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STUDENT SUCCESS IN FRESHMAN CHEMISTRY AT MONTANA
STATE UNIVERSITY AS PREDICTED BY HIGH SCHOOL GRADE
POINT AVERAGE AND COLLEGE APTITUDE TEST SCORES

by

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A professional paper submitted to the Graduate Faculty
in partial fulfillment of the requirements for the degree

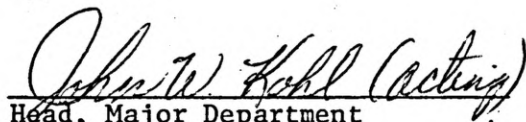
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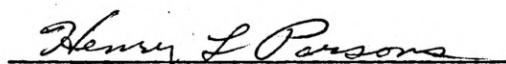
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ABSTRACT

This study was conducted to determine if a meaningful relationship existed between several measures of ability and academic performance and a student's subsequent success in freshman chemistry classes at Montana State University. The classes studied were the Chemistry 121 and Chemistry 131 classes offered during the Autumn Quarters of 1970 and 1971. This study was conducted to investigate three questions:

1. Was there a predictor or combination of predictors that was the best forecaster of success in freshman chemistry?
2. Was there a difference in the forecasting ability of these predictors from instructor to instructor?
3. Was there a consistency in the way students in the same chemistry course were graded from year to year by different instructors?

It was concluded that:

1. The best predictors of success in freshman Chemistry 121 and Chemistry 131 at Montana State University were the University Computed High School Grade Point Average and the Predicted First Quarter Grade Point Average. These predictors were consistent for both Instructors A and B.
2. A significantly higher correlation was observed between verbal aptitude test scores and the grade received in freshman Chemistry 121 and 131 with Instructor A than with Instructor B.
3. The variability of grading from one college instructor to another was great enough that the student's high school work was a better predictor of success in later college chemistry courses than the student's initial college work.

Chapter 1

THE PROBLEM

Introduction

Many of the problems that face college students occur during the freshman year. Because of this, college administrators and faculty members have compiled batteries of tests all aimed at the entering freshman student. These tests are administered with the hope that the probability of the student's first year success or failure could be predicted. The college faculty would then be equipped with adequate predictions which would enable them to aid the entering students that show ability or make course adjustments for the slower students. It would be valuable to have pre-college predictions of this type in order to aid the student very early in his or her academic career.

Statement of the Problem

The problem of this study was to determine if a meaningful relationship exists between several measures of ability and academic performance and a student's subsequent success in freshman chemistry classes at Montana State University.

Purpose of the Study

The purpose of this study was to aid the Montana State University Chemistry Department with the placement of freshman chemistry students. Currently the department is placing students according to

curricular requirements. Therefore, the author feels that it is possible to examine several pre-college tests and combinations of tests and arrive at an adequate prediction for each student. This would then enable the department to place students with a consideration for ability.

Questions to be Answered

The major questions answered by this study are:

1. Which predictor or combination of predictors are the best forecasters of success in freshman chemistry?
2. Is there a difference in the forecasting ability of these predictors from teacher to teacher?
3. In a given course, is there a consistency in the way students are graded by different instructors from year to year?

Procedure

The problem of this study was analyzed by a multiple regression analysis of six parameters: (1) modified high school grade point average, (2) School and College Ability Test Quantitative, (3) School and College Ability Test Verbal, (4) Ohio State University Psychological Test, (5) Predicted First Quarter Grade Point Average computed from the four tests above, and (6) the actual grade received in freshman chemistry. All of the above information, with the exception of (6), was collected from the indicies booklet compiled by the Testing and Counseling Service at Montana State University. The grade received in freshman

chemistry (6) was obtained from the class rolls of the respective instructors of Chemistry 121 and Chemistry 131. In this study, these instructors are known as Instructor A and Instructor B. Grades of the individual students in these courses were compared to the grades that were predicted for them to see what correlation was attained. The accuracy of each of the predictors was also looked at as a Partial R so that comparisons between Instructor A and Instructor B could be made. The grades the students received in Chemistry 131 from Instructor A and the grades the students received in Chemistry 131 from Instructor B were compared to the grades that the same students received two quarters later in Chemistry 133. The Chemistry 133 course was taught by the same instructor, C, for the two succeeding years that were studied.

