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A Study of Relationships Between Selected High School Subjects and Academic Success in College

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A STUDY OF RELATIONSHIPS BETWEEN SELECTED

HIGH SCHOOL SUBJECTS AND ACADEMIC

SUCCESS IN COLLEGE

———————

A Thesis

Presented to

the Graduate Faculty

Central Washington College of Education

———————

In Partial Fulfillment

of the Requirements for the Degree

Master of Education

———————

by

Glade H. Miller

August 1960

ACKNOWLEDGEMENTS

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CHAPTER I

INTRODUCTION AND PURPOSE

I.   INTRODUCTION

No other nation in the world has such a high percentage of its boys and girls in school as the United States. The American comprehensive school is designed to provide a general education for all citizens: good elective programs for those who wish to use their acquired skills immediately following graduation and programs for those who wish to go on to college.

Public education is interested in increasing the quality of its product and in becoming more efficient and effective, especially in the area of preparing the student for future college work. Harold C. Hunt, Under Secretary of Health, Education and Welfare, in a speech at Ann Arbor, Michigan, in 1956, asked for an examination of the present high school curricula. According to him the high schools are not adequately preparing the forty-seven per cent of high school graduates that go on to college either full or part time (11:149).

Dr. James B. Conant, President Emeritus of Harvard, states some standards he feels should apply to all schools:

> Irrespective of family background, academic ability, or vocational goals, all students ought to devote four

years to the study of English literature and composition, and three or four years to social studies, including history. They should also take some mathematics and social science. The amount should be determined by the ability of the students--perhaps as a minimum, one year of general mathematics or algebra and one year of general science or biology (2:85).

With statements such as this issued by Conant, increasing emphasis is being placed upon college preparatory courses in the high school. This is done in the belief that increased academic preparation at the high school level is conducive to academic success as shown by the student's cumulative grade point average (GPA) in college.

Conant further states that a number of high schools are doing a satisfactory job of general education for good students both in college preparation and in vocational training. With the identification of factors conducive to this, it would be possible to strengthen the curriculum of the other schools so that they too will do a satisfactory job of education (3: 1f.).

The college preparatory efforts of the high schools have for a long time been of much concern to the college. As a result of this concern, the high schools have prescribed for prospective college students a minimum number of academic courses. Colleges do not classify as academic many of the courses now offered by the high schools within the State of Washington. Examples of these are beauty culture, auto shop, and vocational sheet metal shop.

One of the most important questions for the high school and college educators today is the extent to which the proportion of academic to non-academic courses in the student's high school preparation affects his ability to adjust to college and achieve satisfactorily (12:10).

II. PURPOSE

The general purpose of this study was to attempt to discover how much, and in what proportion, work of an academic nature in high school facilitates college academic achievement. The student's relative success in college academic work is expressed by the GPA.

The Registrar and other administrators at Central Washington College of Education (CWCE), as well as high school administrators and supervisors, should be interested in learning the relative college performance of students who enter college with a more extensive college preparatory program and of those with lesser amounts of high school academic work. The conclusions of this study may be of value to college personnel, who may use the results to consult with high school administrators, counselors, and the high school student himself in planning what a desirable and adequate high school college-preparatory program should be.

III. MARKING AND POINT SYSTEM

The meaning of the following letter grades is para-
phrased from the 1959-1960 CWCE General Catalog. The
highest grade, an "A," is reserved for those students who
have excelled in every phase throughout the course. The
"B" grade is for students whose work is definitely supe-
rior but does not warrant the special distinctiveness of
an "A." A "C" grade indicates that the student has met
the requirements, and has made substantial progress toward
meeting the objectives of the course. The "D" is a grade
for those students who have made some progress toward
meeting the objectives of the course, but who have met
the requirements only in a substandard manner. The "E"
is reserved for students who failed to meet or accomplished
so few of the requirements of the course that they should
not be entitled to credit (17:62).

The quality of college work done in this study was
measured in terms of grade points. The following "Quality
Points" are assigned to each letter grade in order to
facilitate the averaging of grades to determine the scholar-
ship of students (17:63):

For each hour with a grade of "A"   4 quality points
For each hour with a grade of "B"   3 quality points
For each hour with a grade of "C"   2 quality points

For each hour with a grade of "D"   1 quality point

For each hour with a grade of "E"   0 quality points

Quality grade point averages are arrived at by multiplying the number of quality points assigned to grades a student receives in each course for which he is enrolled by the credit value of each course. These products are then summed and divided by the sum of the total number of credits the student has carried during the quarter. For example, suppose a student completes the following courses and earns the grades and credits assigned:

Course	X Quarter Hours Credit	Letter Grade	Y Quality Points	XY
English 205	5	B	3	15
Psychology 100	5	A	4	20
Home Ec. 200	3	C	2	6
History 201	3	B	3	9
	16			50

$$M = \frac{XY}{N} = \frac{50}{16} = 3.12 \text{ GPA}$$

A "quarter hour," "quarter hour credit," or "quarter credit" is ordinarily defined as one fifty-minute lecture or recitation period a week or two fifty-minute periods of laboratory or activity work a week for the duration of the quarter, eleven or twelve weeks.

Factors which might in some way influence grades, such as study habits, reading rate and ability, study

environment, teaching procedures and conditions, motivation, academic load, extracurricular activities, employment, teacher's marks, etc., were not taken into consideration as part of this study. Total GPA was used as the sole measure of academic success, as it is in the vast majority of college predictive studies. It is not necessary to discuss the reliability of classroom markings since it is generally accepted that variabilities do exist. More reliable criteria would be desirable but are not available. The greatest hope for improvement of criteria is through improvement of grading systems.

