A PREDICTION STUDY OF STUDENTS TRANSFERRING FROM OKLAHOMA COLLEGES AS JUNIORS INTO THE COLLEGE OF ENGINEERING AT OKLAHOMA STATE UNIVERSITY

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PREFACE

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CHAPTER I

INTRODUCTION

Enrollment in institutions of higher education are at an all-time high. Some of the circumstances contributing to the growing enrollment are population growth and increased demand by students and parents for post high school education, the needs of the complex economy of the United States for more highly trained manpower, society's demand for equality of advanced educational opportunity as well as unanticipated and spectacular gain in knowledge since World War II.

In 1961 the total enrollment in institutions of higher education in the United States was 3,582,726 in 1965, the enrollment figure had expanded to 5,526,325, and in 1970 the enrollment figure was 7,612,000 (Simon, 1970). It is estimated that the total enrollment in colleges and universities in 1980 will 12,000,000 students, an increase of 103 percent in fifteen years (Cosand, 1968).

With increased enrollments there are heavy demands placed upon four year professional schools and universities. Much of this burden is being accepted by the two year junior or community colleges. In the past fifteen years the total number of junior colleges had increased

from 467 in 1955, with a total enrollment of 308,411 to 886 institutions in 1969 with a total enrollment of 1,942,325 (Simon, 1970). New community colleges are being established at the rate of fifty per year. The American Association of Junior Colleges expects 1,200 community colleges to be in operation in 1980 with an enrollment close to 3,000,000 (Cosand, 1968). The Carnegie Commission on Higher Education has made a strong plea to make the community college the cornerstone of higher education by recommending the establishment of a minimum of 230 new community colleges by 1980 so that one will exist within commuting distance of every potential student.

The growth of the community college movement in Oklahome is reflected in a report released by the Oklahoma State Regents for Higher Education (Oklahoma State Regents, 1970).

> In 1958, 3,611 students were enrolled in the state supported junior colleges. In 1968, 7,020 were enrolled. By 1975, it may be assumed that this number will more than double as Tulsa Junior College develops and as the other junior colleges assume a greater share of the responsibility for providing lower division collegiate instruction and technical education for the residents of Oklahoma.

At the present time there are thirteen public and four private junior colleges in Oklahoma. Seven of the public junior colleges are supported by the state and six are public municipal colleges. The seven state supported junior colleges include Connors State College of Agriculture and Applied Science, located at Warner; Eastern

Oklahoma State College of Agriculture and Applied Science at Wilburton, Murray State College of Agriculture and Applied Science at Tishomingo, Northeastern Oklahoma Agricultural and Mechanical College at Miami, Northern Oklahoma College at Tonkawa, Oklahoma Military Academy at Claremore, and Tulsa Junior College, a newly created junior college at Tulsa which opened in September, 1970.

In addition to the state supported junior colleges, Oklahoma also maintains five community colleges as part of its public system of higher education. These schools are under the control of local school boards and are located at Altus, El Reno, Poteau, Sayre, Seminole, and the newly created Oscar Rose Junior College in Midwest City which opened in September, 1970.

The private junior colleges in Oklahoma are Bacone College located at Muskogee and supported by the American Baptist Board of Missions, Bartlesville Wesleyan at Bartlesville, Southwestern College in Oklahoma City operates under the auspices of the Pentecostal Holiness Church, and St. Gregory's College, a Catholic education institution located at Shawnee.

A new community college will be established in the Capitol Hill area of Oklahoma City in the near future. Other communities seeking to establish community colleges are Ardmore, Henryetta, and Woodward (Oklahoma State Regents, 1970).

The community college is generally established to fulfill several objectives: to provide occupational education, general education, and education for transfer (Thornton, 1966). It is in the function of education for transfer that the community college is relieving much of the burden placed on the four year institutions of higher education. A student may pursue a preprofessional program of studies in engineering at a community college, at minimum expense, then transfer to a professional school at a university. In order to meet the need of the preprofessional student many four-year colleges, which do not offer professional curricula, also offer a two year pre-engineering program of studies, thus providing the function of education for transfer similar to the community college. The four-year colleges in Oklahoma offering a two-year pre-engineering program are Central State College at Edmond, East Central State College at Ada, Northeastern State College at Tahlequah, Northwestern State College at Alva, Panhandle State College at Goodwell, Southeastern State College at Durant, and Southwestern State College at Weatherford. In addition to the above listed state supported colleges the following private four year colleges have a program of pre-engineering studies; Oklahoma Christian College at Oklahoma City and Phillips University located at Enid.

The increased enrollments of community colleges have taken a great share of the freshmen and sophomore burden

from the universities. As the enrollment of the universities becomes increasingly composed of community college transfer students, several problems result. With the growing crisis in higher education enrollment many educators recommend that the questions and problems of the community college transfer student be studied in depth.

Purpose of the Study

The purpose of this study is to investigate the possibility of predicting grade point average for the first semester after transfer of students transferring into the College of Engineering at Oklahoma State University from Oklahoma institutions of higher education. If grade point average can be predicted then how accurate is the prediction?

This study is an investigation of the relationships of certain selected factors to determine which, if any, contribute to the successful academic completion of the first semester of those students transferring into the College of Engineering at Oklahoma State University after completing 60 to 90 semester credit hours in a pre-engineering curriculum at another Oklahoma institution of higher education

The variables selected for this study are the five ACT test scores, English Usage, Mathematics Usage, Social Studies Reading, Natural Science Reading, and Composite. The grade point average in all math courses attempted prior

to transfer at or above the level of analytic geometry, the grade point average of all chemistry courses attempted prior to transfer, the grade point average of all physics courses attempted prior to transfer, the quantitative grade point average of all math courses at or above analytic geometry, chemistry, and physics courses attempted prior to transfer to the College of Engineering and the overall grade point average at the time of transfer comprise the other five variables that will be used in this study.

A study of the relationship between each variable and combinations of variables will be studied in relation to success during the first semester after transfer.

Need for the Study

The success of the student transferring from a community college to a four year institution has been of continuing interest to educators involved in the guidance function of secondary schools and community colleges as well as college and university faculty and administration.

There is little evidence of the study of transfer students at Oklahoma State University and the College of Engineering in particular. In 1938, a Master's thesis by Cowley made a study of transfer students at Oklahoma A & M College, the former name of Oklahoma State University. Hoemann investigated junior college students that transferred into the College of Arts and Sciences in 1968.

Alden (1967) recognized the value of the transfer function in an Engineers Joint Council Report:

> While transfers out of engineering occur at each stage, a counterflow of students into engineering shows up at the end of the sophomore year. This phenomenon, insignificant in the past, is assuming increasing importance because of the rapid growth of pre-engineering courses in junior colleges, technical institutes, community colleges, and in four year schools which do not themselves grant engineering degrees.

The bachelor's degree in engineering is offered in only three Oklahoma institutions: Oklahoma State University, the University of Oklahoma, and the University of Tulsa. The four year colleges in Oklahoma fulfill the transfer function similar to the community colleges by offering a two year pre-engineering curriculum.

A later statement by Alden (1968) commenting on engineering enrollment wrote:

> Third year through fifth year enrollments are up 15% from 76,823 in fall 1966 to 88,371 in fall 1967. It is also undoubtedly due to the increased input of students from pre-engineering programs in schools which do not offer engineering degrees.

The report of the Goals Committee of the American Society of Engineering Education called attention to the importance of the community college transfer in the Goal's Report with the statement:

> Too many engineering colleges make it almost impossible for students to transfer to engineering above the freshman level. There is a real opportunity to increase the enrollment of first-rate students other than through the freshman class (Walker, 1965).

In a study made at the request of the General Council of the American Society of Engineering Educators, Armsby (1962) found that the number of students transferring into engineering from non-engineering curricula probably reached its peak sometime between 1956 and 1960, and that in 1962 the number appeared to be declining slightly. While this may have been accurate in 1962, a review of third year students enrolled in the College of Engineering at Oklahoma State University in 1967, 1968, and 1969 revealed that transfer students consistently made up approximately one-half of the third-year student enrollment. Many of these students, however, enrolled prior to their third year.

Since no continuing records separating the academic achievement of transfer students are maintained by the Office of the Registrar or by the College of Engineering at Oklahoma State University it would seem that a study of the transfer student in the College of Engineering would be feasible for the purpose of student counseling and guidance both in the College of Engineering and by advisors in community colleges.

Scope and Limitation of the Study

This study was begun for the purpose of collecting data which might be useful in counseling with students planning to transfer as juniors into the College of Engineering at Oklahoma State University. This study is

limited to students entering one of the several engineering departments but excludes students transferring into Architecture or Architectural Engineering because courses are significantly different from the other engineering curricula.