Limitations

There are several limitations in this study that must be considered. These are:

1. Restrictions of sample size. In this case, about ten percent of the students in each of the Chemistry 121 and Chemistry 131 classes were used.
2. The fact that only the Chemistry 121 and Chemistry 131 chemistry classes at Montana State University were studied.
3. The freshman students in Honors Chemistry 141 were disregarded in the sample due to small class size.

Definition of Terms

The Modified High School Grade Point Average referred to in this study is the University Computed High School Grade Point Average. This grade point average was computed by the Testing and Counseling Service at Montana State University. The method of calculation is included in Appendix A.

The SCAT Q and SCAT V referred to are the School and College Ability Tests Quantitative and Verbal. The Examiner's Manual, Cooperative School and College Ability Tests, edited by Gaver and Melville (3:3), states that:

The SCAT Series contains four relatively short subtests or parts. Two of these subtests Parts I and III, are measures of developed ability in skills that are closely related to student success in the verbal kinds of school learning The two other subtests, Parts II and IV, are measures of ability in certain quantitative skills of number manipulation and problem solving, together yielding a quantitative score. The kinds of material in the four parts of the test are:

- Part I 30 sentence completion tasks.
- II 25 numerical problem-solving.
- III 30 vocabulary tasks.
- IV 25 numerical problem-solving.

The tests are measures of developed ability indicative of the relative academic success the student is likely to achieve in his next step up the educational ladder.

The Ohio Test referred to is the shortened form of the Ohio State University Psychological Test Form 23. It is a seventy-eight item test that is administered during Freshman Orientation Week at

Montana State University.

The Predicted Grade Point Average is the Predicted First Quarter Grade Point Average that was computed by the Montana State University Testing and Counseling Service. It is derived from previous high school scores and aptitude test scores obtained from high school records and Freshman Orientation Week tests.

The freshman chemistry grades used were the grades received by the individual students in Chemistry 121 and Chemistry 131 during the Autumn Quarters of 1970 and 1971. These grades were used in both the percent form and letter grade forms.

The instructors of the Chemistry 121, Chemistry 131, and Chemistry 133 courses are referred to as Instructor A, Instructor B, and Instructor C. The following table lists the name of the instructor, course taught, and which quarter the course was taught:

Instructor A	Chemistry 121	Autumn Quarter 1970
Instructor B	Chemistry 121	Autumn Quarter 1971
Instructor A	Chemistry 131	Autumn Quarter 1971
Instructor B	Chemistry 131	Autumn Quarter 1970
Instructor C	Chemistry 133	Spring Quarter 1971
		Spring Quarter 1972

Summary

It has been stated that many of the problems that face college students occur during the freshman year. Therefore, the problem of this study was to determine if a meaningful relationship existed between several measures of ability and academic performance and a student's

subsequent success in freshman chemistry classes at Montana State University. The purpose of this study was to aid the Montana State University Chemistry Department with the placement of freshman chemistry students.

The major questions answered by this study were: which predictors were the best forecasters of success in freshman chemistry, and how does the forecasting ability of these predictors vary from teacher to teacher?

This problem was analyzed by a multiple regression analysis of six parameters: one high school grade point average, three academic test scores, one university predicted grade point average, and the grades received in freshman Chemistry 121, 131, and 133 by the respective students.

Chapter 2

REVIEW OF LITERATURE

In recent years, many studies have been undertaken to help refine the methods used to predict success of freshman students as they enter college. It was hoped that by an accurate prediction of success that the appropriate steps could be taken to help beginning students meet the demands of the academic load required of college students.

Suvak (9:3) reports that there are three distinct areas in predicting academic success for college freshman. The first area is a measure of the student's previous high school performance. The second is an objective test area, and the third is a criteria of success as perceived by the instructor of a particular course.

The supporters of the student's previous record as an indicator of future success have built a strong case over the years. In 1961, Bloom and Peters (1:5) reported that a correlation of $+0.50$ between high school grade point average and freshman college grade point average is common, and, with an adjusted high school grade point average, correlations of $+0.70$ can be achieved with freshman college grade point averages. Lindquist (6:1) did an extensive study in 1963 on a scale to adjust high school grades to make them better predictors of college grades. He concluded that by adjusting the high school grades to account for high school differences, better predictors of college grades could be achieved.

