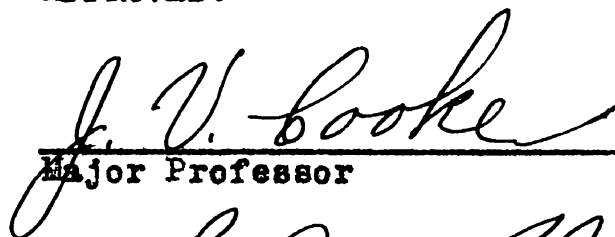



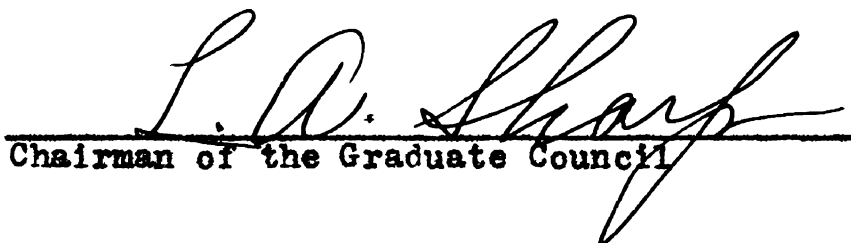
THE RELATION OF CERTAIN FACTORS TO SUCCESS  
IN COLLEGE MATHEMATICS

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THE RELATION OF CERTAIN FACTORS TO SUCCESS  
IN COLLEGE MATHEMATICS

THESIS

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By

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## TABLE OF CONTENTS

	Page
LIST OF TABLES . . . . .	iv
<b>Chapter</b>	
I. INTRODUCTION AND DEFINITION OF THE PROBLEM . .	1
II. A REVIEW OF STUDIES ON THE RELATION OF CERTAIN FACTORS TO SUCCESS IN COLLEGE MATHEMATICS AND IN GENERAL COLLEGE WORK . . . . .	4
III. THE RELATION OF HIGH SCHOOL WORK TO SUCCESS IN COLLEGE MATHEMATICS FOR TWO HUNDRED FORTY-THREE FRESHMEN STUDENTS AND FORTY- THREE SENIOR STUDENTS IN NORTH TEXAS STATE TEACHERS COLLEGE . . . . .	30
IV. SUMMARY AND GENERAL CONCLUSIONS . . . . .	46
BIBLIOGRAPHY . . . . .	48

## LIST OF TABLES

Table	Page
1. Grades Earned in College Algebra by 291 Students Having Certain Numbers of Semesters in High School Mathematics . . . . .	5
2. Grades Earned in College Algebra by Percentages of 291 Students Having Certain Numbers of Semesters in High School Mathematics . . . . .	6
3. A Comparison of Grades Made in College Trigonometry by Students Who Had High School Trigonometry and Those Who Did Not . . . . .	7
4. Zero-Order and Multiple Correlations between College Marks in Mathematics and Certain Other Factors . . . . .	10
5. Correlation Coefficients for the First Four Grades in College Mathematics With the Scores Made on Five Possible Predictive Tests with the Number of Students in Each Case . . . . .	13
6. Correlation Coefficients of Certain College Mathematics Subjects with Selected Factors . .	14
7. Correlation Coefficients for College Mathematics with Various Criteria Found by Several Investigators at Different Institutions . . .	15
8. Zero-Order Correlations between Freshman College Mathematics and Various Other Measures . . . .	16
9. Zero-Order Correlations between the Grade Point Average in Freshman and Sophomore Mathematics and Various Other Measures . . . . .	17
10. Correlation Coefficients for College Mathematics with Certain Other Factors with the Author and Number of Pupils in Each Case . . . . .	19

Table	Page
11. Correlation Coefficients for the Grade Point Average in All College Work with Certain Factors with the Author and Number of Pupils in Each Case . . . . .	26
12. Summary of the Number of Mathematics Courses and the Grade Point Averages in Mathematics for 243 Freshmen . . . . .	31
13. Grade Point Averages in Mathematics Earned in High School and College Based on the Number of Semesters in Mathematics studied in High School . . . . .	33
14. Grade Points Earned in College Mathematics by 243 freshmen Students, According to the Number of Semesters of High School Mathematics Taken . . . . .	34
15. Percentages of 243 Freshmen Students Making Certain Grade Points in College Mathematics, According to the Number of Semesters of High School Mathematics Taken . . . . .	35
16. Grade Point Averages Earned in High School and College Mathematics by Forty-Three Senior Mathematics Students When Distributed on the Number of Semesters in Mathematics Studied in High School . . . . .	36
17. The Number of the Forty-Three Seniors, When Grouped on the Basis of Semesters in High School Mathematics, Who Made Each Grade Point Average in College Mathematics . . . . .	37
18. Percentages of Senior Mathematics Students Making Certain Grade Point Averages in College Mathematics According to the Number of Semesters of High School Mathematics Taken . . . . .	38
19. Correlation Coefficients for the Grade Point Averages in College Mathematics with Certain High School Factors for 243 Freshmen Students . . . . .	40

Table	Page
20. Correlation Coefficients for the Grade Point Averages in College Mathematics with Certain High School Factors for Forty-Three Mathematics Seniors . . . . .	42
21. Correlation Coefficients for the Grade Point Average in College Mathematics with Certain High School Factors . . . . .	44

## CHAPTER I

### INTRODUCTION AND DEFINITION OF PROBLEM

One of the pressing and intriguing problems of secondary and higher education of the present day is that of the preparation and selection of students for college and university education. The importance of the problem has been accentuated as a result of the great increase in the number of young people who are completing high school and presenting themselves for entrance to institutions of higher learning. Since 1890 the number of pupils enrolled in secondary schools has approximately doubled in each ten-year period.<sup>1</sup> From 1890 to 1900 the increase was from two hundred three thousand to five hundred nineteen thousand pupils of the ages fourteen to seventeen, inclusive. This represents an increase of one hundred fifty-five per cent. During the next ten years there was an increase of one hundred twenty per cent over the number for 1920. The increase in college enrollment is almost as rapid, being from one hundred twenty-two thousand pupils of the ages nineteen to twenty-two, inclusive, in 1890 to seven hundred sixty-eight thousand pupils of a like age in

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<sup>1</sup>Charles W. Odell, Predicting the Scholastic Success of College Freshmen, University of Illinois Bulletin, Bulletin No. 37, Vol. XXV, (1927), No. 2, p. 43.

1926. This represents an increase of five hundred thirty per cent for the thirty-six year period. Such an increase in material has focused attention on the selection of students for college entrance.

The problem of selecting young men and women most capable of profiting from higher education is particularly exacting from two points of view. For a student to attend and work unsuccessfully in any department or branch of higher education with little or no chance for advancement or marked improvement is valuable time wasted on the part of the individual, tiring to the instructor, and particularly expensive to the state. If it is impossible for a student to succeed in one field of endeavor, he should be advised as to the situation and guided in a more promising direction. For this reason we need to know the factors that determine success in the various fields.

The purpose of this study is to determine the relation of certain factors to success in college mathematics, success being defined by the grade or mark received. A survey of studies pertaining to the question is first given, followed by conclusions extracted from the studies in view of the validity of each one. Secondly, a study by the author of two hundred forty-three freshmen students and forty-three senior students in North Texas State Teachers College is presented. Finally, a summary is made of noteworthy



observations and conclusions which seem pertinent to the prediction of success in college mathematics.

