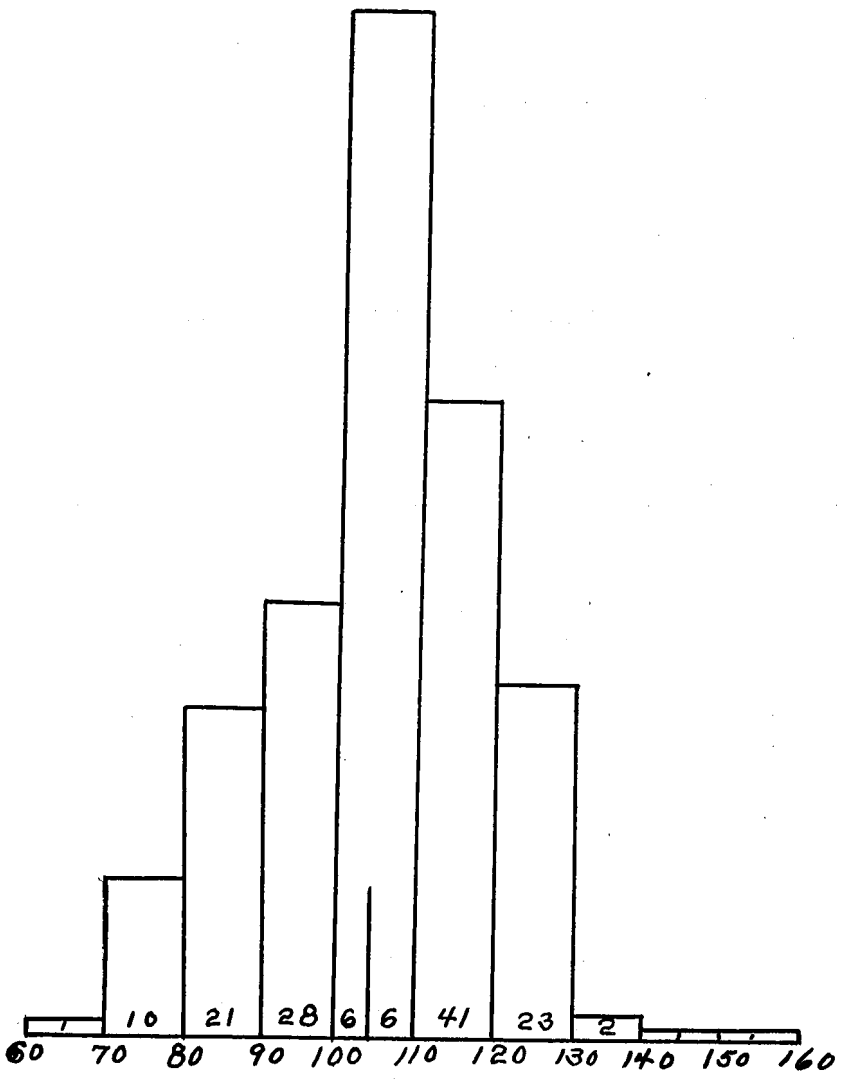

Figure 27. Distribution of intelligenc quotients of 194 industrial arts students of schools A, B, C, D, and E combined.

TABLE X

PERCENTAGE DISTRIBUTION OF INTELLIGENCE QUOTIENTS OF SCHOOLS A, B, C, D, AND E COMBINED

Number of students	Academic 198	Commercial 220	Industrial Arts 194
I.Q.'s	%	%	%
150-159	.51		.52
140-149	1.52	2.27	.52
130-139	8.59	3.18	1.03
120-129	12.12	12.27	11.85
110-119	24.24	23.63	21.13
100-109	24.75	32.27	34.02
90- 99	12.12	14.09	14.43
80- 89	14.14	10.91	10.82
70- 79	1.52	1.36	5.15
60- 69	.51		.52
Total	100.02	99.99	99.99

A General Discussion of Table X. Table X, page 68, is a percentage distribution of the I. Q.'s of the students of schools A, B, C, D, and E. Table X was prepared in order to equalize, if possible, the number of cases from each school. To my notion, this is not absolutely necessary in this instance, for the courses are fairly well-balanced as to the number of students. For purpose of comparison, the step-interval 100-109 was selected because it includes the means and medians of all the courses. According to this table, there are 46.98% of the I. Q.'s of the academic students above this interval, and 28.29% below. There are 41.35% of the I. Q.'s of the commercial students above the interval, and 26.36% below. The academic students have a slight preference over the commercial students for they have more I. Q.'s above the interval than the commercial students. This offsets the advantage the commercial students have below the interval. The commercial students lack 1.93% having as many I. Q.'s below the interval, but they lack 5.63% having as many I. Q.'s above the interval, when compared with the academic students. The industrial arts students have 35.05% of their I. Q.'s above the interval, which is considerable less than that of either the academic or commercial students. The industrial arts students have 30.92% below the interval. This is much more than either the academic or commercial students have below the interval.