In the second area of academic predictions, studies have been conducted to compare success of college freshmen to certain objective test scores. Bloom and Peters (1:32) have said that aptitude test scores are good predictors of college grades. Loeb (5:385) went even further than Bloom and Peters to say that aptitude test scores are equally as good as adjusted high school grade point averages in predicting college freshman success. Another form of objective test that is used to improve prediction success is the Psychological inventory test. In a paper presented to the American Psychological Association in 1970, Kunert (5:8) suggests that a refinement of grade point average predictions with a psychological inventory test greatly improves the prediction accuracy of the college grade point averages. This method is also endorsed by Nicholson (8:8) in a paper he presented in 1971 to the American Educational Research Association.

Suvak (9:19) in his 1966 Montana State University study, has used a University Computed High School Grade Point Average as well as aptitude and psychological test scores to predict college freshman grade point averages at Montana State University. The two aptitude tests that he used were the School and College Ability Test Verbal and the School and College Ability Test Quantitative. The psychological test used was the Ohio State University Psychological Test. He reports that the University Computed High School Grade Point Average is the best single predictor of college freshman success, but it was found that the accuracy

of the prediction could be improved by the addition of the three other tests. To support Suvak's use of the School and College Ability Test, Willis (10:972) reports in his study of that test that it has proven to be a reliable test as a predictor of future college freshman success.

The third area of academic prediction is concerned with the fact that different individuals perceive different criteria as important when considering academic success. A report made by Dawson (2:1) in 1970 at Montana State University, stated that the Chemistry 121 and Chemistry 131 courses differ primarily in the way that they meet the varying interests and background of the students. The author feels that this assumption does not provide consideration for the student who takes freshman chemistry solely to meet curricular requirements. The academic abilities of the students must be taken into consideration when students are advised in chemistry course decisions. In the future, it would be desirable to place students in freshman chemistry courses according to a prediction scale that takes into consideration the student's academic abilities as well as his or her curricular needs.

In a study by Gell (4:43) at Montgomery University in 1971, it was found that academic success is predicted more accurately for local career students than for transfer students. This is due primarily because of the controlled academic backgrounds of the transfer students. Because of the findings of Gell (4), the author's sampling technique was designed to concentrate primarily on local career students and eliminate

transfer students. Another reason for the elimination of transfer students from the sample was that frequently not all of the test scores and information needed in the study was available for these students.

In conclusion, it is possible to see that all three major areas for predicting academic success have something valuable to offer. The author feels that the most reliability is achieved when one uses all three areas in conjunction to arrive at a final prediction.

Chapter 3

EXPERIMENTAL PROCEDURE AND CONCLUSIONS

Introduction

This study was conducted to determine if a meaningful relationship existed between several measures of ability and academic performance and a student's subsequent success in freshman chemistry classes at Montana State University. Included in this chapter are: the methods of collecting and organizing data, a population description, and a description of the sampling procedure. Also included are the questions to be answered, an analysis of the data, and an explanation of the precautions taken for accuracy.

Population Description and Sampling Procedure

The population of students sampled for this study was the Chemistry 121 and Chemistry 131 classes offered during the Autumn Quarters of 1970 and 1971 at Montana State University. The Chemistry 133 classes offered during the Spring Quarters of 1971 and 1972 were also sampled. The students were selected from the class rolls of the respective instructors. The samples from the Chemistry 121 and Chemistry 131 classes were chosen by selecting every tenth person from the alphabetical class rolls, omitting the students who had dropped the course and students for which complete information was not available. The sample from the Chemistry 133 classes consisted of the same students who were included in the Chemistry 131 sample during the same academic year.

Investigation Categories

There were six groups under consideration for this study. The first group consisted of seventy-eight students from the Chemistry 131 class of Instructor A. The second group consisted of seventy-five students from the Chemistry 121 class of Instructor B. The third group consisted of sixty-seven students from the Chemistry 131 class of instructor B. The fourth group consisted of sixty-five students from the Chemistry 121 class of Instructor A. The fifth group consisted of twenty-eight students from the Chemistry 133 class of Instructor C (these students had formerly taken Chemistry 131 from Instructor A). The sixth group consisted of twenty-three students from the Chemistry 133 class of Instructor C (these students had formerly taken Chemistry 131 from Instructor B).