It is not proposed that this particular study will establish a complete and final answer to problems faced by students or college counselors. The study is limited in its scope to academic factors contributing to grade point average after transfer and for this reason can do no more than assist academic advisors and counselors in their work with students from Oklahoma two-year and four-year colleges that prepare students to transfer into the engineering curriculum at Oklahoma State University.

General application of the results of this study is not claimed since the problem was not studied nation wide. By studying the transfer students in the College of Engineering, however, this research may contribute to the solution of transfer students' admission at other professional schools.

There is no way to predict an individual's grade precisely; however, the proportion of students falling into successful and unsuccessful groups can be predicted with a high degree of accuracy. Whether a student will or will not fall into the successful portion of the group cannot be predicted with precision. The individual student can assess his probability of academic success and make a more

objective judgment when he has some knowledge of his capabilities when compared to the group to which he aspires, that is, as a student in an engineering curriculum

Hypotheses to be Tested

Hypothesis I: There is no significant relationship between grade point average earned the semester after transfer for students from Oklahoma institutions of education transferring into the College of Engineering at Oklahoma State University as juniors and the following predictor variables; Transfer GPA, ACT English, ACT Math, ACT Social Studies, ACT Natural Science, ACT Composite, Math GPA, Chemistry GPA, Physics GPA, and Basic Science GPA.

Hypothesis II: There is no significant relationship between grade point average earned the semester after transfer for students from Oklahoma two-year colleges transferring into the College of Engineering at Oklahoma State University as juniors and the following predictor variables: Transfer GPA, ACT English, ACT Math, ACT Social Studies, ACT Natural Science, ACT Composite, Math GPA, Chemistry GPA, Physics GPA, and Basic Science GPA.

Hypothesis III: There is no significant relationship between grade point average earned the semester after transfer for students from Oklahoma four-year colleges transferring into the College of Engineering at Oklahoma State University as juniors and the following predictor

variables: Transfer GPA, ACT English, ACT Math, ACT Social Studies, ACT Natural Science, ACT Composite, Math GPA, Chemistry GPA, Physics GPA, and Basic Science GPA.

Definition of Terms

The following terms and abbreviations are used throughout this study:

Transfer student is one who has matriculated at the College of Engineering, Oklahoma State University, having earned at least sixty semester credit hours and no more than ninety semester credit hours at another institution of higher education located in Oklahoma.

ACT English is the student's score on the American College Testing program English Usage test.

ACT Math is the student's score on the American College Testing program Mathematics Usage test.

ACT Social Studies is the student's score on the American College Testing program Social Studies Reading test.

ACT Natural Science score is the student's score on the American College Testing program Natural Science Reading test.

ACT Composite is the arithemetic average of the ACT English, Math, Social Studies, and Natural Science scores rounded to the nearest whole number.

Transfer GPA is the cumulative grade point average at the time of matriculation to the College of Engineering.

Math GPA is the student's grade point average earned prior to matriculation in mathematics courses at and above the level of analytic geometry.

Chemistry GPA is the grade point average earned prior to matriculation in all chemistry courses attempted by student.

Physics GPA is the student's grade point average in all physics courses attempted prior to matriculation in the College of Engineering.

Basic Science GPA is the cumulative grade point average of Math GPA, Chemistry GPA, and Physics GPA.

CHAPTER II

REVIEW OF RELATED LITERATURE

The topic of academic success of students transferring from one institution of higher education to another has been investigated by a variety of research methods. The most common form of research has been a comparison of the transfer student with the "native" student, that is the student that originally entered the institution as a freshman. The present study is an investigation of the academic success of students transferring into the College of Engineering at Oklahoma State University based on the predictor variables of previous college grades, the standard scores from the American College Test, and the academic success in those basic science courses considered to be prerequisite to the study of the engineering sciences.

This review of literature will be classified into three categories: (1) junior college grades as predictors of college grades following transfer, (2) the American College Test (ACT) as a predictor of college grades, (3) grades in the selected basic science courses of mathematics (analytical geometry and calculus), chemistry and

physics as predictors of grades earned during the third year of engineering studies.

Junior College Grades

A study of transfer students into the various engineering programs in North Carolina by Carson (1969) indicated the number of students entering engineering programs from community colleges and college parallel courses are entering in significant numbers. Typically the pre-engineering student enrolls in the areas of biological sciences, English, foreign language, humanities, mathematics, physical sciences, physical education, and social science with little attempt to take engineering courses other than a graphics or surveying course. Carson, on page 316 summarized his study with the statement:

> The limited statistics available indicate that good transfer students do well and that poor transfer students continue to have academic problems, even as the upper division students who did all their work at the senior institutions are good or poor based on their first two years' performance.

A study of the academic characteristics and academic success patterns of transfer students at the University of Massachusetts by Beals (1969) in which SAT Verbal and Mathematics test scores, class rank, comparison or four specifically defined "types" of community college transfer students as well as academic achievement were compared. Results of the study by means of multiple regression indicated academic achievement at the community college level

is the best predictor of successful academic achievement at the University of Massachusetts. The "plugger-type" community college transfer student is a better academic risk than the "late-achiever," the "unqualified," or even the "qualified type," although all four types are good transfer candidates if they achieved well at the community college.

Hoyt (1960) studied 310 men and 80 women transferring into Kansas State University during 1954, 1955, and 1956. His sample included only those students of junior classification and a score from the American Council on Education Psychological Examination (ACE). The study indicated that junior college grades were positively related to grades earned at Kansas State University. The correlation for 173 engineering students in the study was .507. A comparison of the mean grade point average before transfer and after transfer indicated a drop of .492 grade point average following transfer for the engineering students. Some of the conclusions of the Hoyt study were: (1) junior college grades were positively related to Kansas State University grades, but the relationship was high only for Agriculture students and for women students; (2) junior college grades averaged substantially higher than did later grades obtained at Kansas State University; (3) when ability differences were controlled, students from various junior colleges seem to be uniform with their ability to prepare students for work at Kansas State University.

A similar study to that of Hoyt's was conducted at the University of Wyoming by Grover (1967). He also matched transfer students with "native" students. Pairs were matched on the basis of the Ohio Psychological Examination score, a predicted University of Wyoming grade average, and sex. The results of the Grover study indicated the grade average of transfer students tended to drop after transfer. His sample had a mean grade point average of 2.75 at the time of transfer. At the end of the first semester after transfer the grade range was much wider than before transfer and the mean grade point average dropped to 2.34 which is significant at the .01 level. Although the grade point dropped it tended to rise in subsequent semesters. The second semester after transfer the mean grade point average for the sample was 2.39 and was raised to 2.47 during the third semester. Seventy percent of the sample of 100 students in the study graduated from the University of Wyoming within a three year period after they transferred to the University. Grover concluded that the transfer function of the Wyoming community colleges is successful in preparing students for graduation from the University of Wyoming.

Andrews (1969) studied 239 transfer students from the four largest feeder junior colleges to the University of Missouri in 1966-1967. Students from three of the four junior colleges made significantly lower grades the first semester after transfer than earned prior to transfer.

Andrews concluded from his study that, the 2.0 minimum grade point average required of transfer students prior to acceptance at the University of Missouri may not be a high enough requirement from some feeder colleges if they are to be successful in their first semester after transfer.

Falkenberg (1970) compared 451 junior college transfer students with 275 randomly selected native students from the University of Alberta and the University of Calgary. Questionnaires were sent to each of the students and ninety-three percent responded. In addition to information gathered by the questionnaire academic records were obtained from the registrar at each university. Some of the conclusions from the study are: grade point averages of transfer students dropped in the first year after entering the university, but increased during their second year of attendance. The grading practices used by the five junior colleges seemed to be consistent.

Lunneborg and Lunneborg's study (1967) involved 260 transfer students to the University of Washington-Seattle from 1963 to 1966. They studied the relationship of six academic variables, seven intellective tests, and eleven academic and non-intellective variables from the transcripts of the students. The predictor correlation between prior grade point average and first semester following transfer grades was .14. Better predictors of academic success following transfer were English Usage Test

.33, Vocabulary Test .34, Data Sufficiency Quantitative Test .39, Quantitative Judgement Test .41, Mathematics Achievement Test .30, and high school grade point average .31. They concluded from their research that better predictors of transfer student performance were aptitude tests rather than prior grade point average.

Phay and McCary (1967) studied the 306 transfer students admitted to the University of Missisippi in September, 1963. The transfer students were assigned to groups based on cumulative grade point average at the time of transfer. Grade point averages, based on 4.0 equal an "A," of the four groups were 0.00-1.49, 1.50-1.99, 2.00-2.49, and 2.50-4.00.