> The cumulative grade point average as an index of scholarship does not greatly reflect a student's grade in a single subject from one teacher, but is an average of all his teachers in all the subjects he has completed. It is indicative of his entire scholastic record as a college student, which amounts to a far more stable measure of college achievement than would grades in any particular subject matter area (15:10).

Predictions of academic success such as grades, interest, amount of preparation, etc., predict only within the limits imposed by the reliability of grades. Since grades are the most commonly accepted means of evaluation, they will be used as such in this study.

IV. THE CRITERION OF SUCCESS IN COLLEGE

For the purposes of this study, success in college is defined as the academic success attained by the student.

The student's individual GPA is used as evidence of success reached. The relativity of success so defined need only be explained briefly:

> Obviously there is no grade point average that could be labled "zero success" nor is there another grade point average that could be labled "complete success." The cumulative grade point average of an individual is used as an indicator, not of so many units of success of that individual among the various gradations of success that are indicated on a scale of grade point average that run from 0.0 to 4.0. If one thinks of success interms of quantities this scale does not give a true indication of individual success, for, if we assume a normal distribution of grades, and if grades are actually valid indications of success, a cumulative grade point average of 4.0 would be representative of many times more than twice the success that would be represented by a cumulative grade point average of 2.0 (15:8-9).

The purpose of this definition of criterion is not an attempt to justify the meaning so used, but an attempt to identify the term.

If it can be determined on the basis of past experience that certain preadmission variables bear a definite relationship to success in college, then they may logically be used as indicators of college success. By the same token if certain preadmission variables or criteria do not show a definite relationship, they probably should not be used in a rational program of guidance policies and procedures in the high schools. This study will deal with the number of units earned in these selected areas in high school, contrasting those units to overall college success as expressed by the cumulative grade point average.

CHAPTER II

REVIEW OF LITERATURE

In a study conducted by Soder at the University of Puget Sound (UPS) in 1954, the effects of a high school college preparatory program were studied in relationship to college grades. In this study, a college preparatory course included a minimum of ten units taken during the four year high school program in the subject areas of English, foreign language, laboratory sciences, social studies (either history or civics), and mathematics (16:4).

The freshman students of 1954 who had a college preparatory background in high school earned a grade point average of 2.25 as opposed to a grade point of 1.93 by the non-college preparatory students. Therefore, the college preparatory group earned a .32 better grade point average during its freshman year than did the non-college preparatory group (16:20).

However, by the time this group of freshman had completed seven semesters of college, becoming college seniors, quite a different picture had taken place. When the college preparatory units taken in high school and the cumulative grade point average were compared, there was found to be a correlation of only + .018 with a probable

error of .0702. In approximately 99 per cent of the cases
the standard error would be .269 of the true "r." At the
one per cent level of confidence, the true "r" will lie
somewhere between -.251 and +.287. The standard error of
estimate, based on the regression equation, indicates a
predictive value of no better than by chance guess. This
is to say, by the time these people had completed the seven
semesters of college at UPS, it was found that the college
preparatory course of study in the high schools, as so
defined, had no apparent benefit to the college senior (16:21).

An illustration of the results Soder found were pre-
sented by her in table form. Table 1 was taken from her
study. It shows that of the graduating class of 1957 at UPS,
the non-college preparatory group or those having less than
ten units constituted 17.3 per cent of the total. This
group earned a college cumulative GPA of 2.59. The remain-
ing 82.7 per cent, having ten or more college preparatory
units, earned a GPA of 2.72. This is a difference of only
0.13 in favor of the college preparatory group. Only 3.7
per cent of the total group had fifteen or sixteen college
preparatory units, and they achieved a GPA of 2.37. The
cumulative GPA for the entire class was 2.67. This is
only 0.08 better than the non-college preparatory group
and 0.05 less than the college preparatory having between

TABLE I

From Soder (16:26)

NUMBER AND PERCENTAGE OF THE 1957 GRADUATING GROUP
HAVING GIVEN NUMBER OF COLLEGE PREPARATORY UNITS
IN HIGH SCHOOL AND THEIR COLLEGE CUMULATIVE
GRADE POINT AVERAGES

Number of College Preparatory Units in High School	Their College Cumulative Grade Point Average	Number of Persons in 1957 Graduating Group	Percentage of 1957 Graduating Group
16	2.65	1	1.2
15	2.25	2	2.5
14	2.25	2	2.5
13	2.75	8	9.9
12	2.83	16	19.7
11	2.79	21	25.9
10	2.65	17	21.0
9	2.58	6	7.4
8	2.73	5	6.2
7	2.38	3	3.7
TOTAL		81	100.0

ten and fifteen units (16:26). It is interesting to note that those students having fifteen or more college preparatory units averaged a GPA of 0.30 under the entire class average. When these students were compared with the students having from ten through fourteen college preparatory units, it was found that their average GPA was 0.35 poorer.

In a study attempting to develop an instrument of predictive value in assessing good or poor college risks, Douglas compared minimum high school credits (units) and college entrance requirements. Douglas examined the records of 387 members of the class of 1930 at the University of Oregon and concluded:

> Not only do the results of the study based on the Oregon students indicate that the entrance requirements based upon the minima of earned credits in specified subject matter fields are practically useless in the differentiating between good and poor college risks, but there is a general agreement among the conclusions of all other scientific investigators bearing upon the question. It would seem that no more striking example of the application of fallacious untested theories to educational administration may be mentioned than in the prevailing method of selecting students for higher education (4:522-523).