Each of the six groups were subjected to a multiple regression analysis to compare the grades received in the respective chemistry course to previous academic performance for each student. The measures of previous academic performance include the University Computed High School Grade Point Average, the School and College Ability Test Quantitative and Verbal, the Ohio State University Psychological Test, and the Predicted First Quarter Grade Point Average for each student. The relationship between a student's performance in Chemistry 131 from instructor A was compared to his or her later performance in Chemistry 133 from Instructor C. The relationship between a student's performance in

Chemistry 131 from Instructor B was also compared to his later performance in Chemistry 133 from Instructor C.

Method of Collecting Data

After the students for the sample were identified, the method of collecting data was to record the percentage grade each student received in the respective chemistry class. The student's name was then looked up in the indices booklet that was compiled by the Montana State University Testing and Counseling Service. The University Computed High School Grade Point Average, the School and College Ability Test Quantitative, the School and College Ability Test Verbal, the Ohio State University Psychological Test, and the Predicted First Quarter Grade Point Average were all gathered from the indices booklet. The indices booklet contains information on all incoming college freshmen. It is a record of the student's high school and previous academic test performance.

Method of Organizing Data

The information was punched onto computer cards, along with identification numbers for each student and group. A multiple regression analysis was performed for each of the Chemistry 121 and Chemistry 131 classes. A comparison was also made between the Chemistry 131 and Chemistry 133 grades for the students who took both of those courses.

Questions to be Answered

There were three questions investigated by this study:

1. Is there a predictor or combination of predictors that is the best forecaster of success in freshman chemistry?
2. Is there a difference in the forecasting ability of these predictors from teacher to teacher?
3. Is there a consistency in the way students in the same chemistry course are graded from year to year by different instructors?

Analysis of Data

The data was analyzed by a multiple regression analysis. The answer to the question of which measure of performance is the best predictor of success in freshman chemistry was sought by studying correlation values. The comparisons between success in freshman chemistry and five measures of academic achievement are listed in Table I.

TABLE I
CORRELATION COEFFICIENT WITH GRADE IN CHEMISTRY 121

	INSTRUCTOR A	INSTRUCTOR B	SIGNIFICANCE
UCHSGPA	.67	.57	.925
SCAT Q	.60	.51	.751
SCAT V	.60	.31	*2.14
OHIO	.61	.31	*2.25
PREDICTED GPA	.72	.58	1.45

*significant at .05 level

	INSTRUCTOR A	INSTRUCTOR B	SIGNIFICANCE
UCHSGPA	.55	.56	.059
SCAT Q	.48	.49	.118
SCAT V	.40	.18	1.41
OHIO	.59	.17	*3.00
PREDICTED GPA	.60	.49	.882

*significant at .05 level

UCHSGPA - University Computed High School Grade Point Average
 SCAT Q - School and College Ability Test Quantitative
 SCAT V - School and College Ability Test Verbal
 OHIO - Ohio State University Psychological Test
 PREDICTED GPA - Predicted First Quarter Grade Point Average

It can be seen from Table I that the grade point averages and academic tests have a wide range of correlation values. The trend of these predictors for Instructor A and Instructor B seemed to indicate that the University Computed High School Grade Point Average and the Predicted First Quarter Grade Point Average are the best overall predictors of success in freshman Chemistry 121 and Chemistry 131. It can also be seen from the correlation values in this table that certain correlations are higher for one instructor than for the other instructor. The correlation with the Ohio Test and success in freshman chemistry is significantly higher for Instructor A than for Instructor B. This correlation is significant at the .05 level for both the Chemistry 121 and Chemistry 131 courses. The correlation of the School and College Ability Test, Verbal and the grade received in freshman Chemistry 121 is significantly higher for Instructor A than for Instructor B at the .05

level.

To find if there was a difference in the forecasting ability of these predictors from teacher to teacher, the Partial R's for the individual instructors, A and B, were studied. The data is listed in Table II.