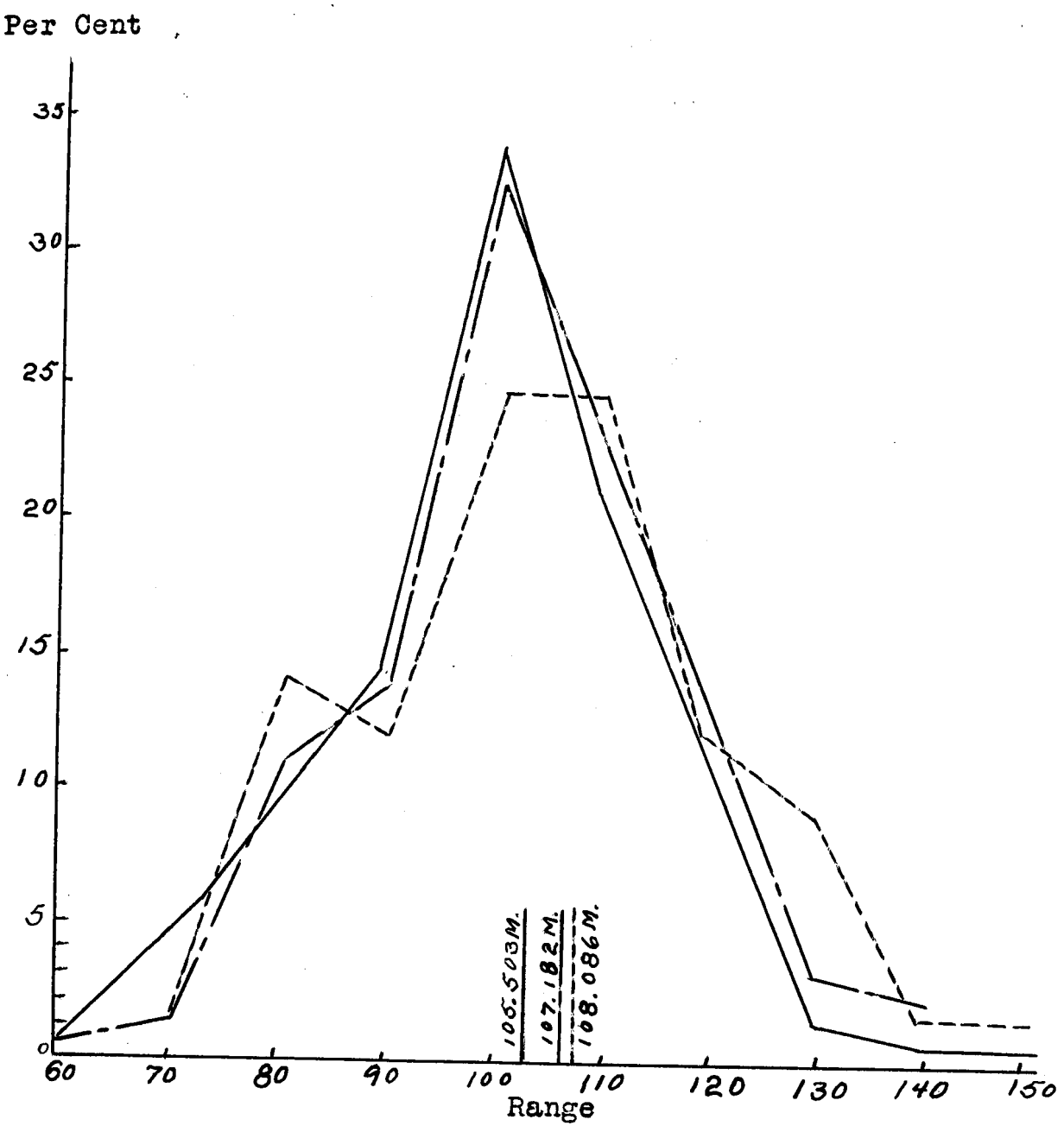

Figure 28. Percentage distribution of intelligence quotients of schools A, B, C, D, and E combined.