## CHAPTER II

### A REVIEW OF STUDIES ON THE RELATION OF CERTAIN FACTORS TO SUCCESS IN COLLEGE MATHEMATICS AND IN GENERAL COLLEGE WORK

As early as twenty years ago such men as Douglas, Odell, Bergen, and May attempted to find some criterion by which success in college might be predicted. Among the various criteria studied are success in high school work, the number of semesters of high school work in various fields, intelligence tests, and marks made on entrance examinations.

Certain of these studies considered success in definite fields of college mathematics. Bergen<sup>1</sup> concluded, after observing 291 students in the Morgan Park Junior College, that the experience and practice the students receive in advanced courses in high school mathematics is of great help to them in their opportunities for success in college algebra. The results of this study may be found in Tables 1 and 2. The students, under three instructors, were classified as to the number of semesters of mathematics taken in high school. The grades earned by the students, compared with the number of

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<sup>1</sup>M. C. Bergen, "Achievement of Students in College Algebra Compared with the Number of Semesters of Preparation in High School," School Science and Mathematics, XXXVIII (1938), 763-765.

semesters of mathematics taken in high school, are shown in Table 1, and the same data in terms of percentages in Table 2. There is a direct relation between the number of "A" grades in college algebra and the number of semesters taken in high school mathematics. The increase is from 2.86 per cent of the students who had only four semesters in high school mathematics making a grade of "A" in college algebra to twenty-five per cent of those who had eight semesters in high school mathematics making "A" in college algebra.

TABLE 1

GRADES EARNED IN COLLEGE ALGEBRA BY 291 STUDENTS  
HAVING CERTAIN NUMBERS OF SEMESTERS  
IN HIGH SCHOOL MATHEMATICS\*

Grade	Number of Semesters of High School Mathematics					Total
	4	5	6	7	8	
A	2	1	6	15	6	30
B	11	6	14	7	10	48
C	21	15	27	33	7	103
D	17	14	21	10	1	63
E	18	10	7	2	0	37
Drop	1	4	5	0	0	10
Total	70	50	80	67	24	291

\*M. C. Bergen, "Comparison of Grades in College Trigonometry between Students Who Had the High School Course and Those Who Did Not," School Science and Mathematics, XXXIX (1939), 273-274.

It may be seen from Table 2 that 15.71 per cent of the

four semester high school students made "B" in college algebra, while 41.66 per cent of the eight semester students made the same grade. Approximately the same percentage of the four, five, six, seven, and eight semester students made a grade of "C". Thirty per cent of the five semester students, 33.75 per cent of the six, and 29.17 per cent of the eight semester students made "C". Forty-nine and twenty-six hundredths per cent of the seven semester students made the same grade. There were 24.29 per cent of the four semester students who made a grade of "D", while only 4.17 per cent of the eight semester students received this grade. Considering "A" as four points, "B" as three points, --- "E" as zero points, the average grade point in college algebra for each group was obtained.

TABLE 2

GRADES EARNED IN COLLEGE ALGEBRA BY PERCENTAGES  
OF 291 STUDENTS HAVING CERTAIN NUMBERS OF  
SEMESTERS IN HIGH SCHOOL MATHEMATICS<sup>a</sup>

Grade	Number of Semesters of High School Mathematics					Total <sup>b</sup>
	4	5	6	7	8	
A	2.86	2.00	7.50	22.38	25.00	10.31
B	15.71	12.00	17.50	10.45	41.66	16.49
C	30.00	30.00	33.75	49.26	29.17	35.39
D	24.29	28.00	26.25	14.92	4.17	21.66
E	25.71	20.00	8.75	2.99	0.00	12.71
Drop	1.43	8.00	6.25	0.00	0.00	3.44
Total	100.00	100.00	100.00	100.00	100.00	100.00

<sup>a</sup>M. C. Bergen, School Science and Mathematics, XXXVIII (1938), 764.

<sup>b</sup>Percentage of 291 students making the grades indicated.

For the students who had eight semesters of high school mathematics, a grade point average in college algebra of 2.87 was found. The seven semester students had 2.34, the six semester students had 1.88, and the four and five semester students had 1.44 as their grade point averages.

In a later study, Bergen<sup>2</sup> reported that the study of high school trigonometry evidently helps some students, but not so much as might be expected. This study of 241 students of Morgan Park Junior College was made in 1939, under three instructors. The results of this study are found in Table 3.

TABLE 3

A COMPARISON OF GRADES MADE IN COLLEGE TRIGONOMETRY  
BY STUDENTS WHO HAD HIGH SCHOOL TRIGONOMETRY  
AND THOSE WHO DID NOT\*

Grade	High School Trigonometry Group		No High School Trigonometry Group	
	Number	Percentage	Number	Percentage
A	23	19.33	7	5.74
B	22	18.49	17	13.93
C	41	34.45	43	35.25
D	18	15.13	26	21.31
E	12	10.08	19	15.57
Drop	3	2.52	9	7.38
Incomplete	0	0.00	1	0.82
Total	119	100.00	122	100.00
Grade Point Average	2.22		1.70	

\*M. C. Bergen, School Science and Mathematics, XXXIX (1939), p. 274.

Of the students taking high school trigonometry, 19.33 per cent made a grade of "A" in college trigonometry, 18.49 per cent made "B", 34.45 per cent made "C", and 25.21 per cent made "D" or "E". Of those students who did not take high school trigonometry, only 5.74 per cent made a grade of "A", 13.93 per cent made "B", 35.25 per cent made "C", and 36.88 per cent made "D" or "E".

Using a series of tests with forty-four students, Marshall found coefficients of correlation for success in college algebra with certain factors to be .788 with knowledge of high school algebra, .557 with an algebra aptitude test score, and .492 with general intelligence.<sup>3</sup> Multiple correlations were somewhat higher, the highest being .841 for the mark in college algebra with the three factors involved, the grades on the algebra achievement, algebra aptitude, and intelligence tests.

In attempting to predict the success of students in college mathematics, Douglas found that it could not be done with any high degree of accuracy from knowledge of the amount of high school mathematics taken, the average mark in all high school subjects, the rank on the Psychological Examination of the American Council on Education,

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<sup>3</sup>M. V. Marshall, "Some Factors Which Influence Success in College Algebra," The Mathematics Teacher, XXXII (1939), 172-174.

or any combination of the above.<sup>4</sup> According to his study, the best prediction that can be made is secured from the average high school mark in all subjects. This study involved 387 students of the class of 1930 in the University of Oregon. As shown in Table 4, the correlation coefficient between the number of semester credits in high school mathematics and the average college mark in mathematics was found to be .28, while the correlation between the same criterion and the average college mark in all subjects was no larger than .02. The partial correlations with intelligence held constant were .17 and -.13, respectively. The average college mark of students with four semester credits in high school mathematics was almost exactly the same as the mark of students with five, six, seven, and eight credits. An analysis of the percentages of students doing unsatisfactory work in various fields, in which students with two units of high school mathematics or less were compared with students with more than two units, revealed no significant differences except in mathematics and business administration. Students with more than two units in high school mathematics furnished in these two fields a much smaller percentage of unsatisfactory students. The correlation coefficients were

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<sup>4</sup>H. R. Douglas and J. H. Michaelson, "The Relation of High School Mathematics to College Marks and of Other Factors to College Marks in Mathematics," School Review, XXXIV (1936), 615-619.

fairly high for the average mark in high school mathematics with the average college mark in every field, being .46 for college mathematics. Correlations for college mathematics with other factors were .47 with average high school work and .28 with the number semesters credit in high school mathematics.

