A STUDY OF THE AMARILLO SENIOR HIGH SCHOOL CHEMISTRY GRADES AND THEIR RELATION TO THE FRESHMAN COLLEGE CHEMISTRY GRADES

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By

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CHAPTER I

INTRODUCTION

Purpose of the study. There has been some discussion in educational magazines within recent years regarding the value of high school chemistry to the student who takes freshman college chemistry. The improvement of grades, or lack of it, when a student takes freshman college chemistry is one of the most definite measuring sticks which can be applied to the high school course. In applying this measure, one has two choices:

First, he may take one college and study the records of the students who attend it.

Second, he may take one high school and follow the students through their transcripts to the various colleges that they attend.

It is the purpose of this study to try to determine the value, if any, of the study of chemistry in the Amarillo Senior High School to the graduates of that school when they take freshman college chemistry.

Definition of terms. In this study the following terms are used with the meanings listed after them.

1. The high school chemistry grade consists of the average between the two semester grades

which are written on the permanent record card of the student in the high school office.

2. The general high school average consists of the average of all the grades recorded on the permanent record card of the student.

3. The quarter-ranking consists of the location of the general average grade of the student relative to the grades of the other students in his graduating class when all the grades are arranged in numerical order; that is, the highest 25% of the grades are ranked first quarter, etc.

4. The college chemistry grade consists of the grade made by the student during his first semester in freshman chemistry.

Analysis of the problem. In this study we shall attempt to determine the value of the high school chemistry course by the apparent effect on the freshman college chemistry grade. There are three possible results:

First, if the freshman college chemistry grades of the group who had high school chemistry are the same as those of the group who did not have high school chemistry, we may assume that the high school course was of no value.

Second, if the grades of the group who had high school chemistry are lower than those of the group who did not have high school chemistry, we

may assume that the high school chemistry course was actually harmful to the students from the standpoint of the grades made.

Third, if the grades of the group who had high school chemistry are higher than those of the group who did not have high school chemistry, we may assume that the course was of value to the students at least as judged by their instructors.

We shall also attempt to determine in this study whether the high school chemistry grade, the general high school average, or the quarter ranking of the student is a better basis for predicting the possible success or failure of the student in freshman college chemistry.

Delimitation.

1. Only graduates of Amarillo Senior High School are used in this study.

2. Only first semester college chemistry grades are used in this study, because of the difficulty in obtaining accurate averages. Then the quality of the high school chemistry teaching would obviously affect the first semester college chemistry grade more than it would the later work. The second semester grades would be more influenced by the quality of the first semester college teaching than by the quality of the high school chemistry teaching.

3. Students who failed either in high school or in college are counted as failures even though they later made the course.

4. No attempt was made in this study to determine whether the student did his freshman college chemistry as a freshman or as an upper classman.

Method of study. The material for this study was collected from a list of transcripts sent out by the Amarillo Senior High School office to the different colleges. The lists were classified by colleges, and the colleges were asked to supply the grades of the students for the first and second semesters of freshman college chemistry. When the reports came back from the colleges, a card was made for each student who took college chemistry. Then from the high school permanent record cards the quarter-ranking, the general high school average, and the high school chemistry grades for two semesters, - if there were high school chemistry grades - , were placed on the individual record card for this study.

CHAPTER II

RELATED WORK

It seems that there is a difference of opinion in regard to the value of high school chemistry to the student who intends to take the subject in college. But considering the amount of discussion on the subject and the figures available in educational magazines, one is inclined to believe that there is not much basis for any great discouragement of high school chemistry teachers about this matter. Those teachers of freshman college chemistry reporting the utter worthlessness or actually harmful nature of the high school chemistry course are far in the minority. The surprising thing to those of us who have learned what we know of chemistry teaching and scientific methods of approaching a problem from college chemistry teachers, is that often no figures are given to support opinions concerning the effect of high school chemistry. Objectors are apparently deceived by the performance of a few high school chemistry students. This error could easily be made if no figures are used, because the high school chemistry student who gives a poor performance in freshman college chemistry is naturally more conspicuous than an equally poor

one who does the same class of work and who has not had high school chemistry. Considerable reading reveals only three cases in educational magazines where the freshman college chemistry teacher radically opposed high school chemistry and had figures carefully worked out to prove his point. Where the college teacher proceeded with scientific accuracy, he usually came to the conclusion that there was a distinct advantage accruing to the student who had studied high school chemistry. An interesting point in connection with this matter is that some of those who radically oppose high school chemistry frequently teach college courses in "How to teach high school chemistry"!

We shall proceed first with the study of those reports which find the high school chemistry course harmful or of no value to the student of freshman college chemistry.

In Syracuse University[1] it was found that though the high school chemistry student made a slightly higher percentage of A's in the freshman college course, his percentage of F's was still higher. In that University it was found that the grades made in high school mathematics were a

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1. Schofield, Maude B. "Further Studies on Sectioning in General Chemistry", Journal of Chemical Education, Vol. VII, January 1930, pp. 117-28.

better indication of a student's likelihood of success than his high school chemistry grade.

A report from Southwestern University, Georgetown, Texasm gave in quotations a regular tirade of freshman college chemistry teachers in Texas colleges against high school chemistry students in their classes. But an analysis of the figures in this report shows that these opinions were not warranted by the figures in the reports of the colleges.

TABLE I[1]

Percentages of Students Failing Freshman College Chemistry in Texas Colleges

State Colleges	Students from high school chemistry who failed	Students without high school chemistry who failed
1A	29.52%	19.85%
2	13.03	52.73
3	11.43	15.92
4	0.0	12.50
5	14.29	24.30
Totals	18.18	30.30
Other Colleges	9.68	22.44

The first part of the report gave college 1A as having 29.52% failures among those freshmen chemistry students who presented a high school chemistry unit for college entrance, and 19.85%

1. Entrikin, John B. "A Survey of Chemistry in the Colleges of Texas", Journal of Chemical Education, Vol. III, May 1926, pp. 551-5.

failures among those students who did not present high school chemistry for entrance. The other state colleges and the denominational colleges used in this report gave a higher percentage of failures among the group who had not studied chemistry in high school. Only one of the Texas colleges reported grades of students with high school chemistry as having a greater percentage of failures than students having no high school chemistry. When the reports of the other colleges with presemably no greater attraction for superior students are considered, it seems that the one college is very unfortunate in the type of student it attracts, or is unfortunate in its method of handling the students.