A Discussion of Figure 28. Figure 28, page 70, is based upon the percentage distribution of I. Q.'s as shown in Table X. This table does not require any explanation since it shows the same thing as Table X, except that it is in graphic form. The per cent of I. Q.'s is represented by the vertical scale, while the base line represents the distribution range.

Discussion of Data of Schools A, B, C, D, and E Combined. There are rather equal numbers when the data from all the schools are considered. There are: 220 commercial students, 198 academic, and 194 industrial arts students.

The means and medians in the order of their rank are:

Course	Mean	Median
1. Academic	108.086	108.77
2. Commercial	107.182	107.32
3. Ind. Arts	104.603	105.61

The reliability of the difference between the means was calculated by the formula given by Garrett.[14] The results of the true difference was referred to Table XIV of Garrett.[15]

According to a comparison of the means, the chances are 71 in 100 (in favor of the academic students) that the true difference between the academic and commercial students is "significant". This lowered reliability is explained by the distribution of the data. School E, which has the lowest arithmetic means of the I. Q.'s of any of the schools, has the second largest group of students in the academic course when all the schools are compared. To be more exact, there are 107 academic students from school A, 11 from school B, 17 from school C, 3 from school D, and 60 from school E. There were only 17 commercial and 11

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[14] Henry E. Garrett, op. cit., p. 130.

[15] Ibid., p. 134.

industrial arts from school E, and although the academic students were first (in school E)) with a high reliability, the I. Q.'s were all lower. When thrown with the group they would tend to bring down the general average, especially in the case of the academic students. The reliability of the weighted chances in 100 is 82 in 100 that the true difference (in favor of the academic students when compared with the commercial students) is "significant".

The academic students are also ahead of the industrial arts students. Here the chances are 94 in 100 that the true difference is "significant".

The commercial students have a higher mean than the industrial arts students. The chances are 94 in 100 that the true difference is "significant".

According to the 612 cases studied in the combined schools, the academic students are first, the commercial second, and the industrial arts third.

I. Summary and Conclusion of All the Data

Viewing each school from the standpoint of the median, without taking into consideration the significance of the difference, the academic students were first, the commercial second, and the industrial arts students third, as far as general intelligence as a group is concerned.

Viewing each school, with the exception of school B, from the standpoint of the mean, the academic students were first, the commercial second, and the industrial arts third. In school B, the chances were only 67 in 100 that the true difference (in favor of the commercial students when compared with the academic students) was "significant". This low reliability suggests that this difference is due to chance.

Upon a comparison between the courses of three of the schools A, B, and C (located in the same city) we again find the academic students first, the commercial second, and the industrial arts third, both from the standpoint of the mean and median.

Comparing all the schools visited, from the standpoint of the mean and the median, we have the academic students first, the commercial second, and the industrial arts students third.

Following is a list showing the significance of the difference between the means, in favor of the academic stu-

dents, when compared with the:

	Commercial	Industrial Arts
School A	88 in 100	100 in 100
School B	---------	58 in 100
School C	80 in 100	100 in 100
Schools, A, B, & C	100 in 100	100 in 100
School D	91 in 100	98 in 100
School E	99 in 100	99 in 100
Schools, A, B, C, D, & E	71 in 100	99 in 100

The weighted reliability of all the schools (in favor of the academic students, when compared with the commercial students) is 82 in 100.

Following is a list showing the significance of the difference between the means, in favor of the commercial students when compared with the:

	Academic	Industrial Arts
School A	--------	99 in 100
School B	67 in 100	91 in 100
School C	--------	80 in 100
Schools, A, B, & C	--------	88 in 100
School D	--------	88 in 100
School E	--------	64 in 100
Schools, A, B, C, D, & E	--------	94 in 100

In other words, we must rank the academic students first, the commercial second, and the industrial arts students third in the order of their general intelligence.

III. A COMPARISON OF THE GRADES OF ACADEMIC, COMMERCIAL, AND INDUSTRIAL ARTS STUDENTS

A. Introduction

Since the writer has had students in his classes who were good in an academic subject and poor in shop work (and vice versa), he wondered whether the academic students, as a group, were poorer in the special subjects than they were in the academic subject. Also the writer wondered whether the special students, namely, the industrial arts and the commercial students, were poorer in the academic subjects than they were in the special subjects. Data for the other special courses were unobtainable in sufficient numbers to make comparisons.