TABLE 4

ZERO-ORDER AND MULTIPLE CORRELATIONS BETWEEN COLLEGE MARKS IN MATHEMATICS AND CERTAIN OTHER FACTORS\*

Factors Correlated	Zero-Order Correlations	Multiple Correlations
College mark in mathematics with:		
High school mark in mathematics.....	.456	
Number of semester credits in high school mathematics....	.277	
Average high school mark in all subjects.....	.469	
Percentile rank.....	.258	
College mark in mathematics with:		
High school mark in mathematics and number credits in mathematics.....		.482
High school mark in mathematics and percentile rank.		.471
High school mark in mathematics and high school average.....		.484



TABLE 4--Continued

Factors Correlated	Zero-Order Correlations	Multiple Correlations
High school average and the number of credits in mathematics.....		.501

\*M. V. Marshall, The Mathematics Teacher, XXXII (1939), p. 618.

Multiple correlations (correlation coefficients for the grade point average in college mathematics with two factors) were higher than single correlations as evidenced by Table 4. Multiple correlations ran as high as .501 for the grade point average in college mathematics with the grade point average in high school work and the number of credits in high school mathematics. Beyond the first two years, additional work in high school mathematics does not seem to contribute materially to success in college subjects. This observation is in direct contrast with Bergen's results in that he found the experience and practice the students receive in advanced courses in high school mathematics increases their opportunities for success in college algebra and trigonometry. Ability in high school mathematics is definitely associated with ability to do work in college mathematics, but not so closely as is the average high school mark in all subjects.

In a later report Douglas found a correlation of .44 for the average high school mark in mathematics with the average

college mark in mathematics, and a correlation of .36 for the same factors with intelligence held constant.<sup>5</sup>

Perry attempted to predict success in college mathematics by administering a battery of five tests to 400 college freshmen mathematics students in Purdue University.<sup>6</sup> These consisted of an intelligence test, an English test, a chemistry test, a mathematics test, and a personality test, in the order of predictive value. From Table 5 we find the highest correlation coefficient to be .74 for the college mark in the first course in college mathematics (Math. 1 in Table 5) with the Iowa Mathematics test. Other high coefficients for the mark in the first course in college mathematics are .66 for the Iowa Chemistry test, .52 for the personality test, and .51 for general intelligence. The remaining coefficients for Math. 1 are somewhat lower. The correlation coefficients for the other marks (second, third, and fourth courses) in college mathematics are much lower than those for the first, becoming ever smaller as are considered the more advanced mathematics courses. This

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<sup>5</sup>H. R. Douglas, "The Relation of High School Preparation and Certain Other Factors to Academic Success at the University of Oregon," University of Oregon Publication, Vol. III (1931), No. 1, University Press, p. 32.

<sup>6</sup>R. D. Perry, "Prediction Equations for Success in College Mathematics," Contribution to Education Published under the Direction of George Peabody College for Teachers, No. 122, George Peabody College for Teachers, Nashville, Tennessee, (1934), pp. 1-55.

indicates that factors not included in this study must influence success in advanced college mathematics more than those discussed here.

TABLE 5

CORRELATION COEFFICIENTS FOR THE FIRST FOUR GRADES  
IN COLLEGE MATHEMATICS VERSUS THE SCORES MADE  
ON FIVE POSSIBLE PREDICTIVE TESTS WITH  
THE NUMBER OF STUDENTS IN EACH CASE\*

	Math. 4	Math. 3	Math. 2	Math. 1	Iowa Math.	Intelli- gence	Iowa Chem.	Purdue Eng.
Number	131	235	369	400	400	400	400	400
Math. 3	.26							
Math. 2	.39	.21						
Math. 1	.25	.18	.32					
Iowa Math.	.24	.13	.42	.74				
Intelligence	.08	.13	.41	.51	.52			
Iowa Chem.	.16	.10	.35	.66	.55	.68		
Purdue Eng.	.06	.13	.32	.25	.46	.65	.55	
Personality	.19	.16	.42	.52	.34	.27	.30	.30

\*H. R. Douglas, "The Relation of High School Preparation and Certain Other Factors to Academic Success at the University of Oregon," University of Oregon Publication, Vol. III (1931), No. 1, University Press, p. 31.

Odell has evaluated certain criteria for predictive purposes with reference to success in college mathematics, using 1892 students at the University of Illinois.<sup>7</sup> From Table 6 the highest correlation for college algebra is found to be .48

<sup>7</sup>Charles W. Odell, Predicting the Scholastic Success of College Freshmen, University of Illinois Bulletin, Bulletin No. 37, Vol. XXV, (1927), No. 2.

with high school general mathematics, followed by .46 and .45 with the high school average grade and high school algebra, respectively. The correlation for college algebra with age is particularly low, being  $-.17$ .

TABLE 6

CORRELATION COEFFICIENTS OF CERTAIN COLLEGE MATHE-  
MATICS SUBJECTS WITH SELECTED FACTORS\*

Factor	College Algebra	College Trigonometry	College General Mathematics
Age.....	$-.17$	$-.08$	$0.28$
Grade Point.....	$.32$	$.28$	$.11$
I. Q.....	$.31$	$.29$	$.14$
High School			
Average.....	$.46$	$.47$	$.48$
Algebra.....	$.45$	$.47$	$.33$
Gen. Math.....	$.48$	$.52$	$.44$

\*R. D. Perry, "Prediction Equations for Success in College Mathematics," Contribution to Education Published under the Direction of George Peabody College for Teachers, No. 122, George Peabody College for Teachers, Nashville, Tennessee, (1934), p. 28.

The highest correlation for college trigonometry is  $.52$  with high school general mathematics, being followed by  $.47$  with both high school algebra and the high school average. Again the lowest correlation is  $-0.8$  with the age of the student. The highest correlation for general mathematics is  $.48$  with the high school average, being followed by  $.44$  with high school general mathematics. The high school average

mark and the high school grades in algebra and general mathematics are of approximately equal value.

In reviewing a group of studies, Wagner reported an average correlation of .38 for the grade point average in college mathematics with a variety of measures.<sup>8</sup> A number of these correlations may be found in Table 7, fifty per cent of the coefficients being between .33 and .45.

TABLE 7

CORRELATION COEFFICIENTS FOR COLLEGE MATHEMATICS  
WITH VARIOUS CRITERIA FOUND BY SEVERAL  
INVESTIGATORS AT DIFFERENT  
INSTITUTIONS\*

Investigator	Correlation	Institution	Criterion	Measure
Abelson	.66	N. Y. U.	Col. Math.	Elem. Alg. Reg.
Abelson	.47	N. Y. U.	Col. Math.	Int. Alg. Reg.
Edds	.48	Milligan Col.	Col. Math.	H. S. Aver.
Gilkey	.34	N.Y.S.T.C.	Col. Math.	H. S. Math. Reg.
Gowen & Gooch	.41	U. of Maine	Col. Alg.	H. S. Alg.
	.41			H. S. Geom.
	.41			H. S. French
	.34			H. S. Chem.
Perrin	.80	Texas U.	Col. Math.	I. Q. Test
Root	.89 & .61	Pitt. U.	Col. Math.	Thorndike T.
Whitman	.37	Pitt. U.	Col. Math.	H. S. Marks

\*Charles W. Odell, "Predicting the Scholastic Success of College Freshmen," University of Illinois Bulletin, Bulletin No. 37, Vol. XXV (1927), p. 201.