TABLE II

PARTIAL R COEFFICIENT WITH GRADE IN CHEMISTRY 121

	INSTRUCTOR A	INSTRUCTOR B	SIGNIFICANCE
UCHSGPA	-.065	.008	.405
SCAT Q	.227	.382	.983
SCAT V	.191	.091	.578
OHIO	-.123	-.103	.116
PREDICTED GPA	.172	.057	.636
MULTIPLE R	.754	.659	1.04
F	15.5	10.6	

PARTIAL R COEFFICIENT WITH GRADE IN CHEMISTRY 131

	INSTRUCTOR A	INSTRUCTOR B	SIGNIFICANCE
UCHSGPA	.134	.166	.235
SCAT Q	.099	.276	1.06
SCAT V	-.045	.054	.588
OHIO	.215	-.158	*2.24
PREDICTED GPA	.093	.050	.824
MULTIPLE R	.647	.609	.412
F	10.4	7.19	

*significant at .05 level

A significant difference between the Partial R values of Instructor A and Instructor B appears with the Ohio Test and the grades received in Chemistry 131. This difference is significant at the .05 level.

The Multiple R's for both instructors in both classes were significant. The corresponding F values indicate this significance in each case to be beyond the .01 level.

The significant differences in the Partial R values and the Multiple R values indicate that there is a definite difference in the forecasting ability of these predictors from instructor to instructor.

To determine if there was a consistency in the way the students in the same chemistry course were graded from year to year with different instructors, the comparisons of Chemistry 131 grades and Chemistry 133 grades were made. Tables III and IV contain a list of data from this comparison.

TABLE III

CORRELATION OF CHEMISTRY 131 GRADE WITH PREDICTED COLLEGE
GRADE POINT AVERAGE AND CHEMISTRY 133 GRADE

	INSTRUCTOR A CHEMISTRY 131	INSTRUCTOR B CHEMISTRY 131	SIGNIFICANCE
PREDICTED GPA	.31	.38	.267
133 GRADE	.43	.61	.833

TABLE IV

PARTIAL R COEFFICIENTS OF CHEMISTRY 131 GRADE WITH PREDICTED
COLLEGE GRADE POINT AVERAGE AND CHEMISTRY 133 GRADE

	INSTRUCTOR A CHEMISTRY 131	INSTRUCTOR B CHEMISTRY 131	SIGNIFICANCE
PREDICTED GPA	-.013	.459	*1.70
133 GRADE	.307	.522	.867

*significant at .05 level

The differences between the Partial R values for Instructor A and Instructor B with the Predicted Grade Point Average was significant at the .05 level. There were no other significant differences. The major conclusion that was drawn from this was that the Predicted First Quarter Grade Point Average is a valuable predictor of success throughout the entire freshman year. It is possible to predict Chemistry 133 success from high school data more accurately than from the previous grades received in freshman Chemistry 131.

Precautions Taken for Accuracy

The precautions taken for accuracy were primarily those of cross checks of computer cards by verification. The scores were all punched onto computer cards and then double checked for transcription errors. The multiple regression analysis was then done on the computer.

Conclusions

The conclusions of this study were three fold. The best predictors of success in freshman Chemistry 121 and 131 at Montana State

University were the University Computed High School Grade Point Average and the Predicted First Quarter Grade Point Average. These predictors were consistent for both Instructors A and B. However, there were differences in the accuracy of the forecasting ability of different predictors from instructor to instructor. A significantly higher correlation was observed between verbal aptitude as measured by the Ohio Test and the grade received in Chemistry 131 with Instructor A than with Instructor B. The other predictors showed differences, but none were significant for Instructors A and B.

The final portion of this study was conducted to find if there was a consistency in the way the students in the same chemistry course were graded from year to year with different instructors. It was found that the variability of grading from one college instructor to another was great enough that the student's high school work was a better predictor of success in later college chemistry courses than the student's initial college work.

Summary

This study was conducted to determine if a meaningful relationship existed between several measures of ability and academic performance and a student's subsequent success in freshman chemistry. The classes studied were the Chemistry 121, 131, and 133 courses that were offered at Montana State University during the academic years of 1970-71 and 1971-72. The grades of the students sampled from these courses were

compared to the student's past performance in high school and performance on academic tests. The information was punched onto computer cards and subjected to a multiple regression analysis.

The study was conducted to investigate the following questions:

1. Is there a predictor or combination of predictors that is the best forecaster of success in freshman chemistry?
2. Is there a difference in the forecasting ability of these predictors from instructor to instructor?
3. Is there a consistency in the way students in the same chemistry course are graded from year to year by different instructors?

