

SEX DIFFERENCES IN COLLEGE ACHIEVEMENT
OF LOW RANKING HIGH SCHOOL STUDENTS

SEX DIFFERENCES IN COLLEGE ACHIEVEMENT
OF LOW RANKING HIGH SCHOOL STUDENTS

OCT 27 1939

By

EARL HAMON

Bachelor of Science

Oklahoma Agricultural and Mechanical College

Stillwater, Oklahoma

1933

Submitted to the School of Education

Oklahoma Agricultural and Mechanical College

In Partial Fulfillment of the Requirements

For the Degree of

MASTER OF SCIENCE

1939

LIBRARY
A & M COLLEGE
STILLWATER OKLA

OKLAHOMA
AGRICULTURAL & MECHANICAL COLLEGE
LIBRARY

OCT 27 1939

APPROVED:

Mr. Chamberlain
In Charge of Thesis

H. C. C. C.
Dean of School of Education

D. C. W. D. D.
Dean of Graduate School

119448

ACKNOWLEDGMENTS

In presenting this investigation as partial fulfillment of the requirements leading to a Master of Science degree in Educational Administration, acknowledgment must be given to certain members of the Oklahoma Agricultural and Mechanical College faculty and personnel without whose help the problem would never have come to a satisfactory solution. Dr. Eleroy Stromberg was most helpful in criticism and kindly inspiration. Dr. Herbert H. Patterson, Dean of Administration, made reservations and records available so that the data might be the more easily assembled. Miss Walters of the library staff was most diligent in her search for material related to this subject. Drs. M. R. Chauncey and Melvin G. Rigg were most thorough in preparing the investigator with the necessary background of Educational Measurements and Statistics without which the observation of the data could not have been as thorough as it is.

E. H.

TABLE OF CONTENTS

CHAPTER	PAGE
I HISTORY AND DISCUSSION OF THE PROBLEM	1
II DATA: SOURCES AND METHODS OF TREATMENT	9
III TREATMENT AND OBSERVATION OF THE DATA.. . . .	13
IV SUMMARY AND CONCLUSIONS. . . .	38
BIBLIOGRAPHY.	43

CHAPTER I

HISTORY AND DISCUSSION OF THE PROBLEM

Investigations have shown that boys of the high schools score higher than girls on standardized achievement tests, and that girls are credited with higher grades from classroom work. On the eve of graduation from high school standardized general achievement tests were given to all seniors in the St. Louis high schools. The results of the application of these tests, as reported by G. R. Johnson,¹ show that:

Two-thirds of the upper half on examination scores were boys, and two-thirds of the lower half were girls

In another report by Johnson,² it is shown that:

Standardized tests of general achievement given at the time of graduation to all pupils in the St. Louis schools,.....show that in all these standardized tests the boys excelled the girls.....

In a study of Massachusetts's seniors by Colvin and MacPhail,³ it is reported that:

From time to time throughout this survey reference has been made to the fact that the median scores, on the Brown University Psychological examination, of the girls are somewhat

¹
G. R. Johnson, "Girls Do Better Than Boys," School and Society, 1938. 47:313-314.

²
G. R. Johnson, "Girls Lead in Progress Through School," American School Board Journal, 1937. 95:25-26.

³
Stephen S. Colvin and Andrew H. MacPhail, Intelligence of Seniors in the High Schools of Massachusetts, United States Department of Interior, Bureau of Education, Bulletin No. 9, 1924.

lower than those of the boys...It is clearly shown that while there is a large amount of overlapping between the scores made by the two sexes, the median score of the boys is higher.

It is concluded from the investigation⁴ that:

Boys in the senior classes on the whole are a more selected group than are the girls in those same classes because boys of lower intelligence tend to drop out of school sooner than the girls of lower intelligence.....

Other reports substantially favor the boys. It is reported by T. M. Livesay⁵ from the University of Hawaii that:

As between high school graduates it would seem that on the whole men do somewhat better on the American Council on Education psychological examination than do women.

The critical ratio of the difference between the means for the men and for the women, as reported by Livesay,⁵ on the American Council test is 1.42. The chances are, as he points out, 92 in 100 that there will be a positive difference between the means greater than zero and in favor of the boys on this test. These results were based upon data obtained from 505 male and 372 female high school graduates.

⁴
Ibid.

⁵
T. M. Livesay, "Sex Difference in Performance on the American Council on Education Psychological Examination," Journal of Educational Psychology, 1937. 28:694-702.

In an investigation of high school seniors from eight Twin City high schools in 1926, by Paterson and Langlie,⁶ it is shown that:

Reference to this table (Table I of their study) shows that the men are markedly superior to the women in the college ability tests....

In these eight schools from 59 to 79 per cent of the boys equal or exceed the median of the girls.

Inspection of the table (Table IV of their study) shows that.....there was a sex difference in favor of the men in the college ability tests.....

A thorough investigation of high school seniors of Indiana is reported by William F. Book. The publication treats data collected from a study of 5748 Indiana high school seniors. It is reported in Chapter XIII of this publication⁷ that:

It must be stated at the outset that in every comparison of the intelligence scores made throughout the entire study, the record made by the boys was superior to that made by the girls.

From the superiority of boys over girls on achievement test scores, it might be assumed that the superiority would transfer to actual scholarship ratings. This is not true, however, because reports consistently show that the girls exceed the scholarship rating of the boys. Every

6

Donald G. Paterson and T. A. Langlie, "The Influence of Sex on Scholarship Ratings," Educational Administration and Supervision, 1926. 12:458-468.

7

William F. Book, Intelligence of High School Seniors, pp. 269-292.

spring there is a constant parade of girls as the valedictorians and honor students of the high school classes.

In a study made of the pupils in the schools of South Portland, Maine, it is reported by L. C. Day⁸ that of the graduating class of 1936 the girls enjoyed a substantial honor advantage over the boys of 1.64 to 1. In the St. Louis investigation it is reported by G. R. Johnson⁹ that:

....approximately two-thirds of the upper half of every high school graduating class consisted of girls.....