<sup>8</sup>Mazie Earle Wagner, Studies in Articulation of high School and College, IX (1934), 194-309.

The correlation of .80 found by Perrin at Texas University and the .89 found by Root at Pittsburgh University, each using intelligence tests as criteria for predicting success in college mathematics, are much higher than any other coefficient found. High school chemistry seems to be of least predictive value of the criteria studied.

In another report Wagner found the correlations for the grade point average in freshman mathematics with various other measures.<sup>9</sup> Only Regents Trigonometry test, given to seventy-three students, produced a correlation of .56, followed by the Regents Average test score for 174 students, which gave a correlation of .44. These are shown in Table 8.

TABLE 8

ZERO-ORDER CORRELATIONS BETWEEN FRESHMAN COLLEGE  
MATHEMATICS AND VARIOUS OTHER MEASURES\*

Criteria Used	No. Students	Correlation
Regents Trigonometry.....	73	.56
Regents Average.....	174	.44
Iowa Content Math.....	259	.40
Regents Latin III.....	197	.38
Rank in Grad. Class.....	178	.34
Regents Algebra.....	322	.32
Regents Geometry.....	325	.31

\*Mazie Earle Wagner, Studies in Articulation of High School and College, IX (1934), p. 155.

<sup>9</sup>Mazie Earle Wagner, Studies in Articulation of High School and College, IX (1934), 145-194.

Other correlations are .40 for the Iowa Content Mathematics test, involving 259 students; .38 for Regents Latin III test, for 197 students; and .34 for rank in the graduating class, involving 178 students. Similar correlations using the grade point average in freshman and sophomore mathematics in place of freshman mathematics may be found in Table 9 to be slightly lower.

TABLE 9

ZERO-ORDER CORRELATIONS BETWEEN THE GRADE POINT  
AVERAGE IN FRESHMAN AND SOPHOMORE MATHE-  
MATICS AND VARIOUS OTHER MEASURES\*

Criteria Used	No. Students	Correlation
Regents Trigonometry.....	81	.51
Regents Average.....	200	.41
Iowa Content Math.....	272	.28
Regents Latin III.....	209	.44
Rank in Grad. Class.....	210	.36
Regents Algebra.....	363	.35
Regents Geometry.....	364	.26
No. of H. S. Units.....	372	.24
Age at H. S. Grad.....	366	-.15

\*Mazie Earle Wagner, Studies in Articulation of High School and College, IX (1934), p. 154.

Regents Trigonometry test involved eighty-one students and gave a correlation of .51, followed by .44 for Regents Latin III test, involving 209 students. The correlation for the Iowa Content Mathematics test, involving 272 students, with the grade point average in freshman and sophomore

mathematics was only .28. Other correlations were .41 for Regents Average, involving 209 students; .36 for rank in the graduating class, including 210 students; .24 for the number of high school units, involving 372 students; and -.15 for the age of the student at the time of high school graduation of 366 students.

Edds and McCall found by studying eighty-five cases that the average mark in college mathematics gave a correlation of .48 with the high school average in all subjects, .43 with mental ability, and .30 with English ability.<sup>10</sup>

Gilkey reported correlations of .343 and .498 for high school mathematics and high school average mark, respectively, with the average in college mathematics.<sup>11</sup> This study was of 210 students who graduated from the New York State College for Teachers.

At the University of Maine, Gowen and Gooch found the highest correlation for grade received in college algebra to be .409 with high school geometry, followed by .407 with the average high school mark, in all subjects.<sup>12</sup> In the same

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<sup>10</sup>Jess H. Edds and W. Morrison McCall, "Predicting the Scholastic Success of College Freshmen," Journal of Educational Research, XXVII (1933), 127-130.

<sup>11</sup>Royal Gilkey, "The Relation of Success in Certain Subjects in High School to Success in College," School Review, XXXVII (1929), 576-588.

<sup>12</sup>John W. Gowen and Marjorie Gooch, "The Mental Attainments of College Students in Relation to Previous Training," Journal of Educational Psychology, XVI (1925), 547-568.



study of 927 cases the highest correlation for college geometry was found to be .384 with the high school average mark, followed by .337 with high school geometry.

For the purpose of comparison there is listed in Table 10, descending in rank order, each correlation mentioned above, with the number of cases, criterion, factor, and investigator.

TABLE 10

CORRELATION COEFFICIENTS FOR COLLEGE MATHEMATICS  
WITH CERTAIN FACTORS WITH THE AUTHOR AND  
NUMBER OF PUPILS IN EACH CASE

Coefficient	No. Cases	Criterion	Factor	Investigator
.89	...	College Math	Thorndike test	Root
.80	...	College Math	Intelligence test	Perrin
.788	44	College Alg.	H. S. Math	Marshall
.74	400	Math I	Iowa Math test	Perry
.66	400	Math I	Iowa Chem. test	Perry
.66	...	College Math	Regents Alg.	Abelson
.61	...	College Math	Thorndike test	Root
.56	73	Math I	Regents Trig.	Wagner
.52	400	Math II	Personality	Perry
.51	81	Math I & II	Regents Trig.	Wagner
.51	400	Math I	Intelligence test	Perry
.498	210	College Math	H. S. Average	Gilkey
.48	85	College Math	H. S. Average	Edds and McCall
.48	1892	Algebra	H. S. Gen. Math.	Odell
.48	1892	Gen. Math.	H. S. Average	Odell
.48	...	College Math	H. S. Average	Edds
.47	387	College Math	H. S. Average	Douglas
.47	1892	Trigonometry	H. S. Average	Odell
.47	1892	Trigonometry	H. S. Algebra	Odell
.47	...	College Math	Reg. Algebra test	Abelson
.469	387	College Math	H. S. Average	Douglas
.46	1892	Algebra	H. S. Average	Odell
.456	387	College Math	H. S. Math	Douglas
.45	1892	Algebra	H. S. Algebra	Odell

TABLE 10--Continued

Coefficient	No. Cases	Criterion	Factor	Investigator
.44	1892	Gen. Math	H. S. Gen. Math	Odell
.44	174	Math. I	Regents Average	Wagner
.44	209	Math. I & II	Regents Latin	Wagner
.43	85	College Math	Mental Ability	Edds & McCall
.42	369	Math. II	Iowa Math Test	Perry
.42	369	Math. II	Personality	Perry
.41	369	Math. II	Intelligence Test	Perry
.41	...	College Math	H. S. Average	Gowen & Gooch
.41	...	College Math	H. S. Geometry	Gowen & Gooch
.41	...	College Math	H. S. French	Gowen & Gooch
.41	200	Math. I & II	Regents Average	Wagner
.409	927	Algebra	H. S. Geometry	Gowen & Gooch
.407	927	Algebra	H. S. Average	Gowen & Gooch
.40	259	Math. I	Iowa Content Test	Wagner
.384	927	Geometry	H. S. Average	Gowen & Gooch
.38	197	Math. I	Regents Latin	Wagner
.37	...	College Math	H. S. Average	Whitman
.36	210	Math. I & II	Rank in Class	Wagner
.35	363	Math. I & II	Regents Algebra	Wagner
.35	369	Math. II	Iowa Chem. test	Perry
.343	210	College Math	H. S. Math	Gilkey
.34	178	Math. I	Rank in Class	Wagner
.34	...	College Math	H. S. Math Test	Gilkey
.34	...	Algebra	H. S. Chem.	Gowen & Gooch
.337	927	Geometry	H. S. Geom.	Gowen & Gooch
.30	85	College Math	English Ability	Edds and McCall
.29	1892	Trigonometry	Intelligence test	Odell
.28	1892	Trigonometry	Grade Point	Odell
.28	272	Math. I & II	Iowa Math Test	Wagner
.28	387	College Math	No. Math Credits	Douglas
.26	364	Math. I & II	Geometry test	Wagner
.258	387	College Math	Percentile Rank	Douglas
.25	400	Math. I	Purdue English	Perry
.24	131	Math IV	Iowa Math test	Perry
.24	372	Math. I & II	No. H. S. Units	Wagner
.19	131	Math. IV	Personality	Perry
.16	131	Math. IV	Iowa Chem. test	Perry
.16	235	Math. III	Personality	Perry
.14	1892	Gen. Math.	Intelligence test	Odell