> Compared on the basis of predictive usefulness to psychological test scores, high school marks, principal's ratings on college promise, the pattern of high school credits is obviously and definitely inferior. The author of this study feels certain that a few years hence, our present practice of selecting college entrants on the basis of minimum credits in certain fields of high school credits will seem a curious and inexplicable anomaly (6:114-116).

The Eight-Year Study carried on by the Commission on the Relation of School and College of the Progressive Education Association was started in 1933 and completed in 1942. In this study, students from thirty secondary schools were selected. These students were not required to have taken any specific pattern of subjects in preparation for college. The thirty schools, each doing what it considered best for the individual student, prepared him for the college he planned to enter. Then, the colleges cooperating in the study admitted students from the thirty schools on the basis of highschool recommendations. The colleges were furnished with considerable information concerning the student when he became a candidate for admission. The colleges participating in the study were more interested in the student than in the traditional fixed pattern of college preparatory courses. They believed that the high schools in question were closer to the student and were, therefore, better able to recommend him for admission (1:425-427).

In order to obtain information regarding the college success of the graduate of the thirty schools, twenty-two colleges were chosen for thorough study. The colleges enrolled about half the graduates of the thirty schools and were representative of four types: Eastern men's colleges;

Eastern women's colleges; endowed coeducational colleges; and state universities. In order to make comparisons, a similar group of students was selected. The comparison group was graduated from the "traditional" high school and had followed the normal college preparatory program. A graduate from the thirty schools was paired with a graduate from the "traditional" schools. Bases for pairing the students were near-equal ratings on scholastic apti-tude tests, equal socio-economic backgrounds, and similar-ity of age, sex, and race (6:114-116).

The data indicate that average college grades earned by graduates of the thirty schools were slightly above those of students from the "traditional" schools. When the data were classified into terms relating to the type of colleges, it was found that the graduates of the thirty schools made slightly better grades in all but the women's colleges. Women students from the "traditional" schools earned a grade point average of 2.45 as compared to the grade point aver-age of 2.41 earned by women from the thirty schools. In the men's colleges, graduates of the thirty schools made a grade point average of 2.40, while the comparison group made a grade point average of 2.29. In the coeducational colleges, the graduates of the thirty schools made an average grade of 2.64, and the comparison group of 2.61. In the state

universities, the graduates of the thirty schools earned
an average grade of 2.66, and the comparison group 2.51.
It was also found that students graduating from the thirty
schools participated in more extra-curricular activities
and possessed more desirable personal qualities, according
to personality ratings made by observers (6:115-121).

The conclusions were that the experimental schools
had broken considerably with "fixed" curricular patterns
and teaching methods and in so doing had generally given
their pupils more worthwhile materials for study than other
secondary schools (1:425-427).

Mitchell's study showed that admission requirements
should depend less on the subjects studied than on the
quality of the work done by the applicant for admission
. . . . The truth that no one subject or combinations
of subjects is essential for all students has been made
evident (14:144).

Zeno B. Katterle, Dean of the School of Education at
Washington State University, (WSU), and Roger Craig investi-
gated the evidence concerning the relative success of first
year college students with the varying proportions of their
high school credits (units) in non-academic courses. In
this investigation, the proportions of non-academic high
school credit was compared to the course grades in the first
year of college and to the tendency of students to withdraw
before completing their freshman year.

A twenty per cent random sample was taken of the freshmen beginning their study at WSU in the fall of 1952. A total of 281 students were studied. All were graduates of high schools throughout the State of Washington, and they were considered as being representative of the 1952 freshman class (12:10).

In the analysis of results, Katterle and Craig found no relationship between academic adjustment and differing proportions of high school credits earned in academic or non-academic courses. Katterle interpreted his investigation as supporting previous studies that suggested a varied program, departing in large part from academic or conventional college preparatory courses (12:38).

In a survey conducted by Paul Horst at the University of Washington, evidence was found showing that there is no significant relationship between the number of units earned in high school and college success. Several interesting conclusions were reached. Horst's survey Table 53, entitled "Correlations between Preadmission Variables and College Course Grades for Entering Class of 1955 through Spring of 1958 for Students Taking Introductory College Courses," showed that between all university grades and the number of high school units the following correlations (r) existed:

Mathematics	$r = + .10$
Natural Science	$r = - .01$

English   r - + .02

Social Science   r -   .00

Foreign Language   r - + .24

Between all university grades in introductory college courses and the high school units in all academic subjects there was a correlation of + .18. When all the university grades were contrasted with the number of high school units earned in all high school subjects, the correlation was only + .17 (9:106, 108).

These results show that very little if any relationship exists between the amount of high school academic preparation in mathematics, natural science, English, or social studies and success in college course work. The relationship between high school units in foreign language and college success is also negligible.

Table 54 of Horst's survey, entitled "Correlations between Preadmission Variables and College Course Grades for Entering Class of 1955 through Spring of 1958 for Students Taking Advanced College Courses," shows the following correlations between advanced college course grades and the number of high school units (9:110, 112).

Mathematics   r - + .02

Natural Science   r - - .03

English   r - + .02

Social Science   r - + .01

Foreign Language   r - + .13

Between all university grades in the advanced courses and the number of high school units in all academic subjects there was a correlation of + .08. Comparing the same university courses with all high school subjects the correlation was + .12. The results for advanced college course work show even more vividly the general lack of relationship between the amount of specific high school academic preparation and college success.

Table II, abstracted from the University of Washington study, shows the comparative correlations between the grades received in introductory and advanced college courses, in the same subject areas, compared with the number of units earned in high school (9:108-112).