An editorial comment on the report as it appeared in the Journal of Chemical Education said,

> "It would be interesting to know what proportion of college teachers of chemistry share the views quoted from teachers in Texas colleges in the foregoing article, to the effect that it makes little difference whether the college student has studied chemistry in high school or not. At Columbia University that view was held thirty years ago but has been considered antiquated for the past twenty years. For at least the past fifteen years the separate treatment of those who have studied chemistry in high school has been a policy so definitely settled and so uniformly followed as to be regarded at Columbia as a matter of course."

Most of the reports to educational magazines insist that, if the maximum work is to be obtained

from each group, there be a different handling of the two groups of students. Of course, this matter is not one under the control of high school teachers of chemistry, though most teachers would like to advise their students to go to colleges where they will do the best work.

A study of freshman chemistry grades for a period of eight years was made in the University of Colorado.[1] The average grade for the group who studied high school chemistry was 0.6 points higher than those of the group who had not studied chemistry in high school. But during one of the years given in the report, the high school group dropped 1.1 points lower than the other group. Dr. Wakeham, who made the report, attributed the slightly higher average of the high school chemistry group to the possibly higher intelligence of a group who would select a science, and said,

> "As far as formal learning is concerned, the high school period could probably be dropped in toto without any serious effect upon the student's work in college."

Many writers insist that one of the main advantages of the high school chemistry course is that it arouses an interest in chemistry which

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1. Wakeham, G. "High School and College Chemistry", School and Society, Vol. 32, August 9, 1930, pp. 206-8.

will be carried over into the college chemistry classes. Langmuir[1] said,

"In my opinion an important move in chemical education is to go back into the high schools and arouse an interest in chemistry among large numbers of boys and girls, particularly among the best of them, for these are the young people who are to supply the superior students for whom we are looking. It will give us a large number of students already interested in chemistry from whom we can choose."

Many teachers of freshman college chemistry are essentially interested in the development of chemistry specialists. B. Clifford Hendricks,[2] of the University of Nebraska, said in regard to the development of experts in the field of chemistry,

"It actually appears that the students from high school chemistry are furnishing more than their share of these specialists. For instance, Dr. Murray Hines of Northwestern University finds that in that University 'during the past five years 4.6% of those students entering with high school chemistry completed a major in the department while but 0.8% of those students entering without any previous chemistry completed a corresponding major in the department'".

Dr. Hines[3] in an article written in the Journal of Chemical Education, said,

"The student entering college with a unit

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1. Langmuir, Irving, "Selecting the Chemist Elect", Journal of Chemical Education, Vol. VII, March 1930, pp. 130-4.
2. Hendricks, B. Clifford, "Salvaging the Superior High School Chemistry Student", Journal of Chemical Education, Vol. III, December 1926, pp. 1360-4.
3. Hines, Murray A. "Of What Value Is the Course in High School Chemistry to Those Students Continuing the subject in College", Journal of Chemical Education, Vol. VI, April 1929, pp. 697-707.

of chemistry persists in the study of the subject for a considerably longer period than the student without this unit. ··· A high school chemistry student has a better chance to make good."

In Pennsylvania State College it was found that students who entered college without high school chemistry, even though they made good on the chemistry aptitude tests, failed in 39% of the cases, and that students entering college with high school chemistry credits failed in 13% of the cases.[1]

In Denison University all the students are given the same lectures, but a more advanced laboratory course is arranged for those students who had high school chemistry. In this University it was found that,[2]

"(1) Beginners have 0.22 times as great a chance of making A as the high school chemistry student.
(2) Beginners have 0.75 times as good a chance to make B or C as the high school chemistry student.
(3) Beginners are 4.5 times as likely to fail as the high school chemistry student."

In Oberlin College it was found that,

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1. Currier, A. J. "The Sectioning Problem in General Chemistry", Journal of Chemical Education, Vol. VIII, February 1931, pp. 328-30.
2. Everhart, W. A. and Ebaugh, W. C. "A Comparison of Grades in General Chemistry by Students Who Have Had and Students Who Have Not Had High School Chemistry", Journal of Chemical Education Vol. III, September 1925, pp. 770-4

"(1) Students who had high school chemistry stand a better chance of making good grades in the first year of college chemistry than students without such preparation.

(2) Students who had high school chemistry are approximately three times as likely to continue as students who have not.

(3) Students in the group who did not study high school chemistry, who continue, appear to be more highly selected than those in the group which studied high school chemistry. Their higher grades in the advanced courses are consistent with this interpretation."[1]

The differences in grades is attributed by Dr. Steiner, who made the report, to:

"(1) To the selective role played by the high school course which tends to attract scientifically inclined students.

(2) To the preparation given by the course itself. In our opinion both factors are important, the second deserving more weight."

It was found that high school chemistry is a better basis than high school physics for selecting students for freshman chemistry at Oberlin College, and the writer said,

"Overlapping of courses is not regarded as serious by this writer because it gives the student a place to catch on in a field of utterly new material."

A report from the University of Iowa[2] said,

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1. Steiner, L. E. "Contribution of High School Chemistry toward Success in College Chemistry Course", Journal of Chemical Education, Vol. IX, March 1932, pp. 530-7.
2. Cornog, Jacob and Stoddard, George D. "Chemistry Training of High School and College Students", Journal of Chemical Education? Vol. VI, January 1929, pp. 85-92.

"We believe that the frequently expressed idea that freshman instructors would prefer to teach chemistry to students who have never dabbled in the subject in high school is not warranted on the basis of the grades made by these students in the course. -- We prefer students who have had high school chemistry." -- But "we give a course which represents a real advance instead of a futile repetition."-- The low attainment in the poorer half of both high school and college chemistry classes is not due to ineffecient instruction by either teacher but the mental limitations of the students."

In Yale University[1] a different course is given to students who studied high school chemistry because both groups do better.

"We attempt here to develop experts."

In regard to the unsatisfactory work done by high school chemistry students in courses where the attempt is made to teach both groups alike,

"It is the writer's contention that the responsibility for the unsatisfactory nature of the work in such courses lies with the college professor rather than the high school teacher whose work he criticizes."