TABLE 10--Continued

Coefficient	No. Cases	Criterion	Factor	Investigator
.13	235	Math III	Iowa Math test	Perry
.13	235	Math III	Intelligence test	Perry
.13	235	Math III	Purdue English	Perry
.11	1892	Gen. Math.	Grade Point	Odell
.10	235	Math III	Iowa Chem. Test	Perry
.08	131	Math IV	Intelligence test	Perry
.06	131	Math IV	Purdue English	Perry
-.08	1892	Trigonometry	Age	Odell
-.15	366	Math I	Age	Wagner
-.17	1892	Algebra	Age	Odell
-.28	1892	Gen. Math.	Age	Odell

Eight of the twenty-two highest correlations were college mathematics with high school grade point average in all subjects. Five more of the highest correlations were obtained by using intelligence tests. The four negative correlations were found by correlating college mathematics with the age of the student. It would seem from this discussion that the high school grade point average and intelligence test scores are the best factors for predicting success in college mathematics, while the age of the student is the poorest factor.

Many studies have been made concerning the correlation of certain factors with general success in all college work. These studies do not mention our chief interest, mathematics, but mathematics is included in the grade point average for all college work. For this reason, and in order to see if

the same factors seem to affect success in all college work that influence success in college mathematics, a brief review of those studies is here presented.

Johnson<sup>13</sup> in reporting from 435 cases gave a correlation of .63 for the average college mark with the average high school mark. For the same variables, Douglas<sup>14</sup> reported .56 for 1196 cases, Odell<sup>15</sup> reported .55 for 1892 cases, Hepner<sup>16</sup> reported .524 for 600 cases, Jones<sup>17</sup> reported .43 for 100 men and .58 for fifty-five women, May<sup>18</sup> reported .405 for 450 cases, and Lauer and Evans<sup>19</sup> reported .386 for 492 cases.

Edds and McCall,<sup>20</sup> using eighty-five cases, found the

<sup>13</sup>J. B. Johnson, "Predicting Success or Failure in College at the Time of Entrance," School and Society, XIX (1924), 772-776.

<sup>14</sup>Harl R. Douglass, "The Relation of High School Preparation and Certain Other Factors to Academic Success at the University of Oregon," University of Oregon Publication, University Press, III (1931), No. 1.

<sup>15</sup>Charles W. Odell, "An Attempt at Predicting Success in the Freshman Year at College," School and Society, XXV (1927), 702-706.

<sup>16</sup>Walter R. Hepner, "Factors Underlying Unpredicted Scholastic Achievement of College Freshmen," Journal of Experimental Education, VII (1939), 159-198.

<sup>17</sup>E. S. Jones, "Predictions from High School Performance," School and Society, XXVII (1930), 339-340.

<sup>18</sup>Mark A. May, "Predicting Academic Success," Journal of Educational Psychology, XIV (1923), 429-440.

<sup>19</sup>Alvah R. Lauer and J. E. Evans, "The Relative Predictive Value of Different High School Subjects on College Grades," School and Society, XXXI (1930), 159-160.

<sup>20</sup>Edds and McCall, op. cit., p. 129.

correlations for general college success to be .62 with high school foreign languages, .60 with mathematics, and .59 with high school English. Douglas,<sup>21</sup> using 1196 cases, found correlations for general college success to be .54 with high school science, .49 with English, .46 with foreign language, and .44 with high school mathematics.

May,<sup>22</sup> using 450 cases, obtained a correlation of .60 for general success in college work with intelligence. For the same variables, Johnson,<sup>23</sup> using 435 cases, obtained a coefficient of .50; Lauer and Evans,<sup>24</sup> using 492 cases, obtained .418; and Odell,<sup>25</sup> using 1892 cases, obtained a coefficient of .38.

Wagner,<sup>26</sup> using 661 cases, found a correlation of .20 for the number of units taken in high school mathematics with the average college mark. Douglas,<sup>27</sup> using 1196 cases, found a correlation of  $-.016$  for the same variables.

<sup>21</sup>Harl R. Douglas, "The Relation of High School Preparation and Certain Other Factors to Academic Success at the University of Oregon," University of Oregon Publication, University Press, III (1931), No. 1.

<sup>22</sup>May, op. cit., p. 437.      <sup>23</sup>Johnson, op. cit., p. 774.

<sup>24</sup>Lauer and Evans, op. cit., p. 160.

<sup>25</sup>Charles W. Odell, "An Attempt at Predicting Success in the Freshman Year at College," School and Society, XXV (1927), 704.

<sup>26</sup>Mazie Erle Wagner, "Generalizations Regarding Prediction at the University of Buffalo with Broader Implications," The University of Buffalo Studies, IX (1934), 184.

<sup>27</sup>Harl R. Douglas, "The Relation of High School Preparation and Certain Other Factors to Academic Success at the University of Oregon," University of Oregon Publication, University Press, III (1931), No. 1.

Hepner,<sup>28</sup> using 600 cases, reported a correlation of .58 for the college average mark with mathematical ability. May,<sup>29</sup> using 450 cases, reported .32 for freshman average work, with the number of hours spent studying, while Edds and McCall,<sup>30</sup> using eighty-five cases, reported .315 for average college work with mental ability.

Odell<sup>31</sup> found a correlation coefficient of  $-.23$  for the freshman average with the age of 1892 students. Cluton<sup>32</sup> found a correlation of .95 for the average freshman mark with a high school content examination. This is higher than reported from any other study.

Johnson<sup>33</sup> reported the highest correlation for two variables, .67, given by general college success with the high school average plus intelligence for 435 cases. Douglas,<sup>34</sup>

<sup>28</sup>Hepner, op. cit., p. 172.      <sup>29</sup>May, op. cit., p. 438.

<sup>30</sup>Edds and McCall, op. cit., p. 129.

<sup>31</sup>Charles W. Odell, "An Attempt at Predicting Success in the Freshman Year at College," School and Society, XXV (1927),

<sup>32</sup>Glen U. Cluton, "The Predictive Value of Certain Measures of Ability in College Freshmen," Journal of Educational Research, XV (1927), 357-370.

<sup>33</sup>Johnson, op. cit., p. 775.