TABLE II

COMPARATIVE CORRELATIONS BETWEEN INTRODUCTORY AND ADVANCED COLLEGE COURSES AND HIGH SCHOOL UNITS (9:108-112).

College Courses		High School Units				
		Mathe-matics	Natural Science	English	Social Science	Foreign Language
College Mathematics	Intro	+.23				
	Adv	+.06				
Biology	Intro		+.11			
	Adv		+.19			
Geology	Intro		.00			
	Adv		+.06			
English Composition*	Intro			.00		
	Adv			.00		
English Literature	Intro			+.07		
	Adv			+.01		
Economics	Intro				+.01	
	Adv				+.05	
History	Intro				.00	
	Adv				+.06	
Political Science	Intro				+.02	
	Adv				+.27	
Sociology	Intro				+.02	
	Adv				-.04	
Classical Language*	Intro					+.14
	Adv					+.14
Germanic Language	Intro					+.23
	Adv					-.08
Romance Language	Intro					+.35
	Adv					+.16

* Total course values are presented since the numbers of intro-
ductory or advanced courses are too few to be included.

The evidence offered by Table II is most interesting. When comparisons were made between college courses and the high school units, correlations were found to range from a low of - .04 in advanced English literature to a high of + .35 in Introductory Romance Languages. In all of these areas, with the exception of the Introductory Romance Languages, the relationships were of no significance. The correlation of + .35 for the Introductory Romance Languages indicates a small but definite relationship. However, in geology, English Composition, English literature, economics, history and sociology, the relationships found must be considered meaningless.

CHAPTER III

LIMITATIONS

This study has been limited to those students either entering or graduating from CWCE who have graduated from high schools within the State of Washington. Persons holding a prior college or university degree were not included in this survey.

For purposes of comparison, two college classes were considered. The first group was comprised of all the persons graduating during the entire academic school year of 1958, regardless of their date of original enrollment or date of transfer to Central. This group was chosen because it was the latest group that could be studied in its entirety at the origin of this research. The second group was the first quarter freshmen that entered CWCE fall quarter, 1954. No age limits were placed on either group, but the freshmen had to have completed one quarter of work.

All of the material used in this study was collected from the permanent college and high school records found in the Office of the Registrar at CWCE.

To facilitate the recording of information from these permanent records, a duplicated form was designed for the recording of data, as shown in Appendix A. It will be

noted that the names of the students were recorded. How-
ever, names are not indicated in this research. The names
were included to facilitate the rechecking of data or the
addition of further data when all records were not readily
available.

The data collected are completely confidential. It
is possible that further studies of a similar nature will
be made utilizing some of this material. All records will
be turned over to the Division of Education and Psychology
at CWCE and filed there in the event of future study.

I. NUMBERS IN THE SAMPLE

Of the totals of each group considered, only those
with sufficient data on the records were used. The entering
freshman class of 1954 totaled 469 students. Of this number
some students dropped out of school before completing the
quarter. Others were graduated from high schools outside
the State of Washington. And for some students there was
an insufficient amount of data on their records for them
to be included in the sample. Of the original total of
469 students, data on 163 were not used, making the total
306.

The original sample of 1958 graduates included 388
persons. Of this number some had graduated from high schools

outside the State of Washington. Some of the students held prior degrees, and for many others there was insufficient data for this study. Of the original number of 388, 115 could not be included in the study. This group finally totaled 273. Correlations in this study between grade point averages and the number of units earned in these selected high school subjects are based upon the grades earned by these two groups.

Obviously this is not a random sample in the strictest sense. Generalizations formed as a result of this study must be considered as being truly representative of only the particular group defined. It is possible to generalize safely from the results of this study relative to other populations only to the extent that it may be assumed that the sample used in this study is truly representative of the other such populations. These, however, are often quite similar because of drop outs for marriage, military service, transfer to other colleges, etc.

II. SUBJECT AREAS

The selected high school subjects used in this study are as follows: mathematics, natural science, English, social studies, and foreign language. Below are given course titles included in each of the mentioned major areas:

Mathematics--General mathematics, all Algebra courses, Trigonometry, all Geometry, Analysis, and Calculus.

English--All English Composition and Literature courses.

Natural Science--General Science and Biology.

Social Studies--U.S. History, World History, Civics, Sociology, World Problems, and Current Problems.

Foreign Language--French, Spanish, Latin, and German. General Mathematics and General Science were included because the State Board of Education in Washington awards credits or units for the successful completion of these courses. Since the state awards credits in these areas which must be accepted by institutions of higher learning in Washington, they were included in this investigation.

III. UNITS

In a study of two hundred representative colleges in the United States and forty-five state universities, it was found that 79.5 per cent required specific subjects for admission. The most common requirement is a minimum number of units in English, mathematics, social science, science and foreign language (10:364).

A unit is defined as a year's study in any major subject in a secondary school . . . . It assumes that

a satisfactory year's work in any major subject can-
not be accomplished in less than 120 sixty-minute
hours, or their equivalent.

It takes the four-year high school as a basis and
assumes that the length of the school year is from
thirty-six to forty weeks, that a subject is studied
for four or five periods a week (18:4).

CHAPTER IV

RESEARCH PROCEDURES AND RESULTS

It would be well to recall at this point that the purpose of this study was to discover how much, and to what degree, greater amounts of academic work in high school facilitated academic work done in college. This chapter presents the methods and procedures of gaining the data and the implications gained as results of this information.

I. PROCEDURES

Data included in this investigation were collected from the permanent files in the Registrar's Office at CWCE. Most information was taken from the student's official transcript. When this could not be done the student's records in the permanent record file were examined.