In discussion of separate class work for students with high school chemistry, Dr. Brown[2] of Iowa State College, made a report which said,

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1. Brinkley, Stewart R. "Freshman Course in Chemistry for the Students Who Have Had Secondary School Chemistry", Journal of Chemical Education, Vol. VIII, February 1931, pp. 285-9.
2. Brown, F. E. "Separate Classes in Freshman Chemistry for Pupils Who Present High School Credits in Chemistry", Journal of Chemical Education, Vol. III, March 1926, pp. 301-6.

"If the high school chemistry student is put in a course in which all his classmates have taken high school chemistry and that class is given lessons as difficult for them as a beginner's lessons are for the beginner, he actually learns more fundamental chemistry than one who did not have high school chemistry. When he starts analytical chemistry, organic chemistry, or physical chemistry, he is not repeating the work done in high school or in the freshman year. He is doing new work, but he has a better foundation for it. The results here show that pupils actually do better work because of the better fundamental training secured in this way."

From the University of Tennessee the report was that,[1]

"(1) Students with high school chemistry make a better record during the first part of the work and they always stand a better chance of getting an A or a B.

(2) Students with no high school chemistry have a better record during the later portion of the work."

An editorial[2] discussing the correlation of high school and college chemistry on the basis of the report by the Committee of Chemical Education of the American Chemical Society said,

"There is no longer any excuse for combining the two groups. Put the student on his mettle. If better results are obtained from the student who had not had high school chemistry than from the student who has had high school chemistry, the criticism involves the college teacher as well as the high school teacher."

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1. Buehler, C. A. "One College Course for Freshmen", Journal of Chemical Education, Vol. VI, March 1929, pp. 510-13.
2. Editorial, Journal of Chemical Education, Vol. V, January 1928, pp. 5-7.

Chapter Summary.

Some teachers of freshman college chemistry found that the study of high school chemistry was really a handicap which the student had difficulty in overcoming. (See page 6)

Some teachers of freshman college chemistry found that it really made no difference whether a student had studied high school chemistry or not. (See page 9)

Most teachers of freshman college chemistry, however, found that students who studied high school chemistry made higher grades in freshman college chemistry than students who did not take high school chemistry. (See pages 10 to 15)

Some teachers of freshman college chemistry found that students who studied chemistry in high school continued in the subject longer than those who did not. (See pages 10 and 12)

Most teachers of freshman college chemistry have found that students who have studied chemistry in high school do better work if they are given a more difficult course than the students who have not studied chemistry in high school. (See pages 8, 11, 13, 14, and 16)

CHAPTER III

WORK DONE BY AMARILLO SENIOR HIGH SCHOOL GRADUATES IN FRESHMAN COLLEGE CHEMISTRY

Despite the findings set forth in the foregoing chapter, one still feels that the evidence is not conclusive. There is a difference in the quality of high school teaching just as there is a difference in the quality of college teaching, and none of the writers studied in Chapter II have considered a single high school. The good, bad, and indifferent results of good, bad, and indifferent qualities of high school chemistry teaching have been lumped together in the study of the conditions at a particular college where the teaching is fairly uniform in its quality. In considering the graduates of a single high school, one finds that the high school chemistry teaching will be fairly uniform in its quality, and that the freshman college chemistry teaching will vary in aims and in qualities depending upon the college the students choose to attend. It is the purpose of this study to try to determine just what effect the study of high school chemistry had on the freshman college chemistry grades of those students who were graduated from the Amarillo Senior High School in the years 1928 to 1933.

Conditions under which the chemistry teaching was done. The Senior High School of Amarillo has an enrollment of thirteen to fourteen hundred students. Twelve sections of chemistry a re taught each semester, and three full-time chemistry teachers are employed to teach these sections. Each section usually consists of from twenty to twenty-eight students. Chemistry is a semi-required subject, in that a student must present either chemistry, physics or three years of home economics for graduation. During the period of time covered by this study 1355 students were regularly graduated from this school, and in addition a comparatively small number of summer school students were graduated. Of the number attending college, 287 enrolled for college chemistry. Eighteen of these dropped the course for one reason or another. Thirty-three were high school chemistry failures, and seven were not graduated. The grades of the remaining 229students are used for this study. The failing percentage in high school chemistry in Amarillo is 10% to 20% for normal clàsses, and 20% to 30% for repeating classes.

In this study, the information secured concerning each student includes the college chemistry grade, the high school chemistry grade, the quarter-ranking of the student in his graduating

class, and his general high school average for four years. The college chemistry grade was obtained from the registrar of the college that the student attended. The other information came from the student's permanent record card on file in the high school office.

Distribution of grades in high school and in college chemistry. Table I shows the distribution of grades in both college and high school for the students who had a course in high school chemistry.

TABLE I

Grade Distribution of Amarillo Senior High School Students in High School and in Freshman College Chemistry

		College chemistry grades					
		A	B	C	D	F	W
High school chemistry grades	A	13	12	5	0	0	0
	B	10	23	15	1	1	5
	C	1	18	23	13	4	4
	D	1	7	7	9	1	2
	F	0	2	7	14	4	6
	*	0	2	1	3	1	0

*Did not graduate

It will be seen from this table that thirty-three students who failed in high school chemistry enrolled for college chemistry. Seven students who failed to graduate enrolled for college chemistry. The students who did not graduate and the high school chemistry failures are not counted in the calculations which follow in this study. The table shows that the general tendency

is for the student to make the same grade in college chemistry that he made in high school chemistry. The exception is that thirteen high school C's made college D's , while only nine high school D's made college D's. Another exception in the same grade letter is that fourteen high school F's made college D's. Some among the fourteen students repeated high school chemistry two and three times before making a passing grade in it in high school. More of the students who had chemistry in high school made the grade letter B in college chemistry than any other one letter. More of the same group made C' in high school chemistry than any other one letter. Students who did not take chemistry in high school made more C's in freshman college chemistry than any other one letter.

TABLE II

Freshman College Chemistry Grades Made by Graduates of Amarillo Senior High School Who Did Not Take High School Chemistry

A	B	C	D	F	W
4	18	23	12	8	7

The numbers in the Tables I and II would indicate that the first time a student takes the subject of chemistry, whether in high school or in college, the high number will receive a grade of C, while

the highest number of students who had high school chemistry will receive a grade of B in college chemistry.