For the 164 transfer students classified as juniors (fifty-seven to ninety-three semester hours attempted) 108 had graduated or were enrolled in September, 1966. Of the forty-three students transferring as juniors with less than a 2.0 grade point average twenty-nine or 48.8 percent had graduated or were persisting. Of the fifty-five students transferring as juniors with a grade point average between 2.00-2.49 thirty-six or 65.45 had graduated or were persisting. Students with a grade point average of 2.50-4.00 were the most persistent. Fifty-one of the sixty-six students were enrolled in the fall of 1966 or had graduated. The study concluded that scholastic performance before and after transfer is related. Each

successively higher grade point average category in the study produced less attrition and higher rate of graduation.

Knoell and Medsker (1965) made a comprehensive study of the transfer student. Their study included over 7,000 transfer students from 345 junior colleges. In addition these students were compared to 3,352 students that had taken all of their college work in four-year institutions.

The study indicated that junior college students' grades one semester after transfer typically drop about three tenths of a point. At the three technical institutions in the study; Georgia Institute of Technology, Rochester Institute of Technology and Texas A & M University, the grade point fell -.46. At major state universities the first term differential was -.56. Knoell and Medsker (1965) on pages 91-92 stated one conclusion of the study as:

> The C grade and C grade point average earned in junior colleges are relatively meaningless as indicators of a student's likelihood of success in four year institutions. Grades of A and B are given in junior college as recognition of superior achievement, but a C grade may be given as a reward for compliance with course requirements at only a minimally acceptable level.

Willingham (1963) studied the academic promise of 750 students transferring to Georgia Institute of Technology over the three year period 1957-1960. He found after one year that forty percent of the 750 students had withdrawn and only one-third of the remaining students had a passing grade average. The study revealed a correlation

coefficient of .33 between grade point average earned prior to transfer and grade point average for the first year or fraction thereof following transfer.

Willingham attempted to adjust grades earned prior to transfer based on average difference of grade point average from each transfer school in order to predict grade point average after transfer. Computation of adjusted grades on a new sample of 173 transfer students increased the correlation from .44 to .51. Because College Board Achievement Tests in Science and Mathematics had been administered to most of the students in the new sample, these tests were combined with previous grade point average. These three variables correlated .58 with first year grades at Georgia Institute of Technology. When previous grades were adjusted and combined with the two tests the correlation went up only .02 to .60. Willingham (1963) concluded from the study:

> Test scores did improve the accuracy of predictions, and furthermore, it appears that adjusting the previous college average is unnecessary when test scores can be included in a composite score. Strangely, it may be that standardized tests are more important in evaluating transfer applicants than in the case of regular freshman.

Hill's (1965) summary on pages 244 and 245 of the review of research on transfer students between 1910 and 1963 included the statements:

> (1) Students who enter junior colleges and transfer to four-year colleges typically experience an appreciable drop in college grades after transfer. . . (4) The transfer student seems to suffer most if he transfers into a curriculum which requires competence or training in mathematics,

> if he transfers into a major state university, or if he transfers from a junior college instead of from a four-year college.

Hill recommended raising grade point average requirements for transfer students seeking admission to a university above the standard 2.0 grade point average. He suggested requiring a 2.7 grade point average for junior college students and 2.3 for students from four-year institutions. He suggested an alternative procedure by adjusting grades from individual junior colleges, however, he stated, "Test scores combined with pre-transfer grades will probably give multiple regression prediction of good accuracy, and in all likelihood those predictions will not be improved by any attempt to adjust grade averages to a common base."

The literature supports the premise that grades earned prior to transfer are related to grades following transfer. However, the transfer students' grades are expected to suffer appreciably during the first semester after transfer. The student transferring from a pre-engineering curriculum in a four-year college should not suffer such a severe drop in grade point average for first semester after transfer as the junior college student. Test scores, even those administered for freshman class placement, appear to have some value as predictors of academic achievement in upper division work.

Tests of Scholastic Aptitude

McQuinty (1969), in a paper presented to the American Personnel and Guidance Association stated four-year institutions will become more selective in the admission of transfer students in the future. He recommended selection for admission be based on objective tests results as well as grade point average achieved in the two-year institution. McQuinty recommended the use of the American College Test battery as well as the College Entrance Examination Board, the College Qualification Test, the Davis Reading Test, and the Survey of Study Habits and Attitudes, or the Graduate Records Examination with appropriate norms for junior college transfer students.

The hypothesis that the community college transfer program acts as a "filter" which potential baccalaureate degree candidates with relatively poor high school records may pass through as opposed to the theory that the community college strengthens, through remedial programs, the marginal students was investigated by Birnbaum (1970). His study was a comparison of admission test scores and the college grades of two groups, numbering 188 each, from a senior college and from a community college.

The mean Scholastic Aptitude Test (SAT) composite score from the community college group was 14.1 lower than the senior college group. The mean grade point average was .42 lower for the community college group when compared

to the group from the senior college. Results of analysis of covariance indicated that differences were not significant at the .05 level. The two groups shared a common regression line. Differences between groups could be explained by differences in SAT composite scores. They were not related to the level of difficulty of the two types of institutions. One of the conclusions of the study stated by Birnbaum (1970) on page 249 was:

> . . . . the community college program can be considered a lower extension of the senior college program, and students in the community college perform there just as one would expect they would perform in the four year institution had they been admitted there directly from high school.

Brown and Wolins (1965) studied test results of freshman entering Iowa State University in the years 1960, 1961, and 1962. All students in the study completed at least nine credits during the fall quarter of their first year of enrollment. Variables studied were high school performance, American Council on Education Psychological Examination, the Minnesota Scholastic Aptitude Test, the Cooperative English Test, a locally constructed mathematics placement test, and the American College Test with its subsections: English Usage, Mathematics Usage, Social Studies Reading, Natural Science Reading, and the Composite scores. Zero order correlations of the variables with first quarter grade point averages were computed. For engineering students high school performance was generally the best predictor with $\underline{r}$ ranging from .47 to .61. The

math placement test ranged from r=.53 to .61 and ACT composite score ranged from r=.46 to .56.

The best two variable multiple correlations for all students except engineering students were found to be high school grade point average or rank and the ACT composite score. For engineering students the best two predictor variables were high school average or rank and the math placement test.

The correlations of the ACT subtests and composite score with first quarter grade point average for engineering students were:

Year	N	Eng.	Math	Soc. Sci.	Nat. Sci.	Comp.
1960	623	.40	.52	.39	.43	.55
1961	633	.38	.54	.40	.44	.56

The Act Technical Report 1965 cites a study by Munday and Hoyt. In the study sixty-three students were retested two years after initially taking the ACT test. The sixty-three students had two years of college work at the time of the retest. The retest form of the ACT was different from those used in any of the original testing. The retest coefficients were English .73, mathematics .77, social studies .67, natural science .70, and composite .84. The study concluded that under these conditions the test results were reasonably stable.

Another study by Hoyt (1968) developed regression constants to predict first-year grade point average at 985 four year colleges based on high school grades and ACT composite score. A table of predicted grades was devised

for men and a second table for women since Hoyt found differences in mean high school grade point averages and mean ACT composite scores for the two groups.

The constant, which is to be added to the predicted grade point average, derived for Oklahoma State University, was -.48. Hoyt (1968) on pages 21 and 22 stated the following limitations of the constant:

> Especially in complex institutions, a single prediction of academic success may be unsatisfactory since it ignores differences among curricula. Preliminary research shows that in complex colleges, freshmen in Education, Business Administration, or Engineering Sciences typically differ significantly from freshman class as a whole. . . . The study indicated about .2 should be subtracted from grade point average predictions for students planning to enroll in the Engineering Science curriculum.

The American College Test, while developed for use with the incoming college freshman, may be an adequate predictor of upper division grades. The battery of tests appears to be a stable measure of the various academic skills required of a college student.

Basic Science Courses as Predictors

In reviewing attempts to predict scholastic success in engineering schools Moore (1949) noted that mathematical ability apparently is one of the better means of predicting academic success. A study of 155 engineering graduates at Cornell revealed a correlation between math grades and four-year scholastic average to be .84. Moore reviewed studies at ten engineering colleges that used the

Pre-Engineering Inventory. The mathematics section of the Pre-Engineering Inventory consistently proved better than the other six sections of the test in predicting scholarship.

Higgins (1933), in an early study, found a correlation between mathematics average and mean four-year average of engineering student to be .84. In writing about the engineering curriculum in that day Higgins (1933), on page 734 stated:

> At the present time the engineering curriculum is largely composed of subjects such as physics, heat, power, hydraulics, electrical theory, and the like, all of which are theoretical and abstract in content depending as they do upon mathematical formulae for their expression. It would seem logical to argue that if the student is to pursue these subjects with success he should possess an inclination for mathematics or at least be able to handle mathematics with ease.