For the sake of making an adequate comparison in this study, two groups were used. The first group, comprising a total of 306 students, was made up of first quarter freshman for the fall quarter of 1954. The other group, with a total of 273 students, was composed of all graduates of CWCE during the entire academic year of 1958.

The data collected for each of these groups were collected separately. For each student, regardless of group,

the units earned in each of the selected areas of English,
mathematics, natural science, social studies, and foreign
language were noted and transferred to the duplicated form
designed for the recording of this data (Appendix A). The
final grade point average was completed and recorded for
each person. Entrance scores received on the American
Council on Education Psychological Examination were also
included as were the scores of the Nelson-Denny Reading
Test and the Cooperative English Test. The scores presented
on the three tests mentioned were given in percentile rank-
ings in terms of national all-college freshmen norms.

When this information had been recorded, the total
number of units earned by each person in each subject area,
(X), was then multiplied by itself, (X^2), or squared. The
next step was to take the total units earned in each of the
subject areas, (X), and multiply this by the final cumulative
grade point average, (Y), of college, which would return a
cross product of XY. The total recorded data for each stu-
dent would then occupy a single line on the form. This raw
score approach was used as the basis for the correlational
study. Test score percentiles were not used in the cor-
relational part of the study.

The sums for each column on the forms were then com-
puted. This information was recorded on another duplicated

form, and when the sums of each form were tabulated, the information was totaled on one sheet where the final summations for each subject area, the square of that figure, and the cross products were easily accessible.

The data for each group were collected separately. Thus when all the tabulations had been completed there would be the two differing sets of data. By using the two sets of data the comparisons and results would give two groups of different academic patterns for comparison. One group, the freshmen entering fall, 1954, contained not only students who were succeeding but some who were or would be academic failures. The second group, all graduates of 1958, was made up, obviously, of students who were academically successful.

II. CORRELATIONS

When the final tabulations had been completed, a method of making a comparison between the units earned in each of the subject areas and the GPA was needed. The formula used for that purpose in this study is the Pearson Product-moment Coefficient Correlation (19:144):

$$r = \frac{\frac{\angle XY}{N} - Mx\ My}{\delta x\ \ \delta y}$$

"Pearson's product-moment coefficient is the standard index of the amount of correlation between two things, and we

employ it whenever it is possible to do so" (9:285). Computational procedures for computing this formula are explained in Appendix B. A sample problem is worked in Appendix C.

For the convenience of the reader with little statistical background, correlation may be defined as the degree of relationship between two variables (7:101). When paired variables tend to have roughly the same relative position in their respective distributions, they show a "positive correlation." When the variables tend to be divergent in their respective distributions, they show a "negative relation" (13:153). The absence of any systematic (average) tendency for the two variables shows no, or zero, correlation (7:101).

A correlation of 1.00 would represent a perfect relationship between the variables considered. Other correlation magnitudes have the following meanings:

Less than .20	Slight almost negligible relationship.
.20 - .40	Low correlation; definite but small relationship.
.40 - .70	Moderate correlation; substantial relationship.
.70 - .90	High correlation; marked relationship.
.90 -1.00	Very high correlation; very dependable relationship.

It should also be said that the same interpretations apply alike to negative and positive r's of the same numerical

size. An r of - .60 indicates just as close a relation-
ship as an r of + .60 but in an inverse fashion, of course
(8:145).

III. RESULTS

Correlation coefficients were computed between each
of the selected subject areas and the sum total of the
grade point averages for each of the two groups.

Table III illustrates the degree of relationship
between the amount of units taken in high school and the
final GPA's earned by the students at CWCE.

By referring to Guilford's explanation of correla-
tion magnitude (8:145), the significance of the degree of
relationship in each of the subject areas for each year
can be studied. Using that as a reference for the group
of 1954 students, there is no relationship of any signi-
ficance between mathematics units earned in high school
and college GPA, between natural science units earned in
high school and GPA. An almost negligible relationship of
- .153 exists between the amount of English units earned in
high school and college grades. The only r of any signi-
ficance, one of + .630, was found to exist between the num-
ber of units of foreign language taken in high school and
the college grade point average. This r of + .630

TABLE III

CORRELATION COEFFICIENTS BETWEEN SUBJECT UNITS IN HIGH SCHOOL AND ACADEMIC SUCCESS IN COLLEGE FOR 1954 AND 1958 SAMPLES

	1954	1958
Mathematics Units and GPA	r - +.097	r - -.006
Natural Science Units and GPA	r - +.073	r - +.807*
English Units and GPA	r - -.153**	r - +.130**
Social Studies Units and GPA	r - +.018	r - +.088
Foreign Language Units and GPA	r - +.630*	r - -.049

* Significant at the 1 per cent level of confidence.

** Significant at the 5 per cent level of confidence.

exemplifies a moderate yet substantial relationship be-
tween the variables.

The graduates of 1958 showed no relationship of any
significance in four of the five selected areas. An r of
- .006 between high school mathematics units and college
GPA shows almost no relationship. It is interesting to
note that in the group of graduates the r of - .049 for
foreign languages is found to be negligible. The r of
+ .088 between social studies units in high school and
college GPA suggests an insignificant relationship. The
r of + .130 comparing English units and GPA is also neg-
ligible. However an r of + .807, found to exist between
natural science units in high school and college GPA, is
one of marked relationship. Since this is inconsistent
with other correlations in this study and with results
from previous investigations, it may be well to make
hypotheses about its occurence.