Percentages of students making each grade letter. The grades in Table I and Table II will be more easily compared if they are placed in a percentage number table.

TABLE III

Numbers and Percentages of Students Making the Various College Grade Letters

College Grade	Students having high school chemistry		Students having no high school chemistry	
	Number	Percent	Number	Percent
A	25	15.24	4	6.15
B	60	36.60	18	27.69
C	50	30.50	23	35.38
D	23	14.00	12	18.46
F	6	3.66	8	12.30

Table III shows that the student who takes chemistry in Amarillo Senior High School has a distinct advantage over the student who did not take chemistry if he intends to take chemistry in college. The greatest difference is in the percentages of A's and F's made by the two groups. The failing percentage made by those students who did not take high school chemistry is about that made by normal high school chemistry classes, while the failing percentage of the students who had high school chemistry is far below that made by the average

high school chemistry class. The advantage in all the freshman college chemistry grade letters is with the student who took high school chemistry.

Comparison of grade letters made. One hundred and sixty-four graduates of Amarillo Senior High School who had high school chemistry took freshman college chemistry. Sixty-five graduates of the school who did not have high school chemistry took chemistry in college. The two groups may be equated by multiplying the number of students in the second group who made a given grade letter by 2.52. The relations a re then shown in Table IV.

TABLE IV

College Chemistry Grades Made by Amarillo Senior High School Graduates with the Numbers Equated

College Grade	Students having high school chemistry Number	Students having no high school chemistry Number	Times Factor
A	25	4	10.08
B	60	18	45.36
C	50	23	57.96
D	23	12	30.24
F	6	8	20.16
Totals	164	65	163.80

A study of the table will show that the student who took high school chemistry had 2.5 times as good a chance to make A as the student who did not take chemistry in high school. He had a little better chance to make B than the student who did not have high school chemistry. The student who

did not take chemistry in high school had a little better chance to make C and D, and he was 3.89 times as likely to make an F as the student who studied high school chemistry.

If the numbers and grades shown in Table IV are placed on an ordinary graph, the lines representing the two groups cross about 1/3 of the distance between the grades C and B.

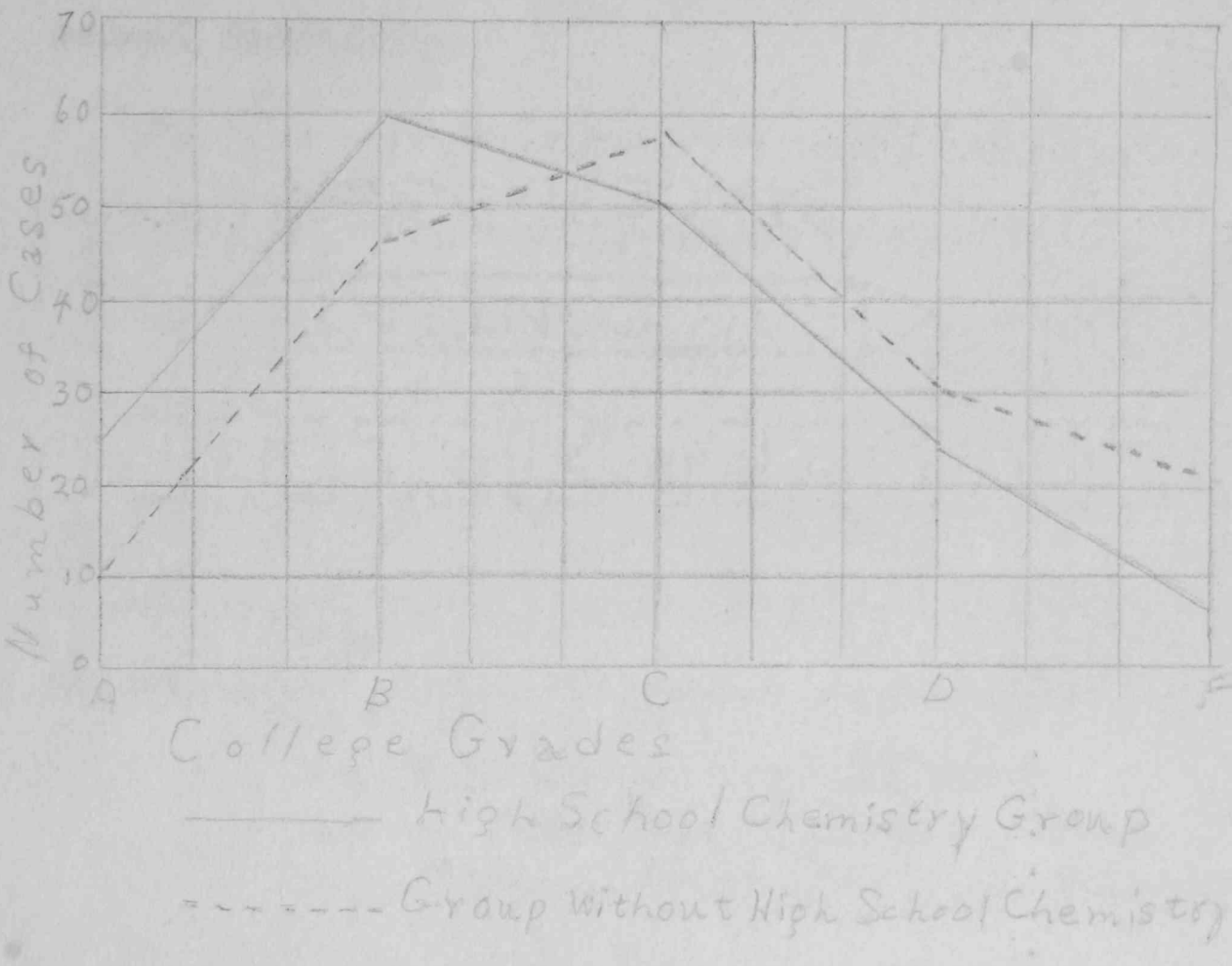

Figure 1. A graph of grades made by graduates of Amarillo Senior High School in Freshman college chemistry

The students who had high school chemistry had the advantage in every case, because they made more of the grades above the point of crossing of the two courves and fewer of the grades below the

point of crossing than those who did not have high school chemistry. If these numbers are placed on a graph for the purpose of showing the differences in the percentages of each group making each grade letter, the difference is still more striking. Figure 2 shows that 73% of the A's made in freshman college chemistry by the graduates of Amarillo Senior High School were made by the group of students who took high school chemistry.