In an investigation by Douglass and Olson¹⁰ it is reported that:

Studies have shown that girls in senior high schools....almost invariably, as a group, receive higher average marks than boys.

In the studies of the South Portland, Maine, schools, it is reported by L. C. Day¹¹ that:

....high school pupils of 1936-1937...the girls had an advantage of 1.34 to 1 toward an A throughout high school, and the boys were under a 2.71 handicap toward making the honor roll.

⁸
L. C. Day, "Boys and Girls and Honor Ranks," School Review, 1938. 46:288-299.

⁹
G. R. Johnson, op. cit.

¹⁰
Harl R. Douglass and Neuman E. Olson, "The Relation of Sex to High-School Marks in Four Minnesota High Schools," The School Review, 1935. 45:283-288.

¹¹
L. C. Day, op. cit.

These reports have all been made of high school students. From the elementary schools it is reported by Mr. Day¹² that out of 1186 boys and 1196 girls, a girl is about one and a third times as likely to receive an A as a boy. The average boy's disadvantage (computed by dividing the average number of D's for each boy by the same average for each girl) toward making D grades throughout the elementary school is 2.08. The boys are more than twice as likely to receive D's as the girls. It is further reported by Mr. Day¹³ that:

The whole elementary-grade situation appears to point unmistakably to the conclusion that the typical boy is much less likely to attain an honor mark and much more likely to receive an unsatisfactory mark than his sister.

It is further reported by Paterson and Langlie¹⁴ that:

Reference to the table (in their study) shows that the men are markedly superior to the women in the college ability tests, 61 per cent of all the men reaching or exceeding the median of the women. The difference is reversed when the comparison is based on high school or university scholarship: less than 50 per cent of the men reach or exceed the median of the women.

Investigators continue to report girls superior to boys on the basis of scholarship ratings. It is reported

¹²

Ibid.

¹³

Day, op. cit.

¹⁴

Paterson and Langlie, op. cit.

by William F. Book¹⁵ that:

Our comparative study of the school marks made by the boys and girls shows that the girls were consistently rated higher in their work than the boys...that a larger percentage of girls than boys were rated excellent on their high school work.....

It is concluded¹⁶ that:

(1) The senior boys who took the intelligence tests are brighter than the girls, but the girls are nevertheless given higher school marks and are more rapidly and regularly promoted by the school.

These reports show that there is little or no correlation between actual school marks and scores obtained from application of objective tests. Boys consistently show more ability on standardized objective tests than girls, yet girls consistently show higher scholarship ratings than boys. These peculiar sex differences must be due to many circumstances which, in the main, help to determine scholastic ratings. It is concluded in the report by Paterson and Langlie¹⁷ that probably more objective methods of measurement of achievements would prevent what is termed 'overrating' of the girls.

Investigations have shown that there is no significant difference between the sexes in native intelligence.

¹⁵ Book, op. cit.

¹⁶ Ibid.

¹⁷ Paterson and Langlie, op. cit.

It is reported by Frederick H. Lund¹⁸ that:

Interest in sex differences has centered about four major problems: Differences in (1) general intelligence, (2) variability, (3) scholarship, and (4) special mental capacities.

Regarding the first of these--general intelligence--Thorndike, Pressey, Lincoln, Burnham...and others are agreed that differences, if they exist, are not general enough to be important.

It is reported by E. A. Lincoln¹⁹ that:

It may be concluded that general sex differences do not appear to any great extent in the individual intelligence examinations of either the Binet or performance type.

Another investigation, which applies to the general population, reported by Conrad, Jones, and Hsiao,²⁰ shows that:

The Army Alpha intelligence examination was administered to 581 males and 607 females in a representative rural group between the ages of ten and sixty. A general slight superiority of females to males is observed.....

All investigators in the field report the insignificance of the differences found. Usually where a difference does occur it is in favor of the girls. In a study

¹⁸ Frederick H. Lund, "Sex Differences in Types of Educational Mastery," The Journal of Educational Psychology, 1932. 23:321-323.

¹⁹ E. A. Lincoln, Sex Differences in School Children, p. 40.

²⁰ H. S. Conrad, H. E. Jones, and H. H. Hsiao, "Sex Differences in Mental Growth and Decline," The Journal of Educational Psychology, 1934. 24:161-169.

of intelligence quotients of approximately 10,000 St. Louis school children, Melvin G. Rigg²¹ shows that a difference between the mean I. Q.'s of 3.38 (106.94 - 103.56) in favor of the girls does occur. The difference is sure to occur; but it, in itself, is too small to be significant.

The two sexes should prove equally successful and efficient in their school work. Instead of their being equally efficient, however, there is the artificial situation where the boys excel the girls on the basis of one rating (standardized achievement tests), and the girls excel the boys on the basis of another rating (school marks from the classroom). Boys graduate from high school with two-thirds of their number in the lower 50 per cent of their classes in scholarship rating, yet two-thirds of their number score in the upper 50 per cent of their classes on standardized achievement tests. The boys have only one advantage in school marks, and that is in the making of D's.

The present investigation will compare the achievement at Oklahoma A. & M. College of those students, men and women, who have an average rating of D for their high school work.

21

Melvin G. Rigg, The Relative Variability in Intelligence of Boys and Girls, An unpublished manuscript, 1939.

CHAPTER II

DATA: SOURCES AND METHOD OF TREATMENT

The data reported in this investigation are from two selected groups of students. The results are from the records made by the 1937 and the 1938 Oklahoma Agricultural and Mechanical College freshmen who have D average scholarship ratings on their high school transcripts.¹ The records studied are the entrance test scores² and the grade point averages³ (for one year) made by each of the individuals in the D lists.

All students entering A. & M. are required to take an entrance examination. The test administered in 1937 was the Ohio State University Psychological examination, Form 17. The test used in September of 1938 was the American Council on Education Psychological examination.