The conclusions of this study were:

1. That a significantly higher correlation was observed between verbal aptitude as measured by the Ohio Test and the grade received in Chemistry 131 with Instructor A than with Instructor B.
2. That a significantly higher correlation existed for Instructor A than for Instructor B when the verbal aptitude as measured by the Ohio Test and SCAT V Test was compared to Chemistry 121.
3. That the variability of grading from one college instructor to another was great enough that the student's high school work was a better predictor of success in later college chemistry courses than the student's initial college work.

Chapter IV

SUMMARY

The Problem

This study was conducted to determine if a meaningful relationship existed between several measures of ability and academic performance and a student's subsequent success in freshman chemistry classes at Montana State University.

The purpose of this study was to aid the Montana State University Chemistry Department with the placement of freshman chemistry students.

Background of the Problem

Many studies have been undertaken to help refine the methods used to predict success of freshman students as they enter college. It was hoped that by an accurate prediction of success that the appropriate steps could be taken to help beginning students meet the demands of the academic load required of college students.

Treatment of the Problem

The correlations of success in freshman chemistry and a student's past high school and academic test performance were studied. A multiple regression analysis was computed for the five predictors of academic success. This study was conducted to identify the best predictors of success in freshman Chemistry 121 and Chemistry 131 at Montana State University. The predictability of the variables was also studied for

differences from instructor to instructor in the same chemistry course.

Conclusions

The conclusions of this study were:

1. A significantly higher correlation was observed between verbal aptitude as measured by the Ohio Test and the grade received in Chemistry 131 with Instructor A than with Instructor B.
2. A significantly higher correlation existed for Instructor A than for Instructor B when the verbal aptitude as measured by the Ohio Test and SCAT V Test was compared to Chemistry 121.
3. The variability of grading from one college instructor to another was great enough that the student's high school work was a better predictor of success in later college chemistry courses than the student's initial college work.

Suggestions for Further Study

Further study might include:

1. An extension of this type of study to other chemistry courses with other instructors.
2. Looking at other predictors of success to improve the predictions for students in freshman chemistry.
3. Looking for the particular variables that are the most significant predictors for different instructors.

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APPENDIX

APPENDIX A

UNIVERSITY COMPUTED HIGH SCHOOL GRADE POINT AVERAGE

The University Computed High School Grade Point Average which was referred to in this study was obtained in the following manner (9:3):

1. A grade average is computed for all English courses taken during the junior and senior year in high school.
2. A grade average is computed for social studies taken during the last two years in high school.
3. A grade average is computed for the semesters of chemistry taken in high school.
4. A grade average is computed for the semesters of physics taken in high school.
5. A grade average is computed for all the commercial courses taken during high school.
6. A grade average is computed for any vocational courses that are taken in high school.
7. A grade average is computed for semesters of language taken in high school.
8. A grade average is computed for the trigonometry, solid geometry, and advanced courses that are taken in high school.

These averages are then averaged to give the total high school grade average as used in this study.

APPENDIX B

MULTIPLE REGRESSION WITH SIX VARIABLES

Instructor A Chemistry 131 Fall 1971			
	MEAN	ST. DEVIATION	PARTIAL R
1. UCHSGPA	3.1	.58	.13
2. SCAT Q	6.1	1.6	.10
3. SCAT V	5.4	1.9	-.05
4. Ohio	6.1	1.8	.22
5. Predicted GPA	2.5	.4	-.09
6. Chemistry Grade	82.3	11.6	

Multiple R = .647 R Square = .419 F = 10.39 N = 78

St. Error of Est. = 9.2

Correlation of Variable I with J through K

I	J	K					
1	2	6	.50	.36	.59	.97	.55
2	3	6	.59	.70	.61	.48	
3	4	6	.75	.50	.40		
4	5	6	.76	.59			
5	6	6	.60				

$$Y = 56.08 + 18.34 \times (X1) + .7869 \times (X2) + .3256 \times (X3) + 3.886 \times (X4) - 22.80 \times (X5)$$