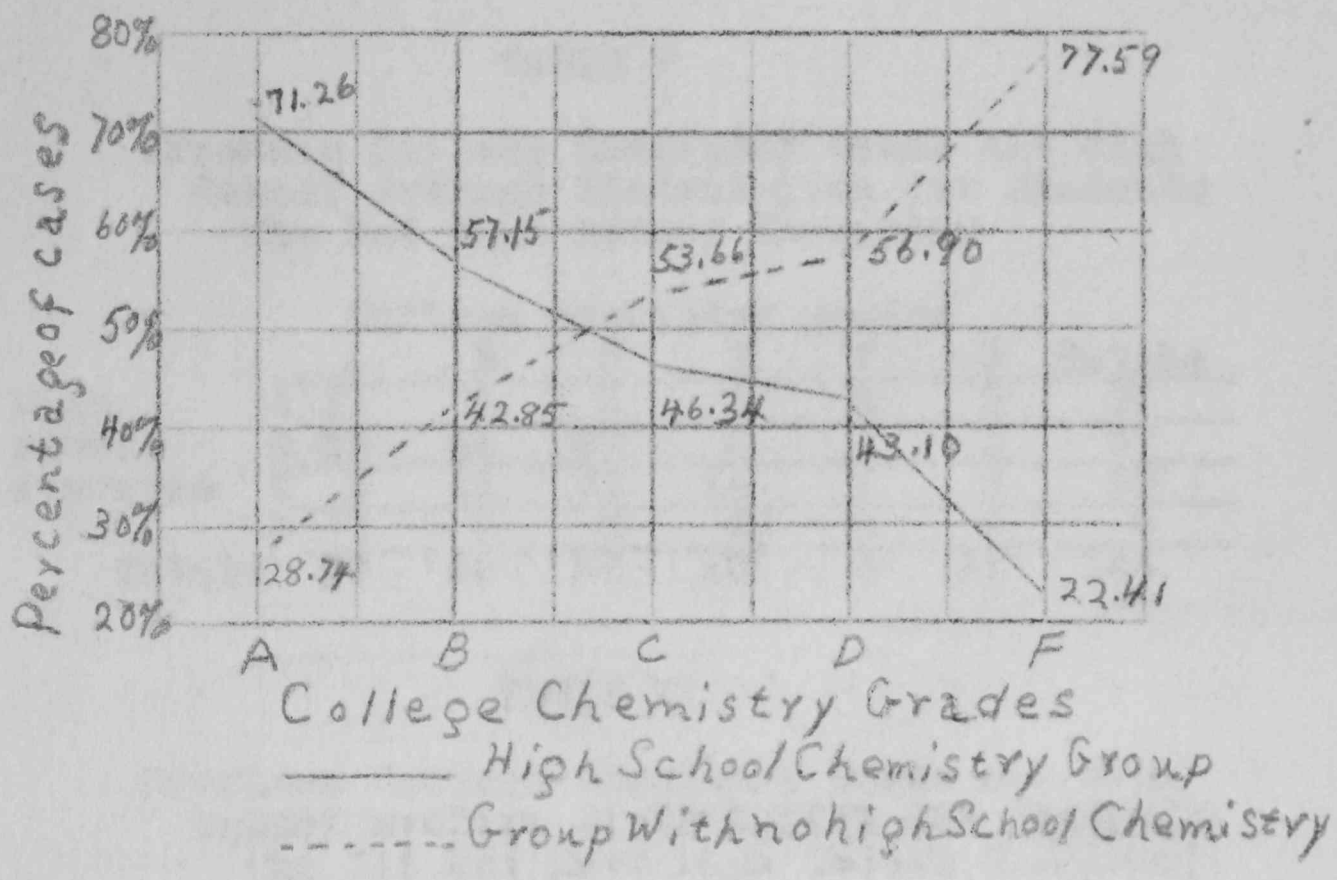

Figure 2. A graph of the percentages of students with and without high school chemistry making each college chemistry grade letter

Only 23% of the F's were made by the group that took high school chemistry. The percentages of students making the two middle passing grades are relatively close together, but in either

case the student having had high school chemistry had a slight advantage. The lines are most widely separated in the two extreme grades, A and F.

A comparison of high school averages and the freshman college chemistry grades. Tables V and VI show the college chemistry grade and general high school average distribution for the group of students who had high school chemistyy and for those who did not have high school chemistry.

TABLE V

Freshman College Chemistry Grade and High School Average Distribution for Students Who Had High School Chemistry

		College chemistry grades						
		A	B	C	D	F	W	Totals
High school averages	A	11	8	2	1	0	0	22
	B	13	41	27	5	1	3	87
	C	1	11	21	14	5	8	52
	D	0	0	0	3	0	0	3
Totals		25	60	50	23	6	11	164

TABLE VI

Freshman College Chemistry Grade and High School Average Distribution for Students Who Did Not Have High School Chemistry

		College chemistry grades							Times
		A	B	C	D	F	W	Totals	factor
High school averages	A	3	2	1	0	0	0	6	15.12
	B	1	15	15	4	1	3	36	90.70
	C	0	1	7	8	6	3	22	55.44
	D	0	0	0	0	0	1	1	2.52
Totals		4	18	23	12	8	7	65	163.80

The group that had had high school chemistry had a slight advantage in the number that made

an A average in high school. The high school chemistry group had 6.88 more students making a general high school average of A than the group which did not have high school chemistry. The group which did not take high school chemistry had 3.70 more students in the B grade and 3.44 more students in the C grade than the group which took high school chemistry. The high school chemistry group had0.48 more students making a grade of D in general high school average. These differences are almost negligible, but they do indicate either a slightly higher intelligence or a slightly greater amount of industry on the part of the group of students who had chemistry in high school.