At different times during the summer of 1938 new students were given the opportunity to take their entrance tests, and at those times the Ohio State test was used instead of the newly adopted American Council examination. At these summer periods, 51 men and 3 women of the 1938 D list took their entrance examinations. This 51 to 3 is

¹ D lists are prepared by the Dean of Administration and sent to the Dean of each school.

² Records available in the office of administrative studies.

³ Records made available by the registrar's office.

not the correct ratio⁴ of D average men to D average women, therefore, it was considered unscientific to group these scores with those made by the 1937 students even though they were all from the same test.

The grade point average for each individual in the D list is reported. The college policy is to award one point for each credit hour with a D grade; two points for a C grade; three points for a grade of B; and four points per hour for an A. The grades recorded for the college courses taken by each student were transposed into their numerical grade point value. The total number of grade points was divided by the total number of hours carried by the student giving a grade point average for each credit hour. For example, a student with a total of 14 hours of work and 30 grade points has a grade point average of 2.14, or slightly better than a C average.

All data are divided into groups as follows: (1) by sexes, and (2) by whether or not the entrance test scores fall in the upper 75 per cent or the lower 25 per cent of the freshman class as a whole (this division is made only with the 1937 group). Treatment, comparisons, and implications are reported from the standpoint of these divisions.

⁴

See Chapter III.

The data are further treated thus:

- (1) The entrance test scores are combined into distribution tables with the Mean, \bar{m} , and the σ_{dis} is computed from the data in each table.
- (2) The grade point averages are treated by the same procedure as (1).
- (3) The critical ratios ($\frac{D}{\sigma_{diff}}$) of the differences between the means made by the women and those made by men are reported with the reliability of those critical ratios.
- (4) The coefficients of correlation (Pearson's Product-Moment) between the entrance test scores and the grade point averages for two semesters are reported for the 1937 group and the 1938 group.
- (5) After all these treatments and comparisons are made, a series of summary tables are developed and reported to show the similarity or dissimilarity of the results.

Statistical manipulations are made by means of standard formulas taken from: (1) Lindquist, E. F. A First Course in Statistics, Cambridge, Houghton Mifflin Company, 1938, and (2) Garrett, H. E. Statistics in Psychology and Education, New York, Longmans, Green and Company, 1926.

Constant factors which affect the results in the investigation are: (1) these are selected groups restricted to students with an average of D for their high school work, and (2) in some instances the results do not approach

normality because the number of cases is small. (3) No consideration has been given to the possibility of different grading scales in use from one high school to another or from one division of the college to another.

CHAPTER III

TREATMENT AND OBSERVATION OF THE DATA

In the general Oklahoma Agricultural and Mechanical College population the men outnumber the women approximately 2 to 1--the first semester of 1937-1938 there were 2878 men and 1447 women enrolled in the college. It is certain that the men will outnumber the women in these D average lists 4 to 1. There were 140 men to 34 women in the 1937 group and 210 men to 43 women in the 1938 group. The sums of these two groups are 350 men to 77 women, which is in the ratio of 4.5 to 1. The actual proportion of women in this combined group is .18 with a σ_p of .019. The proportion of women in the 1937 group is .2. The proportion of women in the 1938 list is .17. The true proportion of women in the combined groups of D average students for 1937 and 1938 will fall between .163 and .277, which is within three standard error units of the obtained proportion of .18 (σ_p is .019).

There is a reliable and significant difference between the proportion of men and the proportion of women in the D average lists whose entrance test scores fall in the upper 75 per cent of all the freshmen entrance test scores. From a total of 338 recorded scores for men, 167 fall in the upper 75 per cent. The proportion is .49, and the σ_p is .027. From a total of 70 recorded scores for the D average women, 25 fall in the upper

75 per cent. The proportion is .357, and the \hat{p} is .056. The difference between these two proportions is .133 (.49 - .357), and the \hat{d}_{diff} is .062. The critical ratio of this difference between the proportions is 2.14 in favor of the men, which approaches certainty of occurrence.

The enrollment distribution by schools in the Oklahoma Agricultural and Mechanical College of these D average men and women, and the enrollment by schools of the entire college population are shown in Table I.

TABLE I

THE PERCENTAGE OF D AVERAGE STUDENTS REGISTERED
IN EACH SCHOOL AND THE PERCENTAGE OF THE ENTIRE
COLLEGE POPULATION IN THE SAME SCHOOLS
(1937 and 1938)

School	No. of D Students	% of D List	% of Entire College Population	
			1937	1938
Education	22	5.2	9.0	9.0
Home Economics	37	8.8	10.7	10.8
Arts and Science	50	11.8	11.6	12.8
Commerce	93	22.0	19.8	20.2
Engineering	108	25.6	21.0	20.9
Agriculture	112	26.6	20.4	19.8
Graduates			5.8	6.5
Specials			1.7	

The data from this table show that the D average students follow closely the pattern set by the entire college population.

The distribution of the entrance test scores made by the 1937 D average men is given in Table II.

TABLE II
DISTRIBUTION OF ENTRANCE TEST SCORES¹ MADE
BY THE MEN OF THE 1937 D AVERAGE LIST

	f	d	fd	fd ²
151-157	1	14	14	196
144-150	0	13	0	0
137-143	2	12	24	288
130-136	1	11	11	121
123-129	3	10	30	300
116-122	6	9	54	486
109-115	2	8	16	128
102-108	5	7	35	245
95-101	7	6	42	252
88-94	8	5	40	200
81-87	11	4	44	176
74-80	3	3	24	72
67-73	14	2	28	56
60-66	10	1	10	10
53-59	20	0	0	0
46-52	14	-1	-14	14
39-45	10	-2	-20	40
32-38	5	-3	-15	45
25-31	1	-4	-4	16
N =	128	$\sum d$	= 319	$\sum fd$ = 2645

¹
The Ohio State University Psychological Examination,
Form 17.