This high coefficient seem to be best explained by
two significant facts. First, it must be remembered that
the units earned in the high school general science courses
were included in this study since the high schools do award
credits (units) for the successful completion of the course.
With units earned in this manner, which could be substituted
for biology, it is possible that the degree of relationship

increased. Secondly, it was found that for the entire group of 1958 graduates included in this study, 273, a total of only 310.50 units, had been taken in this area. This would then make an arithmetical mean of 1.14 units per student. With this low number it is also possible that the relationship increased spuriously.

The difference of r's between the two groups in foreign languages is also one that will draw the attention of the reader. Many educators feel that units earned in foreign language at the high school level will be of great credit and significance to the future college student. Is it possible, then, that units earned in foreign languages, an elective supposedly taken by the more capable high school students, might be of predictive value to the future college student? On the surface this attitude might be accepted because one sees in Table III that the 1954 group achieved an r of + .630 between foreign language units in high school and college GPA.

With this hypothesis in mind, further investigation into this area seemed warranted. The records of the 1954 freshman group were then re-examined. Those students having more than one-half unit of foreign language were considered as having taken foreign languages in high school. Those with one-half unit or less were considered as not having foreign languages.

Using this as the point of separation, the ACE
scores for each of the groups, those with and those with-
out foreign languages, were recorded on tables using five
point intervals. When their figures had been recorded and
tabulated, the median ACE score for each group was com-
puted. Table IV shows the frequency of students scoring
within the five point intervals of the ACE percentile
scores. The median ACE score for each of these sub-groups
is also shown. Edward's formula for computing these median
scores and an example are shown in Appendix D.

A median ACE score of 46.5 for the students taking
foreign languages in high school, compared to a median
of 24.72 for those persons not taking foreign languages
in high school, would definitely indicate that persons
electing foreign languages were more capable. A difference
of 21.78 points between medians show that more capable
students had taken foreign languages in high school.

However, the r between foreign language units in
high school and GPA for the 1958 group was - .049. In an
attempt to find the source of this large difference between
r's, the same type of investigation was employed as pre-
viously with the 1954 freshman group. This information is
shown in Table V.

The results of this internal investigation revealed
a median ACE score of 61.34 for those students having the

TABLE IV

ACE SCORES COMPARING FOREIGN LANGUAGE AND NON-FOREIGN LANGUAGE STUDENTS IN 1954 GROUP

	ACE Scores Without Foreign Language		ACE Scores With Foreign Language	
	f	cf	f	cf
95-99	2	199	4	107
90-94	4	197	4	103
85-89	5	193	2	99
80-84	2	188	8	97
75-79	6	186	6	89
70-74	6	180	5	83
65-69	11	174	4	78
60-64	5	163	5	74
55-59	5	158	5	69
50-54	6	153	6	64
45-49	10	147	9	58
40-44	10	137	3	49
35-39	7	127	10	46
30-34	12	120	5	36
25-29	9	108	5	31
20-24	12	99	7	26
15-19	23	87	5	19
10-14	20	64	4	14
5- 9	23	44	6	10
0- 4	21	21	4	4
		N - 199		N - 107

Mdn - 24.72   Mdn - 46.50

TABLE V

ACE SCORES COMPARING FOREIGN LANGUAGE AND NON-FOREIGN LANGUAGE STUDENTS IN 1958 GROUP

	ACE Scores Without Foreign Language		ACE Scores With Foreign Language	
	f	cf	f	cf
95–99	1	135	4	126
90–94	4	134	3	122
85–89	1	130	6	119
80–84	4	129	9	113
75–79	7	125	14	104
70–74	6	118	8	90
65–69	6	112	12	82
60–64	4	106	13	70
55–59	13	102	8	57
50–54	8	89	2	49
45–49	12	81	4	47
40–44	6	69	5	43
35–39	5	63	5	38
30–34	5	58	5	33
25–29	8	53	10	28
20–24	7	45	5	18
15–19	14	38	4	13
10–14	9	24	2	9
5– 9	10	15	5	7
0– 4	5	5	2	2
Without ACE Scores	11			1
	N – 146		N – 127	

Mdn – 42.50   Mdn – 61.34

foreign language background as compared to a median ACE
score of 42.50 for those not having foreign languages.
The difference between the ACE scores of these sub-groups
was 18.84 in favor of the persons with foreign languages.
This figure, 18.84, is also large enough to be significant.
The difference of the medians of the 1954 group, 21.78,
and the median difference of the 1958 group, 18.84, com-
pared quite favorably. Between these two medians there
existed a difference of only 1.94 centile points.

It appears that even though those electing to study
foreign language in high school are found to have higher
tested ability and that this general ability may likely be
a factor in accounting for greater college academic success,
this alone appears inadequate. Thus it is well to compare
the current finding with previous studies to determine
which r is most likely to reflect the correct relationship.
A previous study shows negligible relationship and the
lower r or an average r of the two groups is likely to be
more representative.

In attempting to make a final assessment of the
information found in this study, it was decided to show
the average units for each group in each subject area and
the average correlation coefficient for each subject area.
The method for the conversion of a Pearson r into a

corresponding Fisher Z coefficient was found in Table IV, Appendix B, in Guilford (8:545). Table VI shows the averages of the units and r's.

In a study such as this the average of the r's in each area may be more meaningful than the r's of each group independently. The possibility does exist, as is shown in the results of the correlations for the natural sciences and in the instance concerning foreign languages, that the extreme ability groups from either end of the sample may be included and tend to give a spurious relationship. This would help explain the high, significant differences between the correlation existing in the natural sciences and foreign languages with other areas.