A comparison of quarter-ranking and the freshman college chemistry grade. The high school average is an individual matter, and the work of the student shows up as well as grades can show the real work of the student. Since the students used in this study are from five different graduating classes and the grades in each quarter vary a little from year to year, it would be well to see how the quarter-ranking of the students in each group compare. Tables VII and VIII show the college chemistry grade and the quarter-ranking distribution for the students who had high school chemistry and for those who did not. A greater

number of students who had high school chemistry ranked in the first quarter in high school than students who did not have high school chemistry.

TABLE VII

Quarter-ranking and Freshman College Chemistry Grade Distribution of Amarillo Senior High School Graduates Who Had High School Chemistry

		College chemistry grades						
		A	B	C	D	F	W	Totals
Quarter-ranking	1st	21	32	18	2	0	1	73
	2nd	3	18	9	5	2	3	37
	3rd	1	8	19	6	0	5	34
	4th	0	2	4	10	4	2	20
	Totals	25	60	50	23	6	11	164

TABLE VIII

Quarter-ranking and Freshman College Chemistry Grade Distribution of Amarillo Senior High School Graduates Who Did Not Have High School Chemistry

	College chemistry grades							Times
	A	B	C	D	F	W	Totals	factor
1st	4	13	7	0	0	1	25	60.48
Quarter 2nd	0	4	8	3	0	1	15	37.80
ranking 3rd	0	1	6	6	5	2	18	45.36
4th	0	0	2	3	3	3	8	20.16
Totals	4	18	23	12	8		65	163.80

A greater number of students who did not have high school chemistry ranked in the third quarter than the group who did have high school chemistry. The numbers in the second and fourth quarters are practically the same for each group. This would again indicate either a slightly higher intelligence or a slightly greater industry on the part of the students who took high school

chemistry.

Chapter Summary.

A student who studied chemistry in Amarillo Senior High School is more likely to make the same letter in college chemistry that he made in high school chemistry than any other letter. (See page 18)

A student who studied chemistry in Amarillo Senior High School had 2.5 times as good a chance to make an A as a student who did not study chemistry in high school. (See page 23)

A student who did not have high school chemistry had 3.39 times as good a chance to fail as a student who did study chemistry in Amarillo Senior High School. (See page 21)

A few more students who had high school chemistry made a general high school average of A than the group who did not study chemistry in high school. (See page 25)

CHAPTER IV

PREDICTION OF FUTURE PERFORMANCE IN CHEMISTRY

As can be seen from Table I of Chapter III, the high school chemistry grade cannot be used as a sure basis for predicting the possible success or failure of a student in college chemistry. If the student made an A, B, or C, we could predict that he would be more likely to make that letter than any other in college chemistry. We could also predict that his chance of failing would be somewhat less if he had had high school chemistry. His chance of making a high grade would also be better.

Three factor basis for predicting the performance of students who have had high school chemistry. All kinds of methods have been used in trying to determine what is the best basis for predicting the possible success or failure of a student in college. So many factors enter into the matter that no one way or combination of ways is sure; they merely indicate the possibilities. For graduates of the Amarillo Senior High School there are three possible methods of prediction based upon the facts contained in the permanent record card of the student. They are the high school chemistry grade, the

general high school average for four years, and the student's quarter-ranking in his graduating class. Figure 3 shows the relation between these three factors and the college chemistry grade for those students who took high school chemistry.

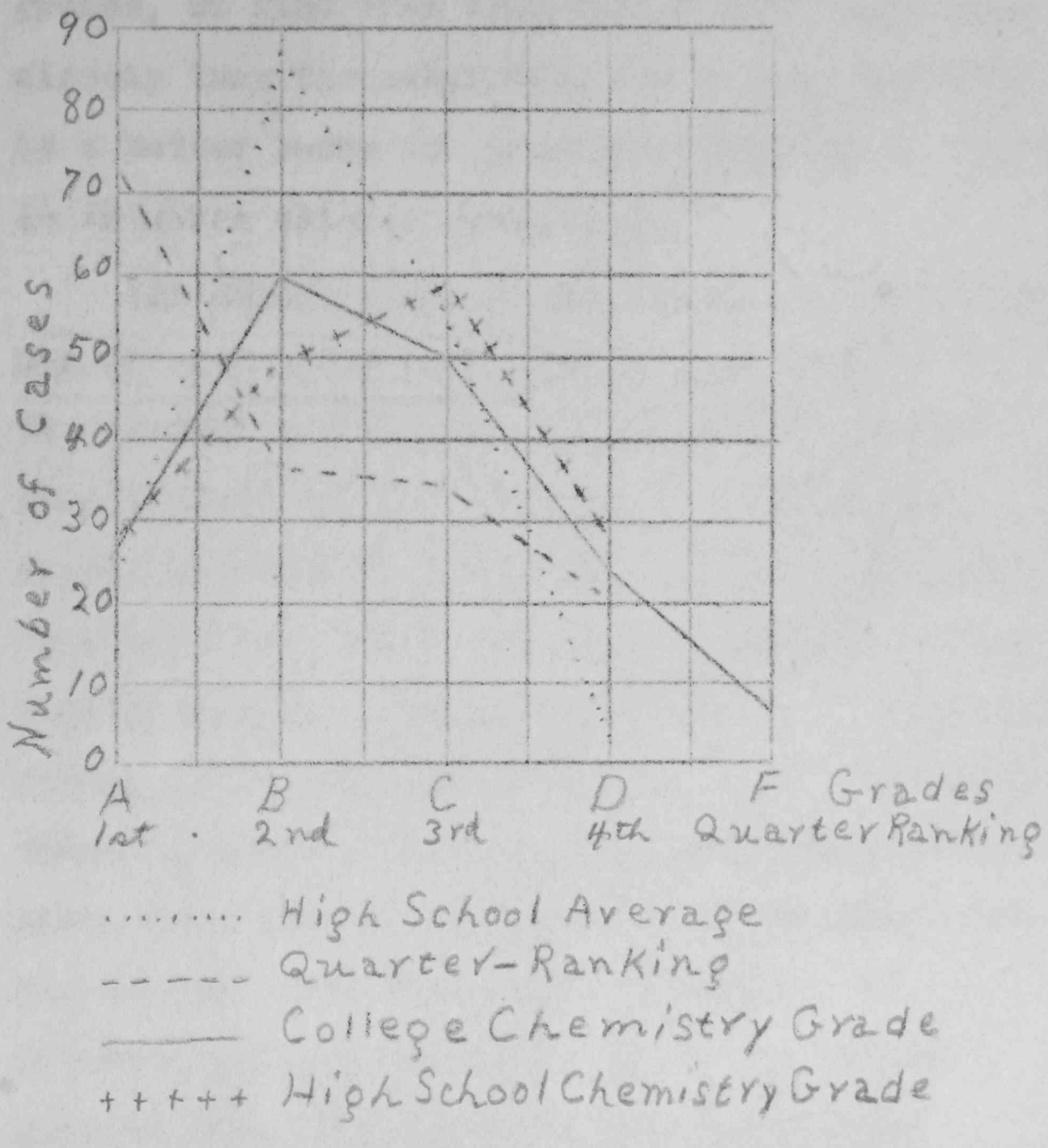

Figure 3. Showing the relation between the high school chemistry grade, freshman college chemistry grade, quarter-ranking, and general high school average