The data were taken from three of the Indianapolis high schools, from the Logansport High School, and from one of the Terre Haute high schools. In other words, both the grades and the I. Q.'s were taken from the same schools.

Only the grades of students who had graduated from the high schools were taken. If a student had six or more grades, indicating, of course, that he had taken six or more courses, in a special subject, then that special subject was counted his major. Most of the students counted as industrial arts or commercial majors had over 10 terms of work in their respective fields.

A comparison was made between the grades of each of the courses in each school, and also between the grades of three of the schools, combined. These three schools are located in the same city and have the same grading system.

Schools A, B, and C (located in the same city) have the following grading system:: ~~A+~~, A, B, and C. Anything below "C" is failure. The numerical value given to each grade for purpose of comparison is:: ~~A+~~4, A 3, B 2, and C 1.

Schools, D and E had the following grading system:: A, B, C and D. Anything below D is failure. The numerical value given to each grade is:: A 4, B 3, C 2, and D 1.

TABLE XI

AVERAGE GRADE OF STUDENTS IN SCHOOL A

Subject	Academic		Commercial		Ind. Arts	
	No. of grades	Av. grade	No. of grades	Av. grade	No. of grades	Av. grade
Social Studies	514	1.875	114	1.737	64	1.594
English	794	1.907	197	1.837	108	1.481
Mathematics	475	1.907	129	1.930	93	1.881
Science	405	1.877	99	1.989	49	1.898
For. Language	539	2.024	145	2.180	30	1.766
Commerce	169	1.923	263	1.981	10	1.500
Home Economics	62	2.500	31	2.645	--	-----
Music	49	2.775	4	3.000	--	-----
Ind. Arts	67	2.059	2	1.000	141	2.645
Art	30	2.300	7	3.143	9	2.666
All subjects	3104	1.949	991	1.977	504	1.974

B. School A

Discussion of the Grades of School A. Table XI, page 78, gives the average grade of the students of school A in each subject and in all the subjects. The writer also gave the number of grades in Table XI, rather than the number of students, for two reasons: first, the average grade was determined directly by the number of grades, and second, the larger the number of grades, the more accurate the average. Of course, the number of grades is determined by the number of students, but not all students take the same amount of work in each subject.

According to Table XI, there is not a great deal of difference, in the academic course, between the average grades of any of the subjects. The average grades in the special subjects are slightly higher than the average grades in the other subjects, with the exception of foreign language. However, the average grades of the special subjects are based upon fewer numbers.

There is not a great deal of difference, in the commercial course, between the average grades of any of the subjects. The average grades of the special subjects, with the exception of industrial arts, are slightly higher than the average grades of the other subjects. The average grade of the industrial arts students is just based upon two grades and is therefore not at all reliable.

The average grades of students on an industrial arts course are slightly higher in the special subjects than they are in the other subjects. Here there is a larger number of grades in the special subject, industrial arts, than in any of the academic subjects, so that the average should be more reliable.

The average grades in all the subjects of each of the courses are about the same:

Academic	Commercial	Industrial Arts
1.949	1.977	1.974

TABLE XII

AVERAGE GRADE OF STUDENTS IN SCHOOL B

Subject	Academic		Commercial		Ind. Arts	
	No. of grades	Av. grade	No. of grades	Av. grade	No. of grades	Av. grade
Social Studies	51	1.529	370	2.024	461	1.841
English	92	2.130	614	2.471	729	1.841
Mathematics	55	2.054	317	2.306	595	2.068
Science	36	2.111	187	2.107	240	2.017
For. Language	46	1.761	257	2.062	201	1.829
Commerce	17	2.177	793	2.161	71	1.986
Home Economics	24	2.625	97	2.577	--	-----
Music	13	2.923	31	3.548	--	-----
Ind. Arts	5	3.200	9	2.222	1132	2.693
Art	5	2.400	14	3.143	30	2.900
All subjects	344	2.093	2689	2.249	3459	2.183

C. School B

Discussion of the Grades of School B. The average grades of school B are given in Table XII, page 81. This discussion is based upon the data given in Table XII.