Table VI illustrates the relative significance of the original and average correlation coefficients. The r of + .54, significant at the one per cent level of confidence, the average r for natural sciences, is one of moderate correlation in which a substantial relationship between the two variables has been expressed. The average r of + .34, also significant beyond the one per cent level of confidence, exhibits a low correlation, one of small but definite relationship. All other averages show insignificant relationship. The latter of the two, as a single index, could hardly be considered of predictive value.

TABLE VI

AVERAGE UNITS AND AVERAGE CORRELATION FOR
1954 FRESHMAN AND 1958 GRADUATES OF CWCE

	Average Units 1954	Average Units 1958	Total Average Units	r for 1954 Freshmen	r for 1958 Graduates	Average r's
Mathematics	1.65	1.91	1.77	r - +.097	r - -.006	r - +.045
Natural Science	1.08	1.14	1.11	r - +.073	r - +.807	r - +.54*
English	3.36	3.56	3.46	r - -.153	r - +.130	r - -.012
Social Studies	2.30	2.34	2.32	r - +.018	r - +.088	r - +.053
Foreign Language	.58	.96	.74	r - +.630	r - -.049	r - +.34*

* Significant beyond one per cent level of confidence.

However, the greater r, + .54, shown in the natural sciences gives some suggestion that college academic success is moderately related to the number of natural science units taken in high school. In his study, Horst did not find this magnitude of relationship; it would be premature, therefore, to suggest greater amounts of high school natural science be taken to facilitate college success.

Chemistry and physics were not included in the natural sciences in this study, and it was found after later investigation that these subjects were included in the University of Washington study (9:2). This may well account for the different magnitude in r's. Since number of units in natural science, omitting chemistry and physics, is about the only correlation showing reasonable magnitude of relationship with college success, it may be well to investigate this partial course area further in later studies.

CHAPTER V

SUMMARY AND IMPLICATIONS

I. SUMMARY

This study was an attempt to discover how much, and in what proportion, work of an academic nature in specified subject matter areas in high school facilitated college academic achievement. For the purpose of making adequate comparisons, two sample groups were used. One group, 306 students, was composed of members of the first quarter college freshmen for fall quarter, 1954. The second group, 273 students, was composed of members of the graduating classes for the entire academic year of 1958.

Data relative to this study was collected from the Registrar's office at CWCE. The high school subject areas considered in this investigation were mathematics, natural science, English, social studies, and foreign language.

Pearson's Product-moment Coefficient Correlation was used in making the comparisons between the units earned in each of the selected high school subjects and the cumulative college GPA.

In reviewing pertinent literature, it was found that Soder, at UPS, had conducted a study comparing the

effects of a high school preparatory program and college grades. The results of her study revealed that by the time students had completed seven semesters of college at UPS, the college preparatory course of study had no apparent benefit to the college senior (16:21).

Evaluating the results of the Thirty Schools Study, Mitchell found that no one subject or special combinations of subjects in high school was essential for college success (14:144). In fact the conclusions of this study were that the experimental schools had broken considerably with "fixed" curricular patterns and teaching methods and in so doing had generally given their pupils more worthwhile material for study than other secondary schools (1:425-427).

In conducting a study at WSU with members of the 1952 freshman class, Katterle and Craig found no relationship between academic adjustment and differing proportions of high school credits earned in academic or non-academic high school courses (12:38).

In a study conducted by Horst at the U of W, evidence showed no significant relationship between the number of academic units earned in high school and general college success. This was also generally true for the number of units in specific high school subjects and lack of relationship with success in specific college subject fields. For

example, more units in high school English was unrelated to college success in English, more units in high school science was unrelated to college success in science courses, and so on, generally, through the gamut of courses (9:106-108).

The results of this study comparing the amount of units earned in high school preparatory classes and success at CWCE are generally consistent with each of the earlier studies. Some show higher relationships; these inconsistencies are explained in the Results chapter. The average correlations between the number of high school academic units in each of the specific course areas and academic success at CWCE are as follows:

Mathematics	r = + .045
Natural Science	r = + .540*
English	r = - .012
Social Studies	r = + .053
Foreign Language	r = + .340*

* Significance beyond the one per cent level of confidence.

II. IMPLICATIONS

Throughout the investigation there has been no evidence to support the theory that persons taking a greater

proportion of college preparatory courses in high school will perform in an academically superior manner to those taking fewer college preparatory courses. The evidence supplied here, conjunctive to other studies, belies the importance of the college preparatory high school program as such. Merely by enrolling in and successfully completing the courses in a program of this type does not, apparently, prepare one for college to any greater degree than the non-college preparatory courses. The channeling of high school students into the traditional program for the sake of college preparation appears to have no substantial merit.

This is not to say that the courses offered as college preparatory should be dropped from the curriculum. In all reality they should probably be maintained, and whenever possible, broadened and extended. But should students be forced to follow any particular college preparatory program, or should these courses be offered as electives for the student? Such an approach would offer classes the student could take because of interest. If this were to happen, it may be likely that grades earned in high school in these areas might raise, simply through the motivating factors of curiosity and personal interest. It seems likely that better study habits might also result.

There are many studies showing moderate relation-
ship between previous achievement and later college suc-
cess as well as tested ability and college success. Now,
with the few but consistent findings that <u>amount</u> of high
school preparation is generally unrelated to college suc-
cess, it appears that some factor such as intrinsic mo-
tivation is much more crucial than a forced pace of curricu-
lar experiences.

In order to start with a point of reference, it is
necessary that the high schools have specified requirements
for graduation. The colleges also must have a similar
point of reference in what they require of a student before
he may enroll. But from this point on, one might ask
whether it may be better to allow the student more freedom
in choosing additional high school work through the elective
program.