The mean from the data in Table II is 73.5, and the σ_{m_1} is 2.34. The σ_{dis} is 26.53.

The entrance test scores made by the D average women of the 1937 group are reported in Table III.

TABLE III
DISTRIBUTION OF ENTRANCE TEST SCORES² MADE BY
THE WOMEN OF THE 1937 D AVERAGE LIST.

	f	d	fd	fd ²
103-107	1	10	10	100
98-102		9	0	0
93-97		8	0	0
88-92	1	7	7	49
83-87	1	6	6	36
78-82	1	5	5	25
73-77	2	4	8	32
68-72	2	3	6	18
63-67	1	2	2	4
58-62	3	1	3	3
53-57	6	0	0	0
48-52	2	-1	-2	2
43-47	1	-2	-2	4
38-42	5	-3	-15	45
33-37	1	-4	-4	16
28-32	2	-5	-10	50
N = 29		$\sum fd = 14$		$\sum fd^2 = 384$

²

See note Table II.

The mean from the data in this distribution is 57.4, and the σ_{m_2} is 3.34. The σ_{dis} is 18.04.

The difference between the mean entrance test score made by the men and that made by the women of the 1937 group is 16.1 (from Tables II and III) in favor of the men. The σ_{diff} is 4.078 which gives a critical ratio of 3.9. This difference is reliable. It is certain that the D average men will have a higher mean score on the Ohio State University Psychological examination, Form 17, test than the women.

Of the 29 women whose entrance test scores are reported in Table III, only 19 per cent of them equal or exceed the mean entrance test score made by the men. Of the 128 men whose entrance test scores are reported for 1937 (Table II), 66 per cent of them equal or exceed the mean entrance test score made by the women. The highest step-interval recorded for the men is 151-157 with one score falling in that step. The highest score reported for the women falls in the step-interval 103-107. The centile rank of the highest score for the men is 93, and that for the women is 68 (these centile ranks are based upon scores made by the entire freshman class of 1937.).

As previously pointed out the majority of the 1938 freshmen took the American Council on Education Psychological examination as a part of their requirements for entrance to Oklahoma Agricultural and Mechanical College.

There were 159 D average men and 38 D average women whose scores are recorded for this test. The men's scores are arranged in Table IV.

TABLE IV
DISTRIBUTION OF THE ENTRANCE TEST SCORES³ MADE BY
THE MEN OF THE 1938 D AVERAGE LIST

	f	d	fd	fd ²
228-234	1	21	21	441
221-227		20		
214-220		19		
207-213	2	18	36	648
200-206		17		
193-199		16		
186-192		15		
179-185	2	14	28	392
172-178	4	13	52	676
165-171	2	12	24	288
158-164	3	11	33	363
151-157	2	10	20	200
144-150	3	9	27	243
137-143	4	8	32	256
130-136	10	7	70	490
123-129	7	6	42	252
116-122	5	5	25	125
109-115	9	4	36	144
102-108	8	3	24	72
95-101	5	2	10	20
88-94	12	1	12	12
81-87	17	0	0	0
74-80	10	- 1	-10	10
67-73	10	- 2	-20	40
60-66	13	- 3	-39	117
53-59	10	- 4	-40	160
46-52	8	- 5	-40	200
39-45	5	- 6	-30	180
32-38	4	- 7	-28	196
25-31		- 8		
18-24	2	- 9	-18	162
11-17	1	-10	-10	100

N = 159

$\Sigma fd = 257$ $\Sigma fd^2 = 5787$

³

The American Council on Education Psychological Examination.

The mean from the data in Table IV is 95.21, and the σ_{m_1} is 3.23. The σ_{dis} is 40.68.

The entrance test scores of the 38 D average women of the 1938 group are shown in Table V.

TABLE V
DISTRIBUTION OF ENTRANCE TEST SCORES⁴ MADE BY
THE WOMEN OF THE 1938 D AVERAGE LIST

	f	d	fd	fd ²
200-206	1	17	17	289
193-199		16		
186-192		15		
179-185		14		
172-178		13		
165-171		12		
158-164		11		
151-157		10		
144-150	1	9	9	81
137-143		8		
130-136	1	7	7	49
123-129	1	6	6	36
116-122	1	5	5	25
109-115	0	4		
102-107	5	3	15	45
95-101		2		
88-94	3	1	3	3
81-87	6	0	0	0
74-80	4	-1	-4	4
67-73	2	-2	-4	8
60-66	4	-3	-12	36
53-59	3	-4	-12	48
46-52	3	-5	-15	75
39-45	1	-6	-6	36
32-38	1	-7	-7	49
25-31		-8		
18-24	1	-9	-9	81

$$N = 38$$

$$\sum fd = -7 \quad \sum fd^2 = 865$$

⁴
The American Council on Education Psychological examination.

The mean from the data in Table V is 82.71, and the σ_{m_2} is 5.41. The σ_{dis} is 33.32.

The difference between the mean entrance test score made by the 1938 D average men and that for the 1938 D average women is 12.5 in favor of the men (Tables IV and V). The σ_{diff} is 6.33 which gives a critical ratio of 1.98 in favor of the men. The difference is not entirely reliable. It is greater than that reported by Livesay⁵ from an unrestricted group of high school graduates.

The previously reported critical ratio for the difference between the mean entrance test scores made by the men and the women on the Ohio State University test is 3.9. That difference is much more reliable than the 1.98 reported for the American Council test in the above paragraph. Since the tests are applied to different groups of students at different times and the tests themselves are different, the data at hand provide no reason for the discrepancy between these critical ratios.

Other results of the 1938 test are similar to those of the 1937 group since 57 per cent of the men equal or exceed the mean for the women on the former test and only 26 per cent of the women reach or exceed the mean for the men. The highest recorded score for the men (the 1938 test) falls within the step-interval 228-234 with the centile rank of 93. The highest score for the women falls within the interval 200-206 with the centile rank of 87.