APPENDIX C

MULTIPLE REGRESSION WITH SIX VARIABLES

Instructor B Chemistry 121 Fall 1971			
	MEAN	ST. DEVIATION	PARTIAL R
1. UCHSGPA	2.6	.58	.01
2. SCAT Q	4.2	1.6	.38
3. SCAT V	4.5	2.0	.09
4. Ohio	4.7	1.8	-.10
5. Predicted GPA	2.1	.42	.06
6. Chemistry Grade	77.7	12.0	

Multiple R = .659 R Square = .435 F = 10.61 N = 75

St. Error of Est. = 9.4

Correlation of Variable I with J through K

I	J	K					
1	2	6	.38	.38	.47	.96	.57
2	3	6	.34	.51	.46	.51	
3	4	6	.72	.53	.31		
4	5	6	.67	.35			
5	6	6	.58				

$$Y = 39.78 + 1.014 \times (X1) + 2.808 \times (X2) + .5993 \times (X3) \\ - 1.719 \times (X4) + 13.60 \times (X5)$$

APPENDIX D

MULTIPLE REGRESSION WITH SIX VARIABLES.

Instructor B Chemistry 131 Fall 1970			
	MEAN	ST. DEVIATION	PARTIAL R
1. UCHSGPA	3.2	.52	.17
2. SCAT Q	6.9	1.7	.28
3. SCAT V	5.9	1.8	.05
4. Ohio	6.1	1.7	-.16
5. Predicted GPA	2.6	.42	.05
6. Chemistry Grade	83.9	9.1	

Multiple R = .6089 R Square = .3707 F = 7.19 N = 67

St. Error of Est. = 7.5

Correlation of Variable I with J through K

I	J	K					
1	2	6	.59	.39	.43	.89	.56
2	3	6	.30	.45	.60	.49	
3	4	6	.77	.59	.18		
4	5	6	.67	.17			
5	6	6	.49				

$$Y = 52.69 + 6.092x(X1) + 1.571x(X2) + .3471x(X3) - 1.307x(X4) + 2.701x(X5)$$

APPENDIX E

MULTIPLE REGRESSION WITH SIX VARIABLES

Instructor A Chemistry 121 Fall 1970			
	MEAN	ST. DEVIATION	PARTIAL R
1. UCHSGPA	2.7	.72	-.07
2. SCAT Q	5.0	1.9	.23
3. SCAT V	4.5	1.7	.19
4. Ohio	4.9	2.0	-.12
5. Predicted GPA	2.2	.49	.17
6. Chemistry Grade	74.6	15.1	

Multiple R = .7539 R Square = .5684 F = 15.54 N = 65

St. Error of Est. = 10.3

Correlation of Variable I with J through K

I	J	K					
1	2	6	.56	.60	.64	.97	.67
2	3	6	.54	.64	.65	.60	
3	4	6	.83	.71	.60		
4	5	6	.79	.61			
5	6	6	.72				

$$Y = 22.65 - 5.189x(X1) + 1.733x(X2) + 1.985x(X3) - 1.695x(X4) + 25.56x(X5)$$

APPENDIX F

MULTIPLE REGRESSION WITH THREE VARIABLES

Instructor B, Chemistry 131 Comparison with Chemistry 133

	MEAN	ST. DEVIATION	PARTIAL R
1. Predicted GPA	2.6	.35	.46
2. 131 Grade	87.6	7.5	.52
3. 133 Grade	74.1	10.4	

Multiple R = .7112 R Square = .5057 F = 10.23 N = 23

St. Error of Est. = 7.7

Correlation of Variable I with J through K

I	J	K		
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1	2	3	.38	.57
2	3	3	.61	

$$Y = -12.47 + 11.64x(X1) + .6452x(X2)$$

APPENDIX F (cont.)

MULTIPLE REGRESSION WITH THREE VARIABLES

Instructor A, Chemistry 131 Comparison with Chemistry 133

	MEAN	ST. DEVIATION	PARTIAL R
1. Predicted GPA	2.6	.41	-.01
2. 131 Grade	86.4	6.7	.31
3. 133 Grade	72.9	17.3	

Multiple R = .4288 R Square = .1838 F = 2.82 N = 28

St. Error of Est. = 16.2

Correlation of Variables I with J through K

I	J	K		
1	2	3	.75	.31
2	3	3	.43	

$$Y = -23.61 - .7291 \times (X1) + 1.139 \times (X2)$$