Hurd (1931) studied 162 third-year engineering students at the University of Minnesota. He found a correlation of .52± .04 between pre-engineering courses (physics-mechanics, heat, optics, and electricity and magnetism), chemistry, and mathematics (algebra and trigonometry, differential and integral calculus). In ranking four of the variables, physics correlated most highly with grades in engineering. The mean grades in all pre-engineering courses ranked second, chemistry third, and mathematics fourth.

Hoyt (1956) reported a study of correlation between grades in engineering physics and performance in the

engineering curricula at Kansas State University. He found that physics I grades bore a close relationship to over-all grade point average. The correlation was about .83 for Kansas State University students, and about .70 for transfer students. Achievement in engineering physics I was also closely related to graduation. Grades of C or better indicated a strong likelihood of eventual graduation, usually from the engineering curriculum. Failing grades carried strong negative implications for graduation, particularly from engineering.

A study of the records of 1,400 students majoring in engineering at the University of California -- Berkeley between 1928-1938 was conducted by Siemens (1943). The study included students originally enrolled at the University of California as well as transfer students from four-year state colleges and junior colleges. The variables studied were first semester grades in engineering courses which Siemens defined as first semester of the junior year, grades in mathematics, physics, chemistry as well as the total grade point average for lower division courses and grades earned in high school math and science courses. The correlation coefficients for each of the variables for the transfer students when correlated with the criterion, grade point average in all engineering courses, were: first semester engineering = .86, mathematics = .55, physics = .53, chemistry = .50, lower division = .63, and a negligible .38 for high school math and science.

From the study Siemens concluded: "a. that the junior college transfers hold their own academically with the native group and, b. that grading standards in the junior colleges seems to be about the same as those of the university for engineering students".

As a practical test of efficiency the prediction equation derived by Siemens, based on all variables was applied to 100 unselected transfer students. An analysis revealed the probable error of the differences between predicted and actual grade point average to be smaller than the estimate -.14 as compared with .22. He concluded from the study that the best single factors for predicting success after transfer were grade point average for all lower division work and grade point average for first semester of engineering work. Siemens (1943) stated:

> Through the use of prediction equations it was found possible to forecast upper division academic success for transfers such that the predicted grade point does not vary on the average from the actual grade point average by more than .25 of a grade point unit.

Summary of Related Literature

In this chapter the literature was reviewed and selected studies were specifically reported. Attention was given to (1) the relationship of grades earned prior to transfer to grades earned following transfer, (2) the use of the ACT and other test batteries as predictors of college grades, and (3) the relationship of certain basic

science courses, namely mathematics, chemistry, and physics to grades earned in the engineering sciences. The review of the literature indicates:

1. The grades earned prior to transfer are related to grades earned after transfer.

2. The transfer students' grade point average should drop during the first semester after transfer.

3. The ACT, while devised for admission and placement purposes with freshmen, may be useful when combined with other information in predicting upper division grades.

4. The student enrolled in engineering courses must have knowledge and background in the basic sciences of mathematics, chemistry, and physics. Grades earned in these basic sciences may be predictive of grades in upper division engineering courses.

CHAPTER III

METHODS AND PROCEDURES

The present chapter will consider the subject population, the predictive indices, the criterion measure, and the method of analysis utilized in the investigation.

Subjects

The subjects for the present study are students transferring into the College of Engineering at Oklahoma State University from Oklahoma junior colleges and four-year colleges. Junior colleges as well as four-year colleges in Oklahoma offer a two-year pre-engineering curriculum designed to prepare students for transfer into an institution offering a professional program in engineering. The subjects in this study transferred into the College of Engineering during the fall semesters 1964, 1965, 1966, 1967, and 1968. Criteria for selection of the sample in this study include the following; (1) The students transferred no less than sixty or more than ninety credit hours, thus could be classified as members of the junior class, (2) The students had attempted mathematics courses above the level of college algebra and trigonometry as college algebra and trigonometry will not apply toward an

engineering degree at Oklahoma State University, (3) they attempted one or more semesters of general chemistry, (4) they had attempted at least one semester of general physics, and (5) the subjects persisted in the engineering curriculum for at least one full semester following transfer.

There were a number of students that transferred into the College of Engineering but withdrew from the university with no grades for the semester. The study does not include these students as the purpose of the study is to predict grade point average for the first semester after transfer rather than student retention and attrition rates.

The subjects of this study transferred from the following Oklahoma institutions of higher education in the year indicated in Tables I and II.

The study has two phases and involves four groups. Group I was composed of 90 students transferring from Oklahoma two-year colleges for the fall semesters of 1964, 1965, 1966, and 1967. Group II was made up of 38 students transferring in the same years as above from Oklahoma four-year colleges. Group III was composed by combining Group I with Group II for a total of 128 subjects. Group IV was made up of students transferring from Oklahoma two-year colleges and four-year colleges for the fall semester 1968.

TABLE I

DISTRIBUTION OF STUDENTS TRANSFERRING FROM TWO-YEAR COLLEGES INTO THE COLLEGE OF ENGINEERING

Name of College	Year of Transfer				
	1964	1965	1966	1967	1968
Altus Junior College	1				
Bacone College			1		
Cameron A & M College	4	4	3	7	4
Connors State College		5	1	1	1
Eastern Oklahoma State College	3	3	2	9	6
Northern Oklahoma College	2	7	1	3	4
Murrary State College	3	1		4	1
Northeastern Oklahoma A & M	3	1	7	5	6
Oklahoma Military Academy	2	1	4		
St. Gregory's College				2	

The first phase of the study used Groups I, II, and III as the criterion groups to derive a regression equation. The second phase of the study utilized Group IV as the validating group to which the regression equation was applied.

TABLE II

DISTRIBUTION OF STUDENTS TRANSFERRING FROM FOUR-YEAR COLLEGES INTO THE COLLEGE OF ENGINEERING

Name of College	Year of Transfer				
	1964	1965	1966	1967	1968
Central State College		2	1	1	3
East Central State College	1	2	1		1
Northeastern State College	1	1	3	4	
Northwestern State College	3	3			
Oklahoma Christian College					1
Panhandle A & M College		3	2	1	1
Southeastern State College			2		
Southwestern State College	4		1	3	3

Predictive Indices

The predictive indices for the current study include grade point average at the time of matriculation at the College of Engineering at Oklahoma State University, the five scores on the American College Test, grade point average in mathematics courses above the level of college algebra and trigonometry, grade point average in all general chemistry courses attempted, grade point average in all general physics courses attempted, and a composite

grade point average of grades earned in the above mathematics, chemistry and physics courses.

Grades Earned Prior to Transfer

The grades earned prior to transfer, as reported in Chapter II, have been found to be a good predictor of college grades following transfer to a four-year college or university.

The students enrolled at an Oklahoma two-year college or four-year college in the pre-engineering curriculum typically attempts; (1) general education courses in English composition, the social sciences, and the humanities, (2) mathematics, at least through analytical geometry and calculus, (3) general chemistry, (4) general physics which usually has a corequisite of calculus, (5) engineering graphics, and (6) physical education, freshman orientation, reading improvement and similar courses unique to the purposes of the two-year or four-year college.

The grades earned prior to matriculation at the College of Engineering were obtained from the Registrar's files at Oklahoma State University. The grades were recorded on transcripts in the following grading system:

A = 4 grade points
B = 3 grade points
C = 2 grade points
D = 1 grade point
F = 0 grade point

A transfer student from a two-year college may not apply more than 65 credit hours earned at the two-year college toward a degree at Oklahoma State University according to the university catalog (1967). In this study all credit hours attempted at either a two-year college or a four-year college were utilized in computing the grade point average prior to transfer.

American College Test (ACT)

The American College Testing Program was initiated in 1959, and in its first year of operation was taken by approximately 120,000 high school seniors. The scores of these initial students were reported to 368 participating colleges (plus over 600 other colleges) in nineteen states. During the school year 1962-1963, over 350,000 students completed the tests, and reported their scores to 725 colleges or universities requiring or recommending the tests (Buros, 1965). The program has continued to grow and today is required prior to admission in all state-supported institutions of higher education in the state of Oklahoma (Hayes, 1969).

The ACT test consists of four parts: English Usage, Mathematics Usage, Social Studies Reading, and Natural Science Reading. Standard scores ranging from one to thirty-six are obtained for each subtest plus a composite score. The English usage examination is an eighty item, fifty minute test that measures the student's understanding

and use of the basic elements in correct and effective writing: punctuation, capitalization, usage, phraseology, style, and organization.

The mathematics usage test is a forty item, fifty minute examination that measures the student's mathematical reasoning ability. This test emphasizes the solution of practical quantitative problems which are encountered in many college curricula. It also includes a sampling of mathematical techniques covered in high school courses.