⁵

T. M. Livesay, op. cit.

There were 129 men from the D average list for 1937 who completed the first semester's work. On the basis of their entrance test scores 62 of these men were in the lower 25 per cent of the 1937 freshmen. The other 67 were in the upper 75 per cent group with the distribution of grade point averages as reported in Table VI.

TABLE VI
DISTRIBUTION OF GRADE POINT AVERAGES MADE BY
D AVERAGE MEN OF THE UPPER 75 PER CENT⁶
THE FIRST SEMESTER OF 1937-1938

	f	d	fd	fd ²
3.00-3.24	4	7	28	196
2.75-2.99		6		
2.50-2.74	6	5	30	150
2.25-2.49	9	4	36	144
2.00-2.24	5	3	15	45
1.75-1.99	4	2	8	16
1.50-1.74	10	1	10	10
1.25-1.49	5	0	0	0
1.00-1.24	5	-1	- 5	5
.75-.99	5	-2	-10	20
.50-.74	7	-3	-21	63
.25-.49	3	-4	-12	48
0-.24	4	-5	-20	100
	N = 67		$\Sigma fd = 59$	$\Sigma fd^2 = 797$

6

This upper 75 per cent, and subsequent references to upper or lower groups has been explained in Chapter II.

The mean grade point average from the data of Table VI is 1.6, and the σ_m is .102. The σ_{dis} is .84.

The grade point averages made by the men of the upper 75 per cent their second semester of 1937-1938 are shown in Table VII.

TABLE VII

DISTRIBUTION OF GRADE POINT AVERAGES MADE BY
THE D AVERAGE MEN OF THE UPPER 75 PER CENT
THE SECOND SEMESTER OF 1937-1938

	f	d	fd	fd^2
5.00-5.24	3	6	18	108
2.75-2.99		5		0
2.50-2.74	2	4	8	32
2.25-2.49	6	3	18	54
2.00-2.24	7	2	14	28
1.75-1.99	7	1	7	7
1.50-1.74	11	0	0	0
1.25-1.49	3	-1	- 3	3
1.00-1.24	7	-2	-14	28
.75-.99	2	-3	- 6	18
.50-.74	2	-4	- 8	32
.25-.49	1	-5	- 5	25
N = 51		$\Sigma fd = 29$	$\Sigma fd^2 = 335$	

Those who were in the 0-.24 step-interval the first semester were not admitted for work the second semester thus restricting the range for that semester. The mean from the data in Table VII is 1.82, and the σ_m is .089. The σ_{dis} is .63.

The 62 men whose entrance test scores fell in the lower 25 per cent group completed their first semester's college work, 1937-1938, with the distribution as shown in Table VIII.

TABLE VIII

DISTRIBUTION OF GRADE POINT AVERAGES MADE BY
THE D AVERAGE MEN OF THE LOWER 25 PER CENT
THE FIRST SEMESTER OF 1937-1938

	f	d	fd	fd ²
2.75-2.99	1	7	7	49
2.50-2.74	2	6	12	72
2.25-2.49		5		0
2.00-2.24	2	4	8	32
1.75-1.99	3	3	9	27
1.50-1.74	9	2	18	36
1.25-1.49	7	1	7	7
1.00-1.24	9	0	0	0
.75-.99	8	-1	-8	8
.50-.74	8	-2	-16	32
.25-.49	6	-3	-18	54
0-.24	7	-4	-28	112
	N = 62		$\sum fd = -9$	$\sum fd^2 = 429$

The mean from the data in Table VIII is 1.09, and the σ_m is .083. The σ_{dis} is .67.

There were 62 of these men the first semester but only 32 returned for the second , a loss of 48 per cent. The distribution of their grade point averages for the second semester is shown in Table IX.

TABLE IX
DISTRIBUTION OF GRADE POINT AVERAGES MADE BY
THE D AVERAGE MEN OF THE LOWER 25 PER CENT
THE SECOND SEMESTER OF 1937-1938

	f	d	fd	fd ²
3.75-3.99	1	10	10	100
3.50-3.74		9	0	0
3.25-3.49	1	8	8	64
3.00-3.24		7	0	0
2.75-2.99	1	6	6	36
2.50-2.74	1	5	5	25
2.25-2.49	2	4	8	32
2.00-2.24	3	3	9	27
1.75-1.99	4	2	8	16
1.50-1.74	3	1	3	3
1.25-1.49	4	0	0	0
1.00-1.24	4	-1	- 4	4
.75-.99	2	-2	- 4	8
.50-.74	4	-3	-12	36
.25-.49	1	-4	- 4	16
0-.24	1	-5	- 5	25
	0 = 32		$\Sigma fd = 28$	$\Sigma fd^2 = 392$

The mean from the data in Table IX is 1.6, and the σ_m is .11. The σ_{dis} is .85.

In 1937 there were 12 D average women whose entrance test scores fell in the upper 75 per cent group, and 16 of them fell in the lower 25 per cent. The distribution of the grade point averages made by the women of the upper group the first semester of 1937-1938 is shown in Table X.

TABLE X
DISTRIBUTION OF GRADE POINT AVERAGES MADE BY
THE D AVERAGE WOMEN OF THE UPPER 75
PER CENT THE FIRST SEMESTER OF 1937-1938

	f	d	fd	fd ²
2.25-2.49	1	3	3	9
2.00-2.24	4	2	8	16
1.75-1.99	1	1	1	1
1.50-1.74	2	0	0	0
1.25-1.49	1	-1	-1	1
1.00-1.24	2	-2	-4	8
.75-.99	1	-3	-3	9
N = 12 $\sum fd = 4$ $\sum fd^2 = 44$				

The mean grade point average computed from the data in Table X is 1.76, and the σ_M is .136. The σ_{dis} is .47.

The difference between the mean grade point averages made by the D average women of the upper 75 per cent group and the corresponding group of men (Table VI) is .16 in favor of the women. The σ_{diff} , however, is .17 which gives a critical ratio of .94. This difference is not reliable.