<sup>34</sup>Harl R. Douglas, "The Relation of High School Preparation and Certain Other Factors to Academic Success at the University of Oregon," University of Oregon Publication, University Press, III (1931), No. 1.

using 1196 cases, reported the highest correlation which he obtained for two variables to be given by high school average plus percentile rank with the average college mark, which gave him .626, being followed by the high school science grade plus percentile rank which gave .614. The addition of a third variable increased the accuracy very little, the best correlation being .636 for industry rating, average high school mark, and percentile rank. Hepner<sup>35</sup> concluded that the best combination was high school marks plus percentile rank with general college success, which gave .626 for 600 cases. Lauer and Evans,<sup>36</sup> using 492 cases, chose the high school average plus intelligence to get .546, while May,<sup>37</sup> using 450 cases, reported a range from .64 to .825 for multiple correlations.

In Table 11 are presented the correlation coefficients for success in all college work with certain factors with the number of cases and the investigator in each case. Four of the highest ten correlations, and seven of the highest eighteen, represent general college success with the high school average. A high school content examination by Cluton<sup>38</sup> gave the highest

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<sup>35</sup>Hepner, op. cit., p. 172.

<sup>36</sup>Lauer and Evans, op. cit., p. 167.

<sup>37</sup>May, op. cit., p. 438.

<sup>38</sup>Cluton, op. cit., p. 363.

correlation, .95, which is well out of line with the others. Grade point averages in high school foreign language, English, mathematics, and science ranked high. The lowest three correlations, two of which are negative, were found by using the age of the student and the number of units in high school mathematics.

TABLE 11

CORRELATION COEFFICIENTS FOR THE GRADE POINT AVERAGE IN ALL COLLEGE WORK WITH CERTAIN FACTORS WITH THE AUTHOR AND NUMBER OF PUPILS IN EACH CASE

Coefficient	No. Cases	Factor	Investigator
.95	...	H. S. Content Exam.	Cluton
.63	435	H. S. Average	Johnson
.62	85	H. S. Foreign Language	Edds and McCall
.60	450	Intelligence	May
.60	85	H. S. Mathematics	Edds and McCall
.59	85	H. S. English	Edds and McCall
.58	600	Math. Ability	Hepner
.58(women)	55	H. S. Average	Jones
.56	1196	H. S. Average	Douglas
.55	1892	H. S. Average	Odell
.54	1196	H. S. Science	Douglas
.524	600	H. S. Average	Hepner
.50	435	Intelligence	Johnson
.49	1196	H. S. English	Douglas
.46	1196	H. S. Foreign Language	Douglas
.44	1196	H. S. Mathematics	Douglas
.43(men)	100	H. S. Average	Jones
.418	492	Intelligence	Lauer and Evans
.405	450	H. S. Average	May
.386	492	H. S. Average	Lauer and Evans
.38	1892	Intelligence	Odell
.32	450	Hours Studying	May
.315	85	Mental Ability	Edds and McCall
.20	661	No. Units Math.	Wagner
-.016	1196	No. Units Math.	Douglas
-.23	1892	Age	Odell



These results are similar to those reviewed previously for the correlation of the grade point average in college mathematics with certain factors. In those studies the high school average and intelligence ranked high, with age ranking low. It seems, then, that the grade point average in all high school work and intelligence test scores are the best factors for predicting success in all college work, followed by the grade point average in high school foreign language, mathematics, and English. Age gives the lowest correlation.

From the above discussion, together with the observations from Tables 10 and 11, it seems safe to draw the following general conclusions:

1. A combination of two or more factors gives slightly higher correlations than any single criterion, making such a combination somewhat more accurate for the prediction of success in college mathematics or in all college work. The highest multiple correlation found was .67 by Johnson, who used the high school average plus intelligence. Douglas reported his highest correlation of .626 to be obtained with the high school average and percentile rank, while Hepner used the same factors to get the same figure.

2. College marks may be predicted only roughly by means of any one variable or any combination of variables.

3. The average high school mark in all subjects and the intelligence test score are the best single criteria for

predicting success in college mathematics and in all college work. The highest correlations are .498 and .63 for the grade point average in all high school work and .89 and .60 for the intelligence test score with the grade point average in college mathematics and the grade point average in all college work, respectively.

4. The grade point average in high school mathematics (followed by high school English for success in all college work) ranks high for predicting success both in college mathematics and in all college work, the highest correlations being .456 and .60 for high school mathematics (.59 for high school English with general college success) with success in college mathematics and average college work, respectively.

5. The number of units in high school mathematics and the total number of credits in high school work have very little relation to success in college mathematics or in the average college work. Bergen's study contradicts this statement when referring to college algebra and trigonometry, but no other investigator agrees with his results.

6. The number of hours a pupil spends studying, his age, the education of his father and mother, and the vocational position occupied by his father are negligible with reference to the prediction of college success as measured by teachers' marks.

7. Neither the size of the high school from which the student comes nor the salary paid to the teachers seems to have much predictive value.

### CHAPTER III

#### THE RELATION OF HIGH SCHOOL WORK TO SUCCESS IN COLLEGE MATHEMATICS FOR TWO HUNDRED FORTY- THREE SENIOR STUDENTS IN NORTH TEXAS STATE TEACHERS COLLEGE

In order to supplement the research discussed in Chapter II and to search for other factors related to success in college mathematics, the author made an original study of the records of 243 freshmen students and forty-three senior mathematics students. Records were taken from the office of the registrar of the North Texas State Teachers College, Denton, Texas.

During the terms 1937-38 and 1938-39, 1466 students registered as first term freshmen. Of this number, 243 students whose high school records are complete took at least one course in mathematics during the first one and one-half years of college work. One hundred eleven of the 243 mathematics students took only one three-hour course in mathematics. Eighty-five students took two courses, and forty-seven students took three or more courses. That is to say, 16.6 per cent of the freshmen students entering this college took at least three semester hours of work in mathematics during the first

one and one-half years of college study. The 16.6 per cent of the students is made up of 7.6 per cent who have only three semester hours, 5.8 per cent who have six semester hours, and 3.2 per cent having nine or more semester hours in mathematics.

In order to convert letter grades into grade points, a value of (3) is assigned to "A", (2) to "B", (1) to "C", and (0) to "D" or "F". From Table 12 is found a grade point average of approximately 1.65 in high school mathematics for those students who have three, four, and seven semesters of high school mathematics.

TABLE 12

SUMMARY OF THE NUMBER OF MATHEMATICS COURSES AND THE GRADE POINT AVERAGES IN MATHEMATICS FOR 243 FRESHMEN

	Semesters in High School Mathematics							Semester Hours in Mathematics during First Two Years of College Work			
	3	4	5	6	7	8	Total	3	6	9	Total
Number	1	11	7	103	65	56	243	111	85	47	243
Grade Point Average	1.7	1.6	1.36	1.98	1.67	2.2	1.9	0.5	1.05	1.5	0.88

Those students having five semesters in high school mathematics have only 1.36 as a grade point average. This low average may be due to the fact that these are the weaker

students who took only the bare requirements in mathematics as demanded by the high school involved. Those students having six and eight semesters of high school mathematics have the highest grade point averages, being 1.98 and 2.2, respectively. This gives us a grade point average for the 243 freshmen students of 1.9 in high school mathematics. The students taking one course in college mathematics have a grade point average in college mathematics of 0.5. This is exceeded by those students having two and three courses in college mathematics. They have grade point averages of 1.05 and 1.5, respectively. Here is noticed a consistent increase in grade point averages for students having more courses in college mathematics. The average grade point average in college mathematics is 0.88.