The social studies reading examination is a fifty-two item, forty minute test that measures the evaluative reasoning and problem-solving skills required in the social studies. It measures the student's comprehension of reading passages taken from typical social studies materials. It also contains a few items that test his understanding of basic concepts, knowledge of sources of information, and knowledge of special study skills needed in college work in the social studies.

The natural sciences reading examination is a fifty-two item, forty minute test that measures the critical reasoning and problem-solving skills required in the natural sciences. Emphasis is placed on the formulation and testing of hypotheses and the evaluation of reports of scientific experiments (ACT Technical Report, 1965).

The fundamental idea underlying development of the four tests is that the best way to predict success in college is to measure as directly as possible the abilities

the student will have to apply in his college work. This means the tasks presented in the tests must be representative of scholastic tasks. They must be intricate in structure, they must be comprehensive in scope, they must be significant in their own right, rather than narrow or artificial tasks that can be defended for inclusion only on the grounds of statistical correlation with a criterion. The validity of this kind of reasoning in test construction has been amply supported by research. The result today is that nearly all of the most widely used tests of academic potential consist largely of two kinds of exercises: (1) the comprehension of reading passages and (2) the solution of functional and practical problems involving quantitative reasoning.

The ACT test differs from other widely used tests of scholastic potential primarily in the degree to which this practice is followed. The ACT tests contain a large proportion of complex problem-solving exercises and proportionately few measures of narrow skills (ACT Technical Report, 1965).

A review reported on page four in Buros' Sixth Mental Measurements Yearbook reported on the reliability of the ACT form-AC, for a sample of 990 high school seniors. The odd-even reliability coefficients were English Usage = .90, Mathematics Usage = .89, Social Studies Reading = .86, and Natural Sciences Reading = .95 (Buros, 1965).

The ACT Technical Report, 1965 Edition on page 17 reported parallel form reliability for Forms 6AC and 7AC for a college-bound population as follows: English Usage = .86, Mathematics Usage = . 87, Social Studies Reading = .81, Natural Sciences Reading = .78, and Composite = .92.

The composite score as well as the four subtest scores were used in this study. The review of the literature indicated that the ACT is a good index for prediction of grade point average at the freshman level and suggested that it may be a good predictor of upper division work as well.

The ACT scores were obtained from the Registrar's Office of each of the respective two-year and four-year colleges used in the study.

Basic Sciences

The review of Related Literature reported studies indicating grades earned in the basic sciences may be predictive of upper division grades in the engineering curricula. The basic sciences for this study are defined as analytical geometry, calculus, general chemistry, and general physics. Two-year colleges and four-year colleges in Oklahoma have similar catalog courses descriptions as the following;

> Analytic Geometry prerequisites -- college algebra and trigonometry. Rectangular coordinates, the straight line and conic sections, polar coordinates, and the general equation of the second degree. Introduction to analytical geometry of three dimensions.

> Beginning Analysis I. Differentiation and integration of real valued functions of one real variable.
>
> Beginning Analysis II. An introduction to differentiation of real and complex valued functions of two or more real variables. Infinite series. Differentiation of vector valued functions on one real variable. (Oklahoma State University Catalog, 1967).
>
> Chemistry -- This science deals with the composition and properties of substances and the transformations which alter their identity. General chemistry includes a study of the elements, their compounds, and the basic chemical laws which govern their chemical behavior.
>
> Physics -- deals with the phenomena of the inanimate world. It treats the properties of matter and non chemical changes. Classical physics includes mechanics, heat, light, sound, electricity, and magnetism (Smith, 1962).

A grade point average was computed for each of the three basic science areas by dividing the total number of credit hours attempted into the number of grade points earned in each of the respective basic science courses. This study computed a basic science composite grade point average. The basic science composite grade point average was made by summing grade points earned in all analytical geometry, calculus, general chemistry, and general physics courses attempted, then dividing by the total number of credits attempted in those courses.

The Criterion

The criterion measure for this study was grade point average earned during the first semester after transfer into the College of Engineering at Oklahoma State

University. Grades for work attempted during the first semester after transfer into the College of Engineering were obtained from the Registrar's files at Oklahoma State University. In computing these averages, grades received in all first semester courses attempted were used. The university grading system was used for these grades.

Method of Analysis

Analysis began by computation of the mean and standard deviation of each of the variables for Group I, Group II, and Group III. Analysis continued with the computation of zero-order correlation coefficients between each predictive variable and every other variable as well as between each variable and the criterion. A multiple regression program from the IBM computer program library was utilized by the computer center at Missouri Southern College to make these computations (Rosenthal, 1966).

A step-wise multiple regression analysis was used in analyzing the data. By this method, multiple correlation coefficients were derived between the predictor variables and the criterion measure. The variable which correlated highest with the criterion was entered as the first step of the multiple correlation analysis. The second step selected the next highest correlation coefficient in the correlation matrix. The analysis continued until all the predictor variables had been included. Multiple regression weights were developed based on the predictive indices.

These weights were applied to the prediction of grade point averages of the group of transfer students comprising Group IV.

CHAPTER IV

TREATMENT OF THE DATA AND ANALYSIS OF RESULTS

The purpose of this study is to investigate certain academic variables as predictors of grade point average earned by students transferring into the College of Engineering at Oklahoma State University as juniors. The current chapter is concerned with the presentation and analysis of the results of the investigation. The intercorrelations between the predictors and the criterion are presented in tabular form. This includes the correlations derived between the values of Transfer GPA, ACT English, ACT Math, ACT Social Studies, ACT Natural Science, ACT Composite, Math GPA, Chemistry GPA, Physics GPA, Basic Science GPA and GPA for the semester after transfer.

Multiple correlations are to be developed on a stepwise buildup between the indices in combination and the criterion measure. Regression equations for purposes of predicting the criterion from known predictive variables will be listed. These equations will be tested for their predictive value by means of data from a group of students

transferring into the College of Engineering at Oklahoma State University the year following the study group.

The computations necessary for this study are to be derived by means of the 1130 IBM computer at the Computer Center on the Missouri Southern College campus. The computer is to be programmed for ten predictor variables and one dependent variable for students transferring from two- and four-year colleges in Oklahoma. The transfer students are juniors, that is, they transferred with between 60 and 90 semester credit hours at the time of transfer. Students included in the study transferred into the College of Engineering for the fall semesters of 1964, 1965, 1966, and 1967. A total of 128 students were included in this phase of the study. Sections II and III of the study are to be concerned with two subgroups: a. students transferring from two-year colleges and b. students transferring from four-year colleges.

Zero order correlation between the predictor variables and the criterion are presented in Tables IV, VII, and XII. After examining the relationship of the predictor variables to the criterion measured individually, the next step in the investigation is to combine the variables in an effort to obtain a multiple correlation coefficient which is larger than the correlation of any single variable.

Multiple correlations and the resulting weights are determined by a step-wise procedure. In a procedure of

this type criterion correlations enter the equation in descending order beginning with the variable that possesses the greatest predictive value. Since the predictive value and reliability of each variable is, in part, determined by the order of entry into the equation, the computer technique is designed to search for optimum entry into the equation. A series of regression equations are obtained by adding one variable at a time, thus giving the following equations:

a. $Y = A + b_1X_1$

b. $Y = A + b_1X_1 + b_2X_2$

c. $Y = A + b_1X_1 + b_2X_2 + b_3X_3$, et cetera

Coefficients for each combination of variables, the multiple regression coefficients and the standard error of estimate for each group in the study are presented in Tables V, IX, and XIII respectively. In order to determine if the predictors are applicable to subjects other than the population under investigation, the predictive equations are to be tested by applying them to students transferring for the fall semester, 1968. Grade point average earned during the first semester after transfer is to be presented along with the predicted grade point average in Tables VI, X, and XIV.

In order to present the data in a systematic manner each group will be presented under separate headings:

Section I is concerned with developing a regression equation to predict grade point average earned during the

first semester after transfer for students transferring from two-and four-year colleges in Oklahoma.

Section II is similar to Section I but involves only those students transferring from two-year colleges in Oklahoma.

Section III involves only those students transferring from four-year colleges in Oklahoma.

Conclusions and recommendations of this investigation will be presented in Chapter V.

Section I

Analysis of Data and Presentation of Information Related to Hypothesis I

Hypothesis I: There is no significant relationship between grade point average earned the semester after transfer for students from Oklahoma institutions of higher education transferring into the College of Engineering at Oklahoma State University as juniors and the following predictor variables: Transfer GPA, ACT English, ACT Math, ACT Social Studies, ACT Natural Science, ACT Composite, Math GPA, Chemistry GPA, Physics GPA, and Basic Science GPA.

A list of the ten predictor variables and the criterion variable is presented in Table III. The mean and sigma of each variable is presented. The resulting correlation coefficient, when related to grade point average the semester after transfer, is presented with an

indication of the level of significance for each significant correlation coefficient.