One of these women from the upper group did not appear for the second semester. The distribution of grade point averages made by the eleven women who did complete the second semester is shown in Table XI.

TABLE XI
DISTRIBUTION OF GRADE POINT AVERAGES MADE BY
THE D AVERAGE WOMEN OF THE UPPER 75 PER CENT
THE SECOND SEMESTER OF 1937-1938

	f	d	fd	fd ²
2.50-2.74	1	5	5	25
2.25-2.49	0	4	0	0
2.00-2.24	3	3	9	27
1.75-1.99	2	2	4	8
1.50-1.74	1	1	1	1
1.25-1.49	0	0	0	0
1.00-1.24	1	-1	-1	1
.75-.99	1	-2	-2	4
.50-.74	1	-3	-3	9
.25-.49	1	-4	-4	16
N = 11			$\Sigma fd = 9$	$\Sigma fd^2 = 91$

The mean computed from the data in Table XI is 1.58, and the σ_m is .206. The σ_{dis} is .68.

The difference between the mean grade point averages made by the women of the upper 75 per cent group and that made by the corresponding group of men the second semester of 1937-1938 (Tables VII and XI) is .24 in favor of the men. The σ_{diff} is .22 which gives a critical ratio of 1.1. The difference is in favor of the men, but it has little reliability.

The distribution of the grade point averages made by the 16 women of the 1937 D average list whose entrance test scores fell among the lower 25 per cent group are shown in Table XII.

TABLE XII

DISTRIBUTION OF THE GRADE POINT AVERAGES MADE
BY THE D AVERAGE WOMEN OF THE LOWER 25 PER CENT
THE FIRST SEMESTER OF 1937-1938

	f	d	fd	fd ²
1.75-1.99	1	4	4	16
1.50-1.74	3	3	9	27
1.25-1.49	1	2	2	4
1.00-1.24	3	1	3	3
.75-.99	3	0	0	0
.50-.74	2	-1	-2	2
.25-.49	2	-2	-4	8
0-.24	1	-3	-3	9
N = 16			$\sum fd = 9$	$\sum fd^2 = 69$

No woman of the lower group made a C average since the highest grade point average recorded is 1.92. The mean from the data in Table XIII is 1.02, and the σ_m is .12. The σ_{dis} is .49.

The difference between the mean grade point averages made by the women of the lower 25 per cent group and the men of the lower 25 per cent group their first semester is .07 in favor of the men. The σ_{diff} is .15 which gives the critical ratio of .47. The difference is not reliable.

Ten of these women in the lower group returned and completed the second semester of 1937-1938, a loss of 37 per cent over the first semester. The distribution of their grade point averages is shown in Table XIII.

TABLE XIII
DISTRIBUTION OF GRADE POINT AVERAGES MADE BY
THE D AVERAGE WOMEN OF THE LOWER 25 PER CENT
THE SECOND SEMESTER OF 1937-1938

	f	d	fd	fd ²
1.75-1.99	1	3	3	9
1.50-1.74	3	2	6	12
1.25-1.49	3	1	3	3
1.00-1.24	2	0	0	0
.75-.99	0	-1	0	0
.50-.74	0	-2	0	0
.25-.49	1	-3	-3	9

$$N = 10$$

$$\sum fd = 9 \quad \sum fd^2 = 33$$

The mean from the data in Table XIII is 1.35, and the σ_m is .12. The σ_{dis} is .39.

The difference between the mean grade point averages made by the women of the lower 25 per cent group and the corresponding group of men the second semester of 1937-1938 is .25 in favor of the men. The σ_{diff} is .16, which gives the critical ratio of 1.56. The reliability of this ratio is slight and in favor of the men.

The total group of D average men of the 1938 freshmen made grade point averages the first semester of 1938-1939 as shown in Table XIV.

TABLE XIV
DISTRIBUTION OF GRADE POINT AVERAGES MADE BY THE
D AVERAGE MEN THE FIRST SEMESTER OF 1938-1939

	f	d	fd	fd ²
3.25-3.49	1	8	8	64
3.00-3.24	1	7	7	49
2.75-2.99	3	6	18	108
2.50-2.74	5	5	25	125
2.25-2.49	6	4	24	96
2.00-2.24	6	3	18	54
1.75-1.99	19	2	38	76
1.50-1.74	13	1	13	13
1.25-1.49	27	0	0	0
1.00-1.24	17	-1	-17	17
.75-.99	15	-2	-30	60
.50-.74	17	-3	-51	153
.25-.49	12	-4	-48	192
0-.24	12	-5	-60	300

$$N = 154$$

$$\sum fd = -55 \quad \sum fd^2 = 1307$$

The mean from the data in Table XIV is 1.29, and the σ_m is .058. The σ_{dis} is .72.

There is no difference between the mean grade point averages for the 1938 D average men and the 1937 D average women⁷ the first semester.

Table XV shows the distribution of the grade point averages made by the men of the 1938 D average list the second semester of 1938-1939.

TABLE XV
DISTRIBUTION OF GRADE POINT AVERAGES MADE BY THE
D AVERAGE MEN THE SECOND SEMESTER OF 1938-1939

	f	d	fd	fd ²
2.75-2.99	1	5	5	25
2.50-2.74	5	4	20	80
2.25-2.49	7	3	21	63
2.00-2.24	13	2	26	52
1.75-1.99	8	1	8	8
1.50-1.74	10	0	0	0
1.25-1.49	9	-1	-9	9
1.00-1.24	13	-2	-26	52
.75-.99	10	-3	-30	90
.50-.74	4	-4	-16	64
.25-.49	4	-5	-20	100
0-.24	2	-6	-12	72

$$N = 86$$

$$\sum fd = -33 \quad \sum fd^2 = 615$$

7

A distribution table was prepared for the total 1937 group by combining the scores, or grade point averages, of the upper and lower groups. The table is not reported in this study.