The average grades of the academic and commercial students are about the same in each of the subjects. However, the average grades in the special subjects are slightly higher than the average grades in the other subjects.

The average grade of students on an industrial arts course is slightly higher in the industrial arts course, itself, than the average grades in any of the other subjects, with the exception of art. The average of the art students on an industrial arts course is based upon only 30 grades.

Evidently the teachers of the special courses are more lax in their grading than the other teachers.

The average grades of all the subjects in each of the courses are about the same:

Academic	Commercial	Industrial Arts
2.285	2.151	2.143

TABLE XIII

AVERAGE GRADE OF STUDENTS IN SCHOOL C

Subject	Academic		Commercial		Ind. Arts	
	No. of grades	Av. grade	No. of grades	Av. grade	No. of grades	Av. grade
Social Studies	107	2.532	307	2.130	126	2.167
English	187	2.347	914	2.177	383	1.893
Mathematics	73	2.411	182	2.170	132	2.106
Science	83	2.108	173	2.081	96	1.906
For. Language	73	1.890	146	2.069	65	1.969
Commerce	24	2.083	801	1.980	11	1.273
Home Economics	4	2.000	117	2.461	--	-----
Music	21	3.000	104	2.875	25	2.520
Ind. Arts	--	-----	5	3.200	370	2.500
Art	10	2.200	30	2.500	---	-----
All subjects	582	2.285	2779	2.151	1208	2.143

D. School C

Discussion of the Grades of School C. This discussion is based upon Table XIII, page 83, which gives the average grades for each of the subjects, as well as for all the subjects.

The average grades of the students on an academic course are about the same in each of the subjects.

The average grades of the students on a Commercial course are slightly higher in the special subjects than they are in the other subjects. However, the difference is too small to be very significant.

The average grades of the students on an industrial arts course are also slightly higher in the special subjects, than they are in the other subjects.

However, the average grades of all the subjects in each of the courses are about the same:

Academic	Commercial	Industrial Arts
2.285	2.151	2.143

TABLE XIV

AVERAGE GRADE OF STUDENTS IN SCHOOLS A, B, AND C

Subject	Academic		Commercial		Ind. Arts	
	No. of grades	Av. grade	No. of grades	Av. grade	No. of grades	Av. grade
Social Studies	672	1.968	791	2.023	651	1.880
English	1073	2.003	1725	2.243	1220	1.825
Mathematics	603	1.981	628	2.207	820	2.054
Science	524	2.000	459	2.072	385	1.974
For. Language	658	1.991	548	2.095	296	1.841
Commerce	210	2.009	1857	2.052	92	1.880
Home Economics	90	2.511	245	2.531	--	-----
Music	85	2.607	139	3.029	25	2.520
Ind. Arts	72	2.139	16	2.375	1643	2.645
Art	45	2.267	51	2.764	39	2.821
All subjects	4030	2.024	6459	2.167	5171	2.141

E. Schools A, B, and C Combined

Discussion of the Grades of Schools A, B, and C Combined. The average grades of the students in schools A, B, and C combined are given in Table XIV, page 85.

The average grades of students on an academic course are slightly higher in the special subjects than they are in the other subjects.

The average grades of students on a commercial course are slightly higher in the special subjects than they are in the other subjects.

The average grades of students on an industrial arts course are also slightly higher in the special subjects than they are in the other subjects.

The average grades of all the subjects in each of the courses are about the same:

Academic	Commercial	Industrial Arts
2.024	2.167	2.141

TABLE XV

AVERAGE GRADE OF STUDENTS IN SCHOOL D

Subject	Academic		Commercial		Ind. Arts	
	No. of grades	Av. grade	No. of grades	Av. grade	No. of grades	Av. grade
Social Studies	418	2.581	109	2.073	81	1.728
English	483	2.861	136	2.360	71	1.761
Mathematics	278	2.679	34	2.885	48	2.250
Science	278	2.492	52	2.577	50	2.080
For. Language	199	2.492	15	3.266	--	-----
Commerce	72	2.319	183	2.579	6	3.000
Home Economics	76	2.487	16	2.432	--	-----
Music	10	2.900	--	-----	4	2.750
Ind. Arts	56	2.266	5	1.800	76	2.447
Art	15	3.126	--	-----	--	-----
All subjects	1885	2.638	550	2.451	336	2.059

F. School D

Discussion of the Grades of School D. The average grades for each of the subjects, as well as for all the subjects, are given in Table XV, page 87.