TABLE III

CORRELATION COEFFICIENTS WITH DEPENDENT VARIABLE STUDENTS TRANSFERRING FROM TWO-YEAR AND FOUR-YEAR COLLEGES IN OKLAHOMA (N=128)

	Predictor	Mean	Sigma	Correlation Coefficient
1.	Basic Science GPA	2.81	0.67	0.68**
2.	Transfer GPA	2.90	0.53	0.66**
3.	Math GPA	2.71	0.85	0.64**
4.	Physics GPA	2.67	0.87	0.54**
5.	Chemistry GPA	3.03	0.74	0.43**
6.	ACT Math	25.19	3.93	0.35**
7.	ACT Composite	22.67	3.57	0.35**
8.	ACT Natural Science	23.92	4.85	0.27**
9.	ACT Social Science	21.54	5.19	0.26**
10.	ACT English	19.27	3.83	0.18*
A.	GPA Semester After Transfer	1.94	0.95	

** Significant at the .01 level of significance.
* Significant at the .05 level of significance.

Table III reveals that all ten predictor variables yielded significant coefficients of correlation with the criterion, grade point average earned the first semester after transfer, as follows: Transfer GPA (r=.66), ACT English (r=.18), ACT Math (r=.35), ACT Social Studies (r=.26), ACT Natural Science (r=.27), ACT Composite

(r=.35), Math GPA (r=.64), Chemistry GPA (r=.43), Physics GPA (r=.54), and Basic Science GPA (r=.68). Seven of the predictor variables, Transfer GPA, ACT Math, ACT Composite, Math GPA, Chemistry GPA, Physics GPA and Basic Science GPA yielded correlations beyond the .001 level of significance.

The zero order correlations between predictor variables as well as correlations with the criterion variable are presented in detail in Table IV. Zero order correlations for the ten predictor variables ranged from .04 to .90 with the highest relationship between Transfer GPA and Basic Science GPA (.90). The lowest intercorrelations were between ACT English and Physics GPA (.04), ACT Natural Science and Math GPA (.12), ACT Natural Science and Physics GPA (.15) and between ACT English and Math GPA (.15). Intercorrelations between the ACT Composite and the four subtests ranged from .63 to .86 as might be expected. Intercorrelations between the Basic Science GPA and its three subgroups, Math GPA, Chemistry GPA and Physics GPA ranged from .73 to .85. The correlation between ACT Composite and Basic Science GPA was .33. Intercorrelations between the four ACT subtests and Basic Science GPA ranged from .17 to .35.

In determining the multiple correlations and the resulting weights a step-wise procedure was followed as indicated previously. A total of ten steps producing ten equations were developed adding one variable per

TABLE IV

THE INTERCORRELATION MATRIX OF THE SCORES FOR TEN PREDICTORS AND THE INDEPENDENT VARIABLE - GPA FIRST SEMESTER AFTER TRANSFER FOR STUDENTS TRANSFERRING FROM TWO-AND FOUR-YEAR COLLEGES IN OKLAHOMA
(N=128)

	1	2	3	4	5	6	7	8	9	10	A
1. Transfer GPA		.24	.35	.31	.21	.37	.77	.69	.75	.90	.66
2. ACT English			.43	.57	.50	.77	.15	.22	.04	.17	.18
3. ACT Math				.33	.36	.63	.33	.25	.26	.36	.35
4. ACT Social Studies					.70	.86	.18	.35	.15	.26	.26
5. ACT Natural Science						.82	.12	.32	.14	.22	.27
6. ACT Composite							.26	.38	.20	.33	.35
7. Math GPA								.48	.56	.85	.64
8. Chemistry GPA									.49	.73	.43
9. Physics GPA										.82	.54
10. Basic Science GPA											.68
A. GPA First Semester After Transfer		.05 level of significance = .17 .01 level of significance = .23 .001 level of significance = .32									
Mean	2.90	19.27	25.19	21.54	23.92	22.61	2.71	3.03	2.67	2.81	1.94
Sigma	.53	3.83	3.93	5.19	4.85	3.57	.85	.74	.87	.67	.95

step. Step six was selected as the most appropriate equation. A listing of the entering variables in each of the six steps, the standard error of estimate, the coefficients for each variable in each step, the value of the constant term for each step and the multiple correlation coefficient is presented in Table V.

As Table V reveals, the computer program selected the following order of variables based on their contribution to the value of the multiple R; Basic Science GPA, ACT Composite, Math GPA, Transfer GPA, Chemistry GPA and ACT English. The multiple R was increased from the first step, where only one variable was considered, from .68 to .73 and the standard error of estimate was reduced from .70 in the first step to .67 in the sixth step. Negligible increase in the multiple R from step six (R=.72) to step ten (R=.72) was accompanied by an increased standard error of estimate from .67 in step six to .68 in step ten. The multiple R in step six was .72 which implies that about fifty-two percent of the variablity in the criterion was accounted for by the combination of the six predictor variables in the following equation;

$$Y = 0.464768X_1 + 0.067434X_2 + 0.208135X_3 + 0.477084X_4 - 0.182740X_5 - 0.032734X_6 - 1.648431$$

where:

X_1 = Basic Science GPA

X_2 = ACT Composite

X_3 = Math GPA

X_4 = Transfer GPA

X_5 = Chemistry GPA

X_6 = ACT English

TABLE V

RESULTS OF STEPS 1, 2, 3, 4, 5, AND 6 FOR ENTERING A VARIABLE INTO THE REGRESSION EQUATION IN A STEP-WISE FASHION FOR THE CRITERION - GPA FIRST SEMESTER AFTER TRANSFER FOR STUDENTS FROM TWO-AND FOUR-YEAR COLLEGES IN OKLAHOMA (N=128)

Entering Variable	Standard Error of Estimate	Constant	Variables in Regression Equation	Coefficient of Variables in Regression Equation	Multiple Correlation Coefficient
Basic Science GPA	0.70	-0.782338	Basic Science GPA	0.971428	.68
ACT Composite	0.69	-1.441226	Basic Science GPA	0.904233	.69
			ACT Composite	0.037483	.70
Math GPA	0.68	-1.378018	Basic Science GPA	0.584705	.70
			ACT Composite	0.039437	
			Math GPA	0.291042	
Transfer GPA	0.68	-1.652687	Basic Science GPA	0.320476	.71
			ACT Composite	0.034515	
			Math GPA	0.279673	
			Transfer GPA	0.399327	
Chemistry GPA	0.68	-1.662250	Basic Science GPA	0.520097	.71
			ACT Composite	0.039162	
			Math GPA	0.196730	
			Transfer GPA	0.438674	
			Chemistry GPA	-0.179665	

TABLE V (Continued)

Entering Variable	Standard Error of Estimate	Constant	Variables in Regression Equation	Coefficient of Variables in Regression Equation	Multiple Correlation Coefficient
ACT English	0.67	-1.648431	Basic Science GPA	0.464768	.72
			ACT Composite	0.067434	
			Math GPA	0.208135	
			Transfer GPA	0.477084	
			Chemistry GPA	-0.182740	
			ACT English	-0.032734	

The values of 0.464768, 0.067343, 0.208135, 0.477084, -0.182740, -0.032734 are weights by which the values of Basic Science GPA, ACT Composite, Math GPA, Transfer GPA, Chemistry GPA and ACT English, respectively are multiplied. The products of these multiplications and the constant (-1.648431) are summed for the predicted grade point average the first semester after transfer for students transferring from two-and four-year colleges in Oklahoma. Predicted grade point average is compared with actual grade point average in the Appendix (see Table XV).

The standard error of estimate for step six was 0.67 which indicated that 68 times out of 100 the grade point average earned the first semester after transfer will be within the interval of the predicted range plus or minus 0.67.

A review of Table XVII in the Appendix reveals that sixty-eight percent of the predictions were within one standard error of the estimate, ninety-six percent of the predictions were within two standard errors of the estimate and four percent were greater than two standard errors of estimate from the predicted grade point average.