The general high school average and the college chemistry grade curves are near each other only in the A grade. The quarter-ranking and the

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college chemistry grade curves are near each other only in the case of the D grade. The general high school average would cause us to predict too high on B's and too low on C's and D's. On comparing the curves of the high school and college chemistry grades, we find that they follow each other more closely than the other two, and would, therefore, be a better basis for predicting success or failure in freshman college chemistry.

Two factor basis of prediction for the student who did not study chemistry in high school. For the student who did not take chemistry in high school there are two methods of predicting his chance of success in freshman college chemistry. They are his general high school average and his quarter-ranking. Figure 4 is a graph showing the curves of the college chemistry grades, the high school averages, and the quarter-ranking of the sixty-five Amarillo Senior High School graduates who did not take high school chemistry but took freshman college chemistry. In Figure 4, the general high school average and the college chemistry grade curves are near each other in the A and C grades. This basis of predicting the success of the student, however, is much too high in B's and too low in D's. The quarter-ranking and the college chemistry grade curves a re near each

other in the B, C, and D grades, but this method of predicting success is much too high in A's.

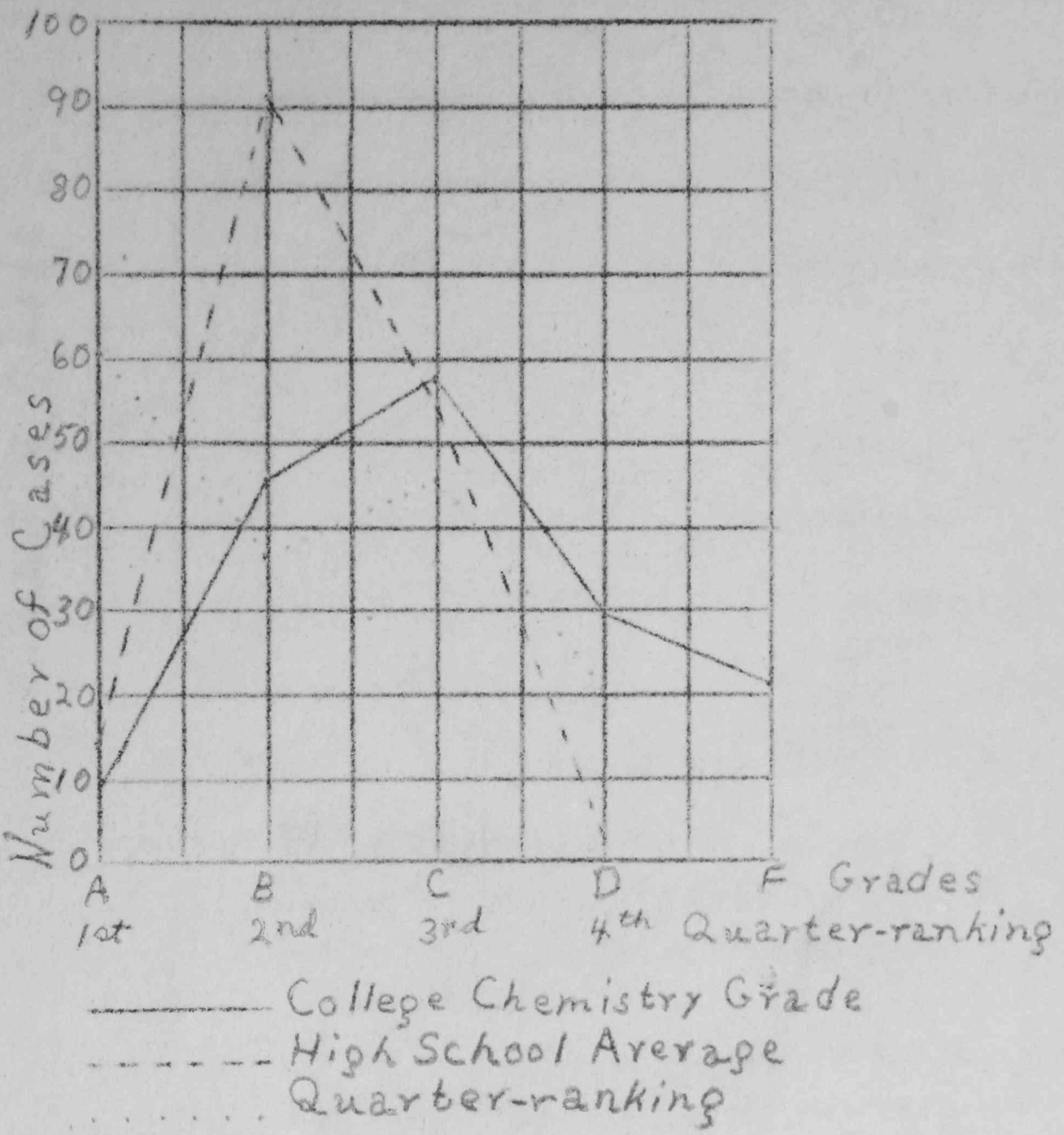

Figure 4. A graph showing the relation between the general high school average, the quarter-ranking, and the college chemistry grade for those students who did not take high school chemistry

It is rather significant that the general outline of the grade curve for high school chemistry students in high school is similar to the outline of the grade curve for freshman college chemistry students who never had high

school chemistry. In Figure 5 are shown the grade curves for freshman college chemistry for the group which had chemistry in high school and for the group which did not have chemistry in high school.