Subsequent cross references between the 1938 and the 1937 groups show the latter group treated as one combined total, too.

The mean from the data in Table XV is 1.58, and the σ_m is .07. The σ_{dis} is .65.

The difference between the mean grade point averages made by the D average men the second semester of 1938-1939 and that made by the D average women the second semester of 1937-1938 is .11 in favor of the men. The σ_{diff} is .15, which gives the critical ratio of .73 indicating that the difference is not reliable.

Table XVI shows the distribution of the grade point averages made by the women of the 1938 D average list the first semester of 1938-1939.

TABLE XVI
DISTRIBUTION OF GRADE POINT AVERAGES MADE BY THE
D AVERAGE WOMEN THE FIRST SEMESTER OF 1938-1939

	f	d	fd	fd ²
3.25-3.49	1	7	7	49
3.00-3.24	0	6	0	0
2.75-2.99	0	5	0	0
2.50-2.74	1	4	4	16
2.25-2.49	1	3	3	9
2.00-2.24	4	2	8	16
1.75-1.99	3	1	3	3
1.50-1.74	9	0	0	0
1.25-1.49	4	-1	-4	4
1.00-1.24	3	-2	-6	12
.75-.99	2	-3	-6	18
.50-.74	2	-4	-8	32
.25-.49	1	-5	-5	25
0-.24	2	-6	-12	72

$$N = 33$$

$$\sum fd = -16 \quad \sum fd^2 = 256$$

The mean from the data in Table XVI is 1.56, and the σ_m is .11. The σ_{dis} is .66.

The difference between the mean grade point averages made by the D average men and women the first semester of 1938-1939 is .25 in favor of the women. The σ_{diff} is .123 which gives the critical ratio of 2.00. The difference approaches reliability.

Between the mean grade point averages made by the 1938 D average women and the 1937 D average men during their first semesters' college work, there is a difference of .16 in favor of the women. The σ_{diff} is .13 which gives the critical ratio of 1.23 in favor of the women. The difference is not very reliable.

The second semester of 1938-1939 the D average women made grade point averages as shown in Table XVII.

TABLE XVII
DISTRIBUTION OF GRADE POINT AVERAGES MADE BY THE
D AVERAGE WOMEN THE SECOND SEMESTER OF 1938-1939

	f	d	fd	fd ²
2.75-2.99	3	5	15	75
2.50-2.74	0	4	0	0
2.25-2.49	4	3	12	36
2.00-2.24	4	2	8	16
1.75-1.99	5	1	5	5
1.50-1.74	5	0	0	0
1.25-1.49	1	-1	-1	1
1.00-1.24	4	-2	-8	16
.75-.99	1	-2	-2	4
.50-.74	5	-4	-20	80

$$N = 32$$

$$\sum fd = 8 \quad \sum fd^2 = 238$$

OCT 27 1939

The mean from the data in Table XVII is 1.74, and the σ_m is .12. The σ_{dis} is .68.

There is a difference of .04 between the mean grade point averages made by these women their second semester and that made by the 1937 D average men their second semester. The σ_{diff} is .15 which gives a critical ratio of .27 in favor of the women. The difference is not reliable.

The D average women the second semester of 1938-1939 are superior to the men for the same period in their mean grade point average. The difference is .16 with a σ_{diff} of .14. This gives a critical ratio of 1.14 which indicates that the difference is not very reliable.

The tables of the grade point averages show that at ten different times men made B averages, and only at one time did a woman reach that average.

Table XVIII shows the coefficients of correlation between the entrance test scores and grade point averages of these D average students. Correlations are shown for two semesters for the different groups of students.

TABLE XVIII

SUMMARY OF THE COEFFICIENTS OF CORRELATION
BETWEEN ENTRANCE TEST SCORES
AND GRADE POINT AVERAGES

O. S. U. vs. G. P. A. 1937-1938	r	\bar{Gr}
Men--First Semester	.39	.076
Men--Second Semester	.22	.11
Women--First Semester	.67	.112
Women--Second Semester	.77	.096
A. C. E. vs. G. P. A. 1938-1939		
Men--First Semester	.41	.076
Men--Second Semester	.24	.094
Women--First Semester	.096	.18
Women--Second Semester	.45	.16

The coefficients of correlations between the entrance test scores and the grade point averages made by these D average freshmen are more consistent for the men than for the women. This is in part due to the larger number of cases for the men. It is to be noticed that in each instance r for the men is lower the second semester than it is for the first. This indicates normality, for the ranges of the two measures are more restricted the second semester. In each instance r for the women is higher the second semester than it is for the first. It is clear that the correlations for the women are highly unreliable.

A summary of the results of the entrance test scores made by these D students is shown in Table XIX.

TABLE XIX
SUMMARY OF THE RESULTS
OF THE ENTRANCE TEST SCORES

	mean	σ_{dis}	σ_m	$\frac{D}{\sigma_{diff}}$	C.R.	Chances ⁸ in 100
1937 men	73.5	26.53	2.34	16.1	3.9	100
1937 women	57.4	18.04	3.34	4.08		
1938 men	95.21	40.68	3.23	12.5	1.97	98
1938 women	82.71	33.32	5.45	6.33		

⁸

In favor of the group represented on the line where the "chances" appear.

Table XX is a summary of the grade point averages made by these D students showing the sex differences that exist from the results as reported.