Testing the Regression Equation

Thirty-one students with 60 to 90 semester credit hours transferred from two-and four-year colleges in Oklahoma to the College of Engineering at Oklahoma State University for the fall semester 1968. Data from these

TABLE VI

ACTUAL AND PREDICTED GRADE POINT AVERAGE FOR FIRST SEMESTER AFTER TRANSFER FOR STUDENTS TRANSFERRING FOR FALL SEMESTER 1968 (N=31)

Student Number	Actual GPA	Predicted GPA	Deviation
1	2.20	1.73	0.47
2	0.33	1.46	-1.13
3	1.57	1.02	0.55
4	1.80	1.05	0.75
5	2.81	2.57	0.24
6	2.62	3.09	-0.47
7	1.42	1.15	0.27
8	1.52	1.51	0.01
9	3.11	3.07	0.04
10	1.07	1.65	-0.58
11	3.18	2.74	0.44
12	1.52	2.18	-0.66
13	2.22	1.41	0.82
14	2.60	2.85	-0.25
15	0.25	1.86	-1.61
16	0.80	1.13	-0.33
17	1.92	1.24	0.68
18	3.00	2.85	0.15
19	1.87	2.13	-0.26
20	1.81	2.98	-1.17
21	2.75	2.36	0.37
22	1.06	1.57	-0.51
23	2.00	0.99	1.01
24	1.25	1.40	-0.15
25	0.73	2.44	-1.71
26	1.71	1.25	0.46
27	3.20	2.96	0.24
28	1.50	1.01	0.49
29	1.57	1.24	0.33
30	1.75	1.89	-0.14
31	1.31	1.97	-0.66

students was utilized to test the predictive value of the regression equation previously developed. The regression equation based on the six variables, Basic Science GPA, ACT Composite, Math GPA, Transfer GPA, Chemistry GPA and ACT English, produced a multiple correlation coefficient of 0.72 which is only .005 less than using the ten variables. The standard error of estimate for the equation is 0.67. The results of the equation applied to the data for 31 students are presented in Table VI.

The standard error of estimate associated with the six predictor variables used in the regression equation is 0.67. The following results are obtained in relation to predicted GPA the first semester after transfer when compared to the GPA actually earned after transfer. Eighty-one percent of the predicted GPAs fell within one standard error of estimate, plus or minus, and ninety-four percent of the predicted grades were within two standard errors of the estimate.

Summary of Section I

Hypothesis I assumes that there is no significant relationship between grade point average earned the semester after transfer for students transferring from two-and four-year Oklahoma colleges into the College of Engineering at Oklahoma State University as juniors and the following predictor variables: Transfer GPA, ACT English, ACT Math

ACT Social Studies, ACT Natural Science, ACT Composite, Math GPA, Chemistry GPA, Physics GPA, and Basic Science GPA.

Analysis of the data reveals that all ten variables are significantly related to the criterion and may be used to predict grade point average following transfer. The null hypothesis is therefore rejected. The regression equation based on the six predictor variables, Basic Science GPA, ACT Composite, Math GPA, Transfer GPA, Chemistry GPA, and ACT English, would appear to consistently predict earned grade point average following transfer within the range of the standard error of estimate (.67).

Section II

Analysis of Data and Presentation of Information Related to Hypothesis II

Because the standard error of estimate was so large (.67) for students transferring from two-and four-year colleges it was deemed feasible to form two more homogeneous groups in order to try to reduce the standard error of estimate. The original pool of data was divided into two sub-groups for this purpose. One sub-group was made up of data from 90 students transferring from two-year colleges in Oklahoma. The second sub-group was composed of 38 students previously attending four-year colleges in Oklahoma.

Hypothesis II: There is no significant relationship between grade point average earned the semester after

transfer for students from Oklahoma two-year colleges transferring into the College of Engineering at Oklahoma State University as juniors and the following predictor variables; Transfer GPA, ACT English, ACT Math, ACT Social Studies, ACT Natural Science, ACT Composite, Math GPA, Chemistry GPA, Physics GPA, and Basic Science GPA.

A list of the ten predictor variables and the criterion variable is presented in Table VII. The mean and sigma of each variable is presented. The resulting correlation coefficient, when related to grade point average the semester after transfer, is presented with an indication of the level of significance for each significant correlation coefficient.

Table VII reveals nine predictor variables yielded significant coefficients of correlation with the criterion, grade point average earned by students transferring from two-year colleges in Oklahoma the first semester following transfer, as follows: Basic Science GPA (r=.61), Transfer GPA (r=.65), Math GPA (r=.62), Physics GPA (r=.54), Chemistry GPA (r=.41), ACT Composite (r=.39), ACT Social Studies (r=.36), ACT Natural Science (r=.33), and ACT Math (r=.30). No significant relationship was found between ACT English and the criterion. The ACT Math variable was found to be significantly related to the criterion at the .01 level. All other variables were related to the criterion at the .001 level of significance.

TABLE VII

CORRELATION COEFFICIENT WITH DEPENDENT VARIABLE STUDENTS TRANSFERRING FROM TWO-YEAR COLLEGES IN OKLAHOMA (N=90)

Predictor	Mean	Sigma	Correlation Coefficient
1. Basis Science GPA	2.80	0.67	0.66**
2. Transfer GPA	2.90	0.53	0.65**
3. Math GPA	2.73	0.85	0.62**
4. Physics GPA	2.63	0.90	0.54**
5. Chemistry GPA	3.03	0.74	0.41**
6. ACT Composite	22.27	3.75	0.39**
7. ACT Social Studies	21.05	5.27	0.36**
8. ACT Natural Science	23.58	5.13	0.33**
9. ACT Math	24.86	4.01	0.30**
10. ACT English	19.01	3.79	0.20
A. GPA the Semester After Transfer	1.92	1.03	

** Significant at the .01 level of significance.

The zero order correlations between predictor variables as well as the zero order correlations with the criterion variable are presented in Table VIII. Zero order correlations for the ten predictor variables ranged from .04 to .90. As with the data in Section I the highest intercorrelation was found to be between Transfer GPA and Basic Science GPA (.90). The lowest intercorrelations were yielded between English GPA and Physics GPA (.04), ACT Math and ACT Social Studies (.04), ACT English and Math GPA (.16) and ACT Natural Science and Physics GPA (.17).

TABLE VIII

THE INTERCORRELATION MATRIX OF THE SCORES FOR TEN PREDICTORS AND THE INDEPENDENT VARIABLE - GPA FIRST SEMESTER AFTER TRANSFER FOR STUDENTS TRANSFERRING FROM TWO-YEAR COLLEGES IN OKLAHOMA
(N=90)

	1	2	3	4	5	6	7	8	9	10	A
1. Transfer GPA		.30	.26	.42	.33	.43	.75	.70	.79	.90	.65
2. ACT English			.42	.59	.49	.75	.16	.24	.04	.19	.20
3. ACT Math				.04	.44	.65	.25	.21	.17	.27	.30
4. ACT Social Studies					.77	.89	.26	.48	.24	.39	.36
5. ACT Natural Science						.85	.19	.45	.17	.33	.33
6. ACT Composite							.29	.45	.22	.39	.39
7. Math GPA								.48	.56	.84	.62
8. Chemistry GPA									.51	.74	.41
9. Physics GPA										.84	.54
10. Basic Science GPA											.66
A. GPA First Semester After Transfer											
		.05 level of significance = .21									
		.01 level of significance = .28									
		.001 level of significance = .35									
Mean	2.90	19.01	24.86	21.05	23.58	22.27	2.73	3.03	2.63	2.80	1.92
Sigma	.53	3.79	4.01	5.27	5.13	3.75	.85	.74	.90	.67	1.03

Table VII also revealed that the mean grade point average earned during the first semester after transfer dropped .98 from 2.90 at the time of transfer to 1.92 for the first semester after transfer.

The same procedure discussed in Section I was used to derive a regression equation that might have a useful predictive capacity.

The following order of variables, as listed in Table IX were selected by the computer program for their contribution to the value of the multiple correlation coefficient; Basic Science GPA, ACT Composite, Chemistry GPA, Transfer GPA, ACT English and Math GPA.

As in Section I of this investigation step six was selected as the most appropriate equation. The multiple R was increased from 0.66 in the first step to 0.72 while the standard error of estimate was reduced from 0.78 in the first step to .74 in the sixth step. The multiple R was increased .00082 with the addition of steps 7, 8, 9, and 10, and the standard error of estimate increased with each step following step six. The multiple R in step six was .72, which implies about fifty-one percent of the variability in the criterion was accounted for by the combination of the six predictor variables in the following regression equation.

$$Y = 0.343068X_1 + 0.086563X_2 - 0.295180X_3$$
$$+0.715678X_4 - 0.046109X_5 + 0.239938X_6$$
$$-1.937495$$

TABLE IX

RESULTS OF STEPS ONE THROUGH SIX FOR ENTERING A VARIABLE INTO THE REGRESSION EQUATION IN A STEP-WISE FASHION FOR CRITERION - GPA FIRST SEMESTER AFTER TRANSFER FOR STUDENTS FROM OKLAHOMA TWO-YEAR INSTITUTIONS (N=90)