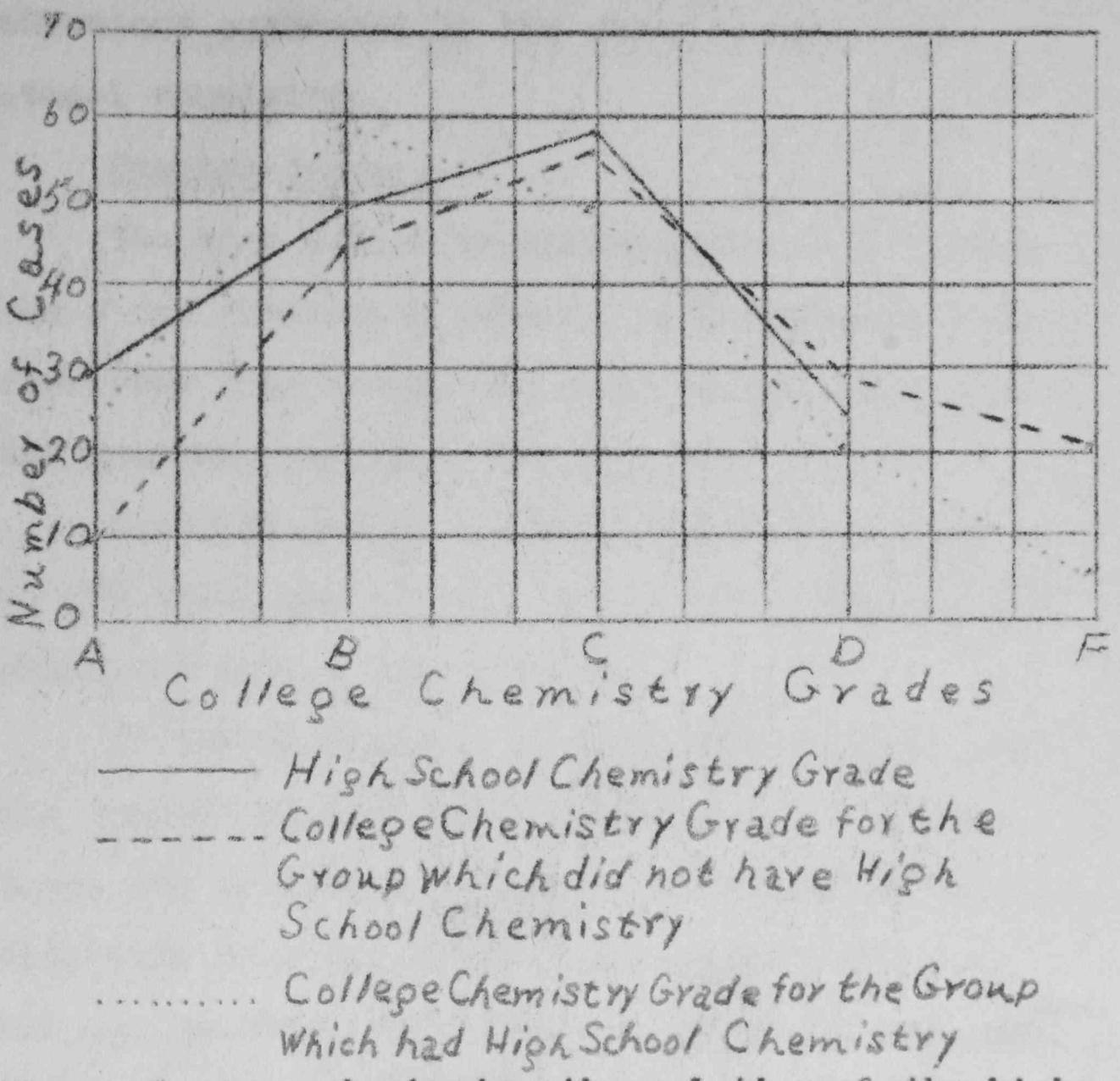

Figure 5. A graph showing the relation of the high school chemistry grade curve to the freshman college grade curve of the group which did not have high school chemistry

The grade curve in high school chemistry is very close to the grade curve in freshman college chemistry for the group which did not study chemistry in high school. The A grade is too high for the high school group, but the B, C,

and D grades are almost identical. The curve for the freshman college chemistry grades of those students who had high school chemistry was added to the graph in Figure 5 to show the distinct advantage possessed by the group having high school chemistry.

Chapter Summary.

The high school chemistry grade is a better basis for predicting success in freshman college chemistry than either the high school average or the quarter-ranking. (See page 29)

The high school chemistry grade is higher in C's and lower in B's than the freshman college chemistry grade. (See page 29)

If the student had no high school chemistry, the quarter-ranking would probably be a better basis for predicting success in freshman college chemistry than the general high school average. But the quarter ranking is too low in B's, C's, and D's and far too high in A's. (See page 32)

CHAPTER V

SUMMARY OF FINDINGS

The purpose of this study, as stated in Chapter I, is to try to determine the value, if any, of the study of chemistry in the Amarillo Senior High School to the graduates of that school when they take freshman college chemistry. Furthermore, in Chapter I it was pointed out:

First, that the high school chemistry course would be valueless if the freshman college chemistry grades of those students who had high school chemistry were the same as the grades of those students who did not have high school chemistry.

Second, that the high school chemistry course would be harmful if the freshman college chemistry grades of those students who had high school chemistry were lower than the grades of those students who did not have high school chemistry.

Third, that the high school chemistry course would be of value if the freshman college chemistry grades of those students who had high school chemistry were higher than the grades of those students who did not have high school chemistry.

In Chapter III, we found for Amarillo Senior High School students:

First, that the student with high school chemistry is 2.5 times as likely to make A in

freshman college chemistry as the student who did not have high school chemistry.

Second, that the student with high school chemistry is a little more likely to make a B than the student without high school chemistry.

Third, that the student without high school chemistry is a little more likely to make a C than the student with high school chemistry.

Fourth, that the student without high school chemistry is nearly twice as likely to make a D as the student with high school chemistry.

Fifth, that the student without high school chemistry is 3.39 times as likely to fail as the student with high school chemistry.

From these facts, therefore, it may be safely assumed that chemistry in the Amarillo Senior High School is of value to the student who means to continue the subject in freshman college chemistry.

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