TABLE XX
A SUMMARY OF THE RESULTS OF THE COMPARISONS BETWEEN THE SEXES ON THE BASIS OF GRADE POINT AVERAGES

First Semester	M	σ_{dis}	σ_m	$\frac{D}{\sigma_{diff}}$	C. R.	Chances ⁹ in 100
Upper 75% women	1.76	.47	.136	.16	.94	83
Upper 75% men	1.6	.84	.102	.17		
Lower 25% men	1.09	.67	.083	.07	.47	68
Lower 25% women	1.02	.49	.12	.15		
1938 women	1.56	.66	.11	.25	2.0	97
1938 men	1.29	.72	.058	.123		
1938 women ¹⁰	1.56	.66	.11	.16	1.23	89
1937 men	1.4	.79	.069	.13		
1937 women ¹⁰	1.29	.596	.113		0.0	50
1938 men	1.29	.72	.058	.13		
<u>Second Semester</u>						
Upper 75% men	1.82	.63	.089	.24	1.1	86
Upper 75% women	1.58	.68	.206	.22		
Lower 25% men	1.6	.85	.11	.25	1.56	94
Lower 25% women	1.35	.39	.12	.16		
1938 women	1.74	.68	.12	.16	1.14	87
1938 men	1.58	.65	.07	.14		
1938 men	1.58	.65	.07	.11	.73	77
1937 women ¹⁰	1.47	.63	.13	.15		
1938 women	1.74	.68	.12	.04	.27	60
1937 men ¹⁰	1.7	.79	.086	.15		

⁹

The 'chances' favor the line upon which they appear.

¹⁰

Op. cit., Chapter III, p. 30.

It may be concluded from the data in Table XX that the differences are unreliable generally. It follows that the D average men do as well in college work as the D average women. The real differences between individuals are much more significant than the differences between the groups.

CHAPTER IV

SUMMARY AND CONCLUSIONS

Entrance test scores and first-year achievement records at Oklahoma Agricultural and Mechanical College of all 1937 and 1938 freshmen students whose high school averages are D make up the data for this investigation.

In the treatment of the data the men are separated from the women. The individuals whose scores fall above the 25th centile are placed into one group and those whose scores fall in the lower quartile are placed into another group. This division into upper and lower groups is for the 1937 D average students only. The data are further treated as follows:

- (1) The entrance test scores are combined into distribution tables with the mean, the σ_m , and the σ_{dis} computed from the data in each table.
- (2) The grade point averages are treated by the same method as the entrance test scores.
- (3) The critical ratios of the differences between the means and the σ_{diff} of the results for the men and the results for the women are reported with the reliability of those differences.

- (4) The r 's (Pearson's Product-Moment) between the entrance test scores and the grade point averages for the first and for the second semesters are reported.
- (5) After these treatments and comparisons are made, a series of summary tables are developed and reported to show the relationship of the results.

The results of this investigation lead to the following conclusions:

- (1) The men will outnumber the women in the D average lists 4 to 1 while the number of men in the general Oklahoma Agricultural and Mechanical College population is only twice as great as the number of women.
- (2) The men will have a greater mean entrance test score than the women.
- (3) These D average students will have a greater range and flexibility in their college achievement than may be assumed from their high school records.

Two assumptions can be made here as to the causes of this phenomenon:

- (a) High school marks are not accurate statements of the achievement of the individual.

- (b) The greater maturity of the students and the more objective methods used in measuring achievement in college work show that individual differences actually exist among the low ranking students.
- (4) There is a slight tendency for the women to make higher mean grade point averages, as groups, than the men; but the range for the men is greater than the range for the women indicating greater flexibility. During the four semesters studied here, only one woman made a B average. Ten times in the different periods men made the B average.
- (5) At no period over the four semesters does any group of these D students make a mean grade point average of 2.00, which is a C. A 'C' average is required for graduation from the college.
- (6) Differences in achievement are greater among individuals within the sex groups than between the sex groups.
- (7) Correlation between the entrance test scores and grade point averages for the men is medium-high and will serve as a better

measure of college achievement than the high school marks. High school marks, however, are not completely unreliable.

- (8) The correlation between the entrance test scores and grade point averages for the women, reported in this study, are too unreliable to be of any value as measures of college achievement.

From the investigation, it may be implied that:

- (1) This report by no means completes the work to be done in this field before the proper advice and guidance may be given the low ranking student.
- (2) This report makes no attempt to study grading systems in the high schools or in the divisions of the college. Such a study might be worthwhile, but an investigation of that sort is not within the limits of this problem.
- (3) A follow-up study of these D average individuals could be made in a year or two to check their standing as citizens of the state or students of the college. It would be worthwhile to estimate the value their contact with the college has been to them.

- (4) Progress toward more objective type criteria by which to measure achievement and abilities will be of value to the low ranking student.

BIBLIOGRAPHY

- Book, William F. Intelligence of High School Seniors.
The MacMillan Company, 1922: New York. Pp.269-292.
- Colvin and MacPhail. Intelligence of Seniors in the
High Schools of Massachusetts. United States
Department of Interior, Bureau of Education,
Bulletin No. 9, 1924.
- Conrad, Jones, and Hsiao. "Sex Differences in Mental
Growth and Decline," The Journal of Educational
Psychology, March, 1934, 24:161-169.
- Day, L. C. "Boys and Girls and Honor Ranks, " School
Review, April, 1938, 46:288-299.
- Garrett, H. E. Statistics in Education. New York:
Longmans Green and Company, 1926.
- Johnson, G. R. "Girls Do Better Than Boys," School and
Society, 1938, 47:313-314.
- Johnson, G. R. "Girls Lead in Progress Through School,"
American School Board Journal, October, 1937,
95:25-26.
- Lincoln, E. A. Sex Differences in School Children. P. 40.
Baltimore: Warwick and York, Inc., 1927.
- Lindquist, E. F. A First Course in Statistics. Cambridge:
The Riverside Press, 1938.
- Livesay, T. M. "Sex Difference in Performance on the
American Council on Education Psychological
Examination", Journal of Educational Psychology,
1937, 28:694-702.

- Lund, Frederick H. "Sex Differences in Types of Educational Mastery," The Journal of Educational Psychology, 1932, 23:321-323.
- Paterson and Langlie. "The Influence of Sex on Scholarship Ratings," Educational Administration and Supervision, October, 1926, 12:458-468.
- Rigg, Melvin G. The Relative Variability in Intelligence of Boys and Girls. An unpublished manuscript, 1939.

Typist:

Florence Lackey

Stillwater, Oklahoma