The average grades of students on an academic course are about the same in each subject, with the exception of art. Art is slightly higher, but its average is based upon only 15 grades.

The average grades of the students on a commercial course are about the same in each of the subjects, with the exception of industrial arts. The average grade in industrial arts is slightly lower. However, the average is based upon only 5 grades, and cannot therefore be very valid.

The average grades of the students on an industrial arts course are slightly higher in the special subjects than they are in the other subjects.

The average grades of the students in all the subjects of each course are:

Academic	Commercial	Industrial Arts
2.638	2.451	2.059

TABLE XVI

AVERAGE GRADE OF STUDENTS IN SCHOOL E

Subject	Academic		Commercial		Ind. Arts	
	No. of grades	Av. grade	No. of grades	Av. grade	No. of grades	Av. grade
Social Studies	17	3.882	82	2.500	226	2.451
English	22	3.455	87	2.747	190	2.295
Mathematics	18	3.222	36	2.694	100	2.330
Science	12	3.667	34	2.794	89	2.551
For. Language	8	3.000	26	2.308	6	1.500
Commerce	9	3.556	146	2.719	20	2.600
Home Economics	4	3.250	51	2.784	--	-----
Music	1	3.000	11	3.182	41	3.500
Ind. Arts	8	4.000	13	2.000	395	2.213
Art	-	-----	2	2.500	--	-----
All subjects	99	3.441	488	2.666	1030	2.329

G. School E

Discussion of the Grades of School E. The average grades of school E are given in Table XVI on page 89.

The average grades of the students on an academic course in school E are about the same in both the academic and the commercial subjects. The average grades of the academic students in this instance are based upon only three students, so that the results are not very significant.

The average grades of the students on a commercial course are about the same in both the academic and the special subjects.

The average grades of the students on an industrial arts course are about the same in both the academic and the special subjects, with the exception of music. The average grade of the music students is slightly higher, but it is based upon only 41 grades.

The average grades of all the subjects in each course are:

Academic	Commercial	Industrial Arts
3.441	2.666	2.329

H. Summary and Conclusions

The average grades of the students, in each of the courses, are about the same in each subject. However, the average grades were usually slightly higher in the special subjects than they were in the other subjects, regardless of the course. The exception to this is school E. In school E, the special subjects did not have higher averages than the other subjects, but the average grades were about the same. Evidently the teachers of the special subjects grade higher than do the other teachers. However, the difference is too slight to be significant. On the average, if a student is good in an academic subject he will be good in a special subject, and vice versa.

IV. Conclusions

No matter whether the comparisons were made between the I.Q.'s of the students on the different courses within the same school, or between three city schools, or between all the schools visited, the academic students were first, the commercial second, and the industrial arts third, when compared by their medians. When compared by their means, the same thing was true except in school B, as was mentioned in the discussion and in the summary. In school B, the chances were only 67 in 100 that the true difference (in favor of the commercial students, when compared with the academic students) was "significant". As the writer has said before, this low reliability suggests that these differences are due to chance.

The differences in intelligence ratings between courses are not large, but the consistency of these differences in the various schools is marked. Some of this difference may be due to the type of test used, for the general intelligence tests we use today may favor the academic students. Thorndike says that there are three kinds of intelligence: Abstract, social, and mechanical.[1] It may be that the commercial and the industrial arts students have more of the mechanical type of intelligence than the academic students. It may also be true that pupils with lower intelligence were advised to take a commercial or an industrial arts course. If this is true, it would tend to pull down the general average of the commercial and industrial arts students. However, upon the basis of our present intelligence tests, the academic students rank first, the commercial second, and the industrial arts third.

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[1] E. L. Thorndike, The Measurement of Intelligence (New York: Bureau of Publications, Teachers College, Columbia U., 1925). p. 64.

Evidently the teachers of the special subjects graded higher than the other teachers, for the students, no matter what course they were on, made higher grades in the special subjects. However, the difference between the grades in the academic and in the special subjects was insignificant. The average grades of the students, on the various courses, were about the same, because the grades of the special students in the special subjects tended to raise their general average. Of course, the average grades of the academic students were also raised when they took special work, but they did not take nearly as many terms of special work as did the special students. In conclusion, we may say, that on the average, if a student is good in an academic subject he will also be good in a special subject, and vice versa.

V. Appendix

A. Bibliography

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