In Table 13 the students having a certain number of semesters of high school mathematics are followed into college for their grade point averages in mathematics. For the students having three, four, six, seven, and eight semesters in high school mathematics may be found grade point averages in college mathematics of 1.0, 0.82, 0.82, 0.94, and 1.3, respectively. This shows a consistent increase in college grade point average for those students who have had six, seven, and eight semesters in high school mathematics, the highest being 1.3 for the eight semester students.

TABLE 13

GRADE POINT AVERAGES IN MATHEMATICS EARNED IN HIGH SCHOOL  
AND COLLEGE BASED ON THE NUMBER OF SEMESTERS IN  
MATHEMATICS STUDIED IN HIGH SCHOOL

Semesters	High School		College
	Number of Students	Grade Point Average	Grade Point Average
3	1	1.7	1.0
4	11	1.6	0.82
5	7	1.36	0.4
6	103	1.98	0.82
7	65	1.67	0.94
8	56	2.2	1.3
Total	243	1.9	0.88

The five semester students have a grade point average of only 0.4 in college, which is well out of line with the others. A possible explanation of this inconsistency is that these students meet only the minimum requirements in taking two and one-half years of high school mathematics.

In Table 14 may be found the grade point average in college mathematics earned by each student, as well as the number of semesters of high school mathematics studied. The same data is presented in Table 15 in terms of percentages. The few students who have less than six semesters of high school mathematics represent such a small group that any

general statement concerning them would be of little significance.

TABLE 14

GRADE POINTS EARNED IN COLLEGE MATHEMATICS BY 243  
FRESHMEN STUDENTS, ACCORDING TO THE NUMBER  
OF SEMESTERS OF HIGH SCHOOL  
MATHEMATICS TAKEN

Grade Points Earned in College Mathematics	Number Semesters High School Mathematics						Total
	3	4	5	6	7	8	
2.8 - 3		1		8	4	7	20
2.3 - 2.7				1	3	4	8
1.8 - 2.2		3		7	11	7	28
1.3 - 1.7			1	14	3	3	21
0.8 - 1.2	1		1	24	11	19	56
0.3 - 0.7			1	5	4	7	17
0.0 - 0.2		7	4	45	27	10	93
Total	1	11	7	104	63	57	243

Fifteen and four-tenths per cent of the six semester students have a grade point average above 1.8 in college mathematics, this percentage being exceeded by 28.7 per cent and 31.6 per cent of the seven and eight semester students, respectively. However, 29.8 per cent of the eight semester students and forty-nine percent of the seven semester pupils have a grade point average in college mathematics below .08, while only forty-eight per cent of the six semester students



have a similar average. (It seems that those students with more high school mathematics may have a slight advantage over those with less mathematics, but the distinction is so slight that no definite statement is justified on these data.) Table 15 shows these percentages.

TABLE 15

PERCENTAGES OF 243 FRESHMEN STUDENTS MAKING CERTAIN GRADE POINTS IN COLLEGE MATHEMATICS, ACCORDING TO THE NUMBER OF SEMESTERS OF HIGH SCHOOL MATHEMATICS TAKEN

Grade Points Earned in College Mathematics	Number Semesters High School Mathematics						Total*
	3	4	5	6	7	8	
2.8 - 3.0		9.1		7.7	6.4	12.3	8.3
2.3 - 2.7				1.0	4.8	7.0	3.3
1.8 - 2.2		27.3		6.7	17.5	12.3	11.5
1.3 - 1.7			14.3	13.5	4.8	5.3	8.6
0.8 - 1.2	100.0		14.3	23.1	17.5	33.3	23.0
0.3 - 0.7			14.3	4.9	6.4	12.3	7.0
0.0 - 0.2		63.6	57.1	43.1	42.6	17.5	38.3
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

\*Percentage of 243 students making the grade point average indicated in college mathematics.

A similar investigation by the author concerning senior mathematics students in the North Texas State Teachers College was made in order to make further generalizations regarding the success in college mathematics. The high School records in the office of the registrar are complete for

forty-three of the 239 students who have received degrees in mathematics. In Table 16 may be found the grade point averages earned by the forty-three senior students in high school and college mathematics when distributed on the number of semesters of high school mathematics.

TABLE 16

GRADE POINT AVERAGES EARNED IN HIGH SCHOOL AND COLLEGE  
MATHEMATICS BY FORTY-THREE SENIOR MATHEMATICS  
STUDENTS WHEN DISTRIBUTED ON THE NUMBER OF  
SEMESTERS IN MATHEMATICS STUDIED  
IN HIGH SCHOOL

Semesters	Number	High School Grade Point Average	College Grade Point Average
4	1	1.5	1.8
5			
6	13	2.6	2.3
7	16	2.4	1.67
8	13	2.6	2.07
Total	43	2.5	1.99

The highest grade point averages in high school and college mathematics were made by the six and eight semester students, being 2.3 and 2.07, respectively, in college mathematics. The college grade point average for the six semester students is slightly higher than that of the eight semester students. The average in college mathematics for the seven semester students is lower than that of the six or the eight semester students, being 1.67.

Hence no general statement seems to be justified here except that college grade point averages seems to be approximately the same as high school grade point averages for various groups with the exception of the seven semester students.

In Table 17 may be found the grade points earned in college mathematics by the forty-three mathematics seniors according to the number of semesters of high school mathematics taken.

TABLE 17

THE NUMBER OF THE FORTY-THREE SENIORS, WHEN GROUPED ON THE BASIS OF SEMESTERS IN HIGH SCHOOL MATHEMATICS, WHO MADE EACH GRADE POINT AVERAGE IN COLLEGE MATHEMATICS

Grade Points Earned in College Mathematics	Number Semesters High School Mathematics						Total
	3	4	5	6	7	8	
2.8 - 3				3	1	3	7
2.3 - 2.7				5		1	6
1.8 - 2.2		1		2	7	5	15
1.3 - 1.7				1	5	4	10
0.8 - 1.2				1	2		3
0.3 - 0.7				1			1
0.0 - 0.2					1		1
Total		1		13	16	13	43

In Table 18 may be found the same information expressed in percentages.

TABLE 18

PERCENTAGES OF SENIOR MATHEMATICS STUDENTS MAKING CERTAIN GRADE POINT AVERAGES IN COLLEGE MATHEMATICS ACCORDING TO THE NUMBER OF SEMESTERS OF HIGH SCHOOL MATHEMATICS TAKEN

Grade Points Earned in College Mathematics	Number of Semesters High School Mathematics					Total*
	4	5	6	7	8	
2.8 - 3			23.1	6.2	23.1	16.3
2.3 - 2.7			38.54		7.7	14.0
1.8 - 2.2	100.0		15.3	43.8	38.4	34.8
1.3 - 1.7			7.7	31.3	30.8	23.3
0.8 - 1.2			7.7	12.5		7.0
0.3 - 0.7			7.7			2.3
0.0 - 0.2				6.2		2.3
Total	100.0%		100.0%	100.0%	100.0%	100.0%

\*Percentage of the forty-three students making the grade point average indicated.