If the student is allowed, through the use of careful
counseling during his high school career, to take those
classes of greater interest to him, it would also seem likely
that the classes taken will be of significance to him. This
may aid the development of greater intrinsic motivation.

Curriculum advisers, in attempting to provide for the
pupil who plans to attend college, may be likely to lean
too heavily toward this area at expense to other areas. Also,

too often the general and vocational students are not provided for in equal proportions or in like manner. If studies such as this conclude that no type of high school preparation is particularly related to higher performance in college, there is probably justification for use of individualized program planning utilizing student interest as a major component.

It becomes apparent that teaching an area does not necessarily mean significant learning occurs in that area. Perhaps the nature of the learner and the learning process, as well as curriculum planning, need further consideration.

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APPENDICES

APPENDIX A

DATA COLLECTION FORM

NO. NAME	MATH	Square	Cross Product	NATURAL SCIENCE	Square	Cross Product	ENGLISH	Square	Cross Product	SOCIAL STUDIES	Square	Cross Product	FOREIGN LANGUAGE	Square	Cross Product	TOTAL	Quarter Drop Out	GPA	ACE	ENGLISH	READING

APPENDIX B

PROCEDURES FOR COMPUTING THE
CORRELATION COEFFICIENTS

In using this formula, $r = \dfrac{\frac{\angle XY}{N} - M_x\, M_y}{\sigma x \quad \sigma y}$, the final

correlation figure is derived in the following manner. For

the sake of explanation, X in this instance will represent

the total number of units earned by high school students

in mathematics. Y is the final college cumulative GPA.

When multiplied together X and Y produce the cross product

XY. The sum of XY, $(\angle XY)$, is then divided by (N), the

total number in the sample. This figure is then used as the

minuend in the next step in which the mean of X, (M_x), is

multiplied by the mean of Y, (M_y), and that resulting pro-

duct is then used as the subtrahend. This remainder is

then divided by the multiple of the standard deviation of

X, (σx), and the standard deviation of Y, (σy).

Underwood's formula for standard deviation,

$\sqrt{\dfrac{\angle X^2}{N} - M_x^2}$, was used in this study (19:145). The sum

of X squared, $(\angle X^2)$, is divided by the total number in the

group, (N). From this quotient is subtracted the mean of X,

(M_x), which is then squared, (M_x^2). The remainder is then

from under the radical to find the square root. When these standard deviation figures have been found they are multiplied together. The product then acts as the divisor for the remainder of the formula, $\frac{\angle XY}{N} - M_x\, M_y$, which then becomes the dividend. The quotient of this final coefficient is correlation of r.

So that the reader may better understand the formulae, and how each works, a problem will be worked on the following page showing the various steps. This instance will show the correlation between the total number of mathematics units earned by the total number of students included within the 1954 sample and their total points of GPA.

N - 306 or total number in sample.

X - 504.50 or total number of units earned by the sample in mathematics.

M_x - 1.65 or X divided by N.

Y - 680.05 or sum total grade points earned by sample.

M_y - 2.22 or Y divided by N.

XY - 1138.13 or sum of product of X times Y.

X^2 - 1079.25 or the sum of the individual units earned in mathematics squared.

Y^2 - 1653.18 or the sum of the individual grade point averages squared.

APPENDIX C

CORRELATION COEFFICIENT BETWEEN MATHEMATICS UNITS AND GPA

$$r = \frac{\frac{\angle XY}{N} - M_x M_y}{\sigma x \quad \sigma y} \qquad = \qquad \frac{3.72 - (1.65)(2.22)}{(.9)(.69)}$$

$$= \frac{3.72 - 3.66}{.62} = \frac{.06}{.62} = \underline{.097}$$

$$r = + \underline{.097}$$

$$\frac{\angle XY}{N} = \frac{1138.13}{306} = \underline{3.72}$$

$$M_x = \frac{504.50}{306} = \underline{1.65} \quad (1.65)^2 = \underline{2.72}$$

$$M_y = \frac{680.05}{306} = \underline{2.22} \quad (2.22)^2 = \underline{4.93}$$

$$(\text{math}) \ \sigma x \ \sqrt{\frac{\angle X^2}{N} - M_x^2} \qquad = \qquad \sqrt{\frac{1079.25}{306} - 2.72}$$

$$= \sqrt{3.53 - 2.72} \qquad = \qquad \sqrt{.81} \qquad = \underline{.9}$$

$$(\text{GPA}) \ \sigma y \ \sqrt{\frac{\angle Y^2}{N} - M_y^2} \qquad = \qquad \sqrt{\frac{1653.18}{306} - 4.93}$$

$$\sqrt{5.40 - 4.93} \qquad = \qquad \sqrt{.47} \qquad = \underline{.69}$$

APPENDIX D

FORMULA AND SAMPLE PROBLEM USED IN FINDING
MEDIAN ACE SCORES (5:44)

Median ACE Scores Without Foreign Language For 1954 Group

$$\text{Mdn} = 11 + \left(\frac{N/2 - fb}{fw}\right) \ i$$

$$= 11 + \left(\frac{\frac{199}{2} - fb}{fw}\right) \ i$$

$$= 11 + \left(\frac{99.5 - 99}{9}\right) \ 4$$

$$= 24.5 + \left(\frac{.5}{9}\right) \ 4$$

$$= 24.5 + \left(.055\right) \ 4$$

$$= 24.5 + \ .22$$

$$\underline{\underline{\text{Mdn} = 24.72}}$$