The one student who had only four semesters of high school mathematics does not represent enough cases to make a general statement. However, it is interesting to note that his grade point average in college mathematics is 1.8. Twenty-three and one-tenth per cent of both the six and the eight semester students have a grade point average above 2.8. Only 6.2 per cent of the seven semester students have a similar grade point average. Sixty-one and six-tenths

per cent of the six semester students have a grade point average above 2.2, while only 6.2 per cent of the seven and 30.8 per cent of the eight semester students have a similar grade point average. However, 15.4 per cent of the six and 18.7 per cent of the seven semester students have a grade point average less than 1.7, while none of the eight semester students have a similar average. Six and two-tenths per cent of the seven semester students have a grade point average of less than 0.3, while no other group has a representation so low. It seems from this discussion that those students having six or eight semesters in high school mathematics make better students in college mathematics than those students having four, five, or seven semesters in high school mathematics.

In Table 19 may be found the correlation coefficients for the grade point averages in college mathematics with certain high school factors for the 243 freshmen students. For the grade point average of the 243 college students in all college mathematics, the highest correlation found is .49 with the grade point average in all high school work. This coefficient is followed very closely by .488 with the grade point average in high school mathematics. Other correlations for the grade point average in all college mathematics are .459 with the grade point average in high school English, .45 with science, .41 with social studies,

.37 with advanced arithmetic, and .15 with the number of units of high school mathematics. This shows very little relation between the grade point average in college mathematics and the grade earned in advanced arithmetic in high school or the number of semesters taken in high school mathematics.

TABLE 19

CORRELATION COEFFICIENTS FOR THE GRADE POINT AVERAGES  
IN COLLEGE MATHEMATICS WITH CERTAIN HIGH SCHOOL  
FACTORS FOR 243 FRESHMEN STUDENTS

High School	College						
	Algebra	Trig.	Analyt-ics	Math. Average	Three Sem. Hr. Average	Six Sem. Hr. Average	Nine Sem.Hr. Average
Algebra	.35						
Math. Average	.43	.468	.51	.488	.388	.29	.65
Average Work				.49	.43	.374	.57
Science				.45			
Soc. Studies				.41			
Adv. Arith.				.37			
English				.459			
Number units Mathematics				.15			

The correlation for the grade point average in college algebra with the grade point average in high school algebra

is .35, while college algebra with all high school mathematics gives .43. The correlations for the grade point average in college mathematics for the nine semester hour students with the grade point average in high school mathematics and in all high school work are fairly high, being .65 and .57, respectively. Here is found a contrast to all other situations in the fact that the correlation for the high school mathematics is higher than that for all high school work. A possible explanation is that those students with nine semester hours of college mathematics were particularly interested in mathematics in high school. The correlations for the three and the six semester hour students are much lower, the higher correlation belonging to the three semester hour group.

In Table 20 may be found the correlation coefficients for the grade point average in all college mathematics with certain high school factors for forty-three senior mathematics students. Also correlations for the grade point average in certain parts of college mathematics with the same high school factors are given. Again the highest correlation for the grade point average in college mathematics is with the average high school work. In this case the correlation is .415. This correlation is followed by .374 with high school mathematics, .367 with science, .344 with English, .32 with social studies, and .24 with high

school advanced arithmetic. Again the correlation is very low for the grade point average in college mathematics with the grade point earned in high school advanced arithmetic.

TABLE 20

CORRELATION COEFFICIENTS FOR THE GRADE POINT AVERAGES  
IN COLLEGE MATHEMATICS WITH CERTAIN HIGH SCHOOL  
FACTORS FOR FORTY-THREE MATHEMATICS SENIORS

High School	College			
	Algebra	Trig.	Analytics	Math. Average
Algebra.....	.235			
Math. Aver.....	.1	.533	.225	.374
Average Work....				.415 -
Science.....				.367
Soc. Studies....				.32
Adv. Arith.....				.24
English.....				.344
Number units....				-.074

The only negative coefficient found is for the grade point average in college mathematics with the number of courses taken in high school mathematics. This coefficient is  $-.074$ . These results furnish sufficient evidence to conclude that neither the grade earned in high school advanced arithmetic nor the number of courses taken in high



school mathematics has a great deal of influence on the grades to be earned in college mathematics. Of those investigated, the best predictive factor concerning the success in college mathematics is the average grade earned in all high school work, followed by the average grade in high school mathematics, then English or science. College algebra with high school algebra gives .235, and with high school mathematics average gives .1. College trigonometry with high school average work gives .533 and college analytics with high school average work gives .225. The correlation for trigonometry runs rather high, while that for college algebra is fairly low.

In Table 21 may be found the coefficients of correlation for the grade point average in college mathematics with certain high school factors. The correlations are usually higher for the freshmen than for the mathematics seniors. The highest correlation for the grade point average in college mathematics is with the grade point average in all high school work. This is followed closely by the high school grade point average in mathematics, English, and science. Correlations are particularly low with the number of units of high school mathematics and the grade point average in advanced arithmetic.

TABLE 21

CORRELATION COEFFICIENTS FOR THE GRADE POINT  
AVERAGE IN COLLEGE MATHEMATICS WITH  
CERTAIN HIGH SCHOOL FACTORS

Coefficient	High School Factor	Group
.49	Average Work	Freshmen
.488	Math Average	Freshmen
.459	English Average	Freshmen
.45	Science Average	Freshmen
.415	Average Work	Math Seniors
.41	Social Studies	Freshmen
.374	Math Average	Math Seniors
.37	Advanced Arithmetic	Freshmen
.367	Science	Math Seniors
.344	English	Math Seniors
.32	Social Studies	Math Seniors
.24	Advanced Arithmetic	Math Seniors
.15	Units Mathematics	Freshmen
-.074	Units Mathematics	Math Seniors

From the above discussion it seems that the following assertions may be made.

1. The most reliable high school factor of those investigated for predicting success in college mathematics is the grade point average earned in all high school work, which gives coefficients of .49 and .415 for the freshman and senior groups, respectively.

2. After those for the grade point average in all high school work, the next highest correlations obtained were .488 and .374 for the freshman and senior groups, respectively,

for success in college mathematics with the grade point average in high school mathematics, followed by English or science. (English is higher for the freshman group, and science is higher for the mathematics seniors.)

3. There is little correlation between the grade point average in high school advanced arithmetic and success in college mathematics, which gave correlations of .37 and .24 for the freshman and senior groups, respectively.

4. The correlation between the number of semesters of high school mathematics studied and success in college mathematics is so very low that correlations approximating zero were obtained for both freshman and senior groups.

## CHAPTER IV

### SUMMARY AND GENERAL CONCLUSIONS

From an original investigation of 243 freshmen students and forty-three senior students in mathematics in the North Texas State Teachers College concerning the relation of high school work to success in college mathematics and a review of similar studies, the following generalizations are made:

1. A combination of two or more factors is somewhat more accurate than any single criterion for the prediction of success in college mathematics or in all college work.

2. College marks may be predicted only roughly by means of any one variable or any combination of variables.

3. The average high school mark in all subjects and the intelligence test score are the best single criteria for predicting success in college mathematics and in all college work. These factors are followed closely by the average mark earned in high school mathematics.

4. The study of advanced arithmetic in high school and the mark earned in such a study has little effect on the success in college mathematics.

5. Neither the number of units in high school mathematics nor the total number of credits in high school work

has much relation to success in college mathematics or in the average college work.

6. The number of hours a pupil spends studying, his age, the education of his parents, and the vocational position occupied by his father are negligible with reference to the prediction of college success as measured by teachers' marks.

7. Neither the size of the high school from which the student comes nor the salary paid to the teachers seems to have much predictive value.

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