Entering Variable	Standard Error of Estimate	Constant	Variables in Regression Equation	Coefficient of Variables in Regression Equation	Multiple Correlation Coefficient
Basic Science GPA	0.78	-0.910439	Basic Science GPA	1.009907	.66
ACT Composite	0.76	-1.615993	Basic Science GPA	0.912470	.67
			ACT Composite	0.043932	
Chemistry GPA	0.75	-1.579602	Basic Science GPA	1.174938	.69
			ACT Composite	0.057269	
			Chemistry GPA	-0.352774	
Transfer GPA	0.74	-1.979739	Basic Science GPA	0.791198	.70
			ACT Composite	0.050979	
			Chemistry GPA	-0.368807	
			Transfer GPA	0.572228	
ACT English	0.74	-1.944595	Basic Science GPA	0.684943	.71
			ACT Composite	0.084917	
			Chemistry GPA	-0.385541	
			Transfer GPA	0.698486	
			ACT English	-0.042601	

TABLE IX (Continued)

Entering Variable	Standard Error of Estimate	Constant	Variables in Regression Equation	Coefficient of Variables in Regression Equation	Multiple Correlation Coefficient
Math GPA	0.74	-1.937495	Basic Science GPA	0.343068	.72
			ACT Composite	0.086563	
			Chemistry GPA	-0.295180	
			Transfer GPA	0.715678	
			ACT English	-0.046109	
			Math GPA	0.239938	

where:

X_1 = Basic Science GPA
X_2 = ACT Composite
X_3 = Chemistry GPA
X_4 = Transfer GPA
X_5 = ACT English
X_6 = Math GPA

The predicted grade point average is compared with the earned grade point average for the group under study in the Apprendix (see Table XVIII).

The standard error of estimate for step six is .74 which indicates that 68 times out of 100 the grade point earned by students during the first semester following transfer will be within the interval of the predicted range, plus or minus 0.74. A review of Table XIV in the Appendix reveals that seventy-two percent of the predictions were within one standard error of estimate.

Testing the Regression Equation

Twenty-two of the 31 students used in testing the regression equation in Section I of this chapter had attended two-year colleges. Data from those 22 students were utilized to test the predictive value of the regression equation developed for those students that attended two-year colleges in Oklahoma prior to transfer. The regression equation based on six variables: Basic Science GPA, ACT Composite, Chemistry GPA, Transfer GPA, ACT English and Math GPA produced a multiple R of 0.72 which is .0008 less than the multiple R for the regression equation which used all ten variables. The standard error of estimate for

the equation is 0.74. The results of the regression equation applied to the data for the 22 transfer students from two-year colleges are presented in Table X.

The standard error of estimate associated with the six predictor variables used in the regression equation is 0.74. The following results were obtained in relation to predicted grade point average the first semester following transfer when compared to the grade point average actually earned after transfer. Seventy-three percent of the predicted GPAs fell within one standard error of estimate, plus or minus 0.74, and ninety-six percent of the predicted grades were within two standard errors of estimate.

Summary of Section II

Hypothesis II assumes that there is no significant relationship between grade point average earned the semester after transfer for students from two-year colleges in Oklahoma transferring into the College of Engineering at Oklahoma State University as juniors and the following predictor variables: Transfer GPA, ACT English, ACT Math, ACT Social Studies, ACT Natural Science, Math GPA, Chemistry GPA, Physics GPA and Basic Science GPA.

Analysis of the data reveals that 9 of the 10 variables are significantly related to the criterion and may be used to predict grade point average following transfer. The null hypothesis is rejected for the following variables: Transfer GPA, ACT Math, ACT Social Studies, ACT Natural

TABLE X

ACTUAL AND PREDICTED GRADE POINT AVERAGE FOR FIRST SEMESTER AFTER TRANSFER FOR STUDENTS TRANSFERRING FROM OKLAHOMA TWO-YEAR COLLEGES FOR FALL SEMESTER 1968 (N=22)

Student Number	Actual GPA	Predicted GPA	Deviation
1	2.20	1.83	0.37
2	0.33	1.34	-1.01
3	1.57	0.90	0.67
4	1.80	0.89	0.91
5	2.81	2.52	0.29
6	2.62	3.13	-0.51
7	1.42	0.95	0.47
8	1.52	1.78	-0.26
9	3.11	3.09	0.01
10	1.07	1.75	-0.68
11	3.18	2.73	0.45
12	1.52	2.03	-0.51
13	2.22	1.36	0.86
14	2.60	2.96	-0.36
15	0.25	1.93	-1.68
16	0.80	1.34	-0.54
17	1.92	1.06	0.86
18	3.00	2.96	0.04
19	1.87	2.08	-0.21
20	1.81	3.09	-1.28
21	2.75	2.35	0.40
22	1.06	1.55	-0.49

Science, ACT Composite, Math GPA, Chemistry GPA, Physics GPA and Basic Science GPA. The analysis gives cause to fail to reject the null hypothesis for the ACT English variables, Basic Science GPA, ACT Composite Transfer GPA, Chemistry GPA, ACT English and Math GPA, would appear to consistently predict earned grade point average following transfer.

Section III

Analysis of Data and Presentation of Information Related to Hypothesis III

As stated in Section II of this chapter two sub-groups were formed from the original pool of data. The present section of 38 students transferring from four-year colleges in Oklahoma.

Hypothesis III: There is no significant relationship between grade point average earned the semester after transfer for students from Oklahoma four-year colleges transferring into the College of Engineering at Oklahoma State University as juniors and the following predictor variables: Transfer GPA, ACT English, ACT Math, ACT Social Studies, ACT Natural Science, ACT Composite, Math GPA, Chemistry GPA, Physics GPA and Basic Science GPA.

A list of the 10 predictor variables and the criterion variable is presented in Table XI. The mean and sigma of each variable is presented. The resulting correlation coefficient, when related to grade point average the

semester after transfer, is presented with an indication of the level of significance for each significant correlation coefficient.

TABLE XI

CORRELATION COEFFICIENT WITH DEPENDENT VARIABLE STUDENTS TRANSFERRING FROM FOUR-YEAR COLLEGES IN OKLAHOMA (N=38)

Predictor	Mean	Sigma	Correlation Coefficient
1. Basic Science GPA	2.82	0.67	0.77**
2. Math GPA	2.66	0.87	0.75**
3. Transfer GPA	2.89	0.53	0.73**
4. Physics GPA	2.76	0.79	0.55**
5. ACT Math	25.97	3.67	0.52**
6. Chemistry GPA	3.04	0.75	0.52**
7. ACT Composite	23.42	2.97	0.15
8. ACT English	19.89	3.91	0.11
9. ACT Social Studies	22.71	4.85	-0.09
10. ACT Natural Science	24.73	4.07	-0.01
A. GPA Semester After Transfer	2.01	0.76	

** Significant at the .01 level of significance.

Table XI reveals that 6 of the 10 predictor variables yielded significant coefficients of correlation with the criterion, grade point average earned by students transferring from four-year colleges in Oklahoma during the first semester following transfer as follows: Basic Science

GPA (r=.77), Math GPA (r=.75), Transfer GPA (r=.73), Physics GPA (r=.55), ACT Math (r=.52) and Chemistry GPA (r=.52). No significant relationship was found between ACT Composite, ACT English, ACT Natural Science and ACT Social Studies with the criterion. The Basic Science GPA, Math GPA and Transfer GPA variables were found to be significantly related to the criterion at the .001 level of significance. The variables Physics GPA, ACT Math and Chemistry GPA were found to be significantly related to the criterion at the .01 level of significance.

The zero order correlations between predictor variables as well as the zero order correlations with the criterion variable are presented in Table XII. Zero order correlations for the predictor variables ranged from 0.00 to 0.88. As with the students in Section I as well as the students in Section II, the highest intercorrelation was found to be between Transfer GPA and Basic Science GPA (r=.88). The lowest intercorrelations were yielded between ACT Social Studies and Math GPA (r=.00), ACT Social Studies and Chemistry GPA (r=.01). Table X also reveals that the grade point average earned the semester following transfer dropped from 2.89 at the time of transfer to 2.01, a drop of .88.

The same procedure used in Sections I and II of this chapter was used to derive a regression equation that might have a useful predictive capacity for students transferring from four-year colleges.

Table XIII presents a listing of the entering variables in each step, the standard error of estimate, coefficients for each variable in each step, the value of the constant for each step, and the multiple correlation coefficient for each step. The following order of variables, as listed in Table XIII were selected by the computer program for their contribution to the value of the multiple correlation coefficient; Basic Science GPA, Math GPA, ACT Natural Science, ACT Social Studies and Transfer GPA. The fifth step was selected as the most appropriate equation. The multiple R was increased from .77 in the first step to .80 in the fifth step which implies about sixty-five percent of the variability in the criterion was accounted for by the combination of the five predictor variables in the five step multiple regression equation. The multiple R was increased .004 with the additional 5 steps to the 10 step equation. The smallest standard error of estimate was also found at the fifth step (.48). The selected equation was:

$$Y = 0.330826X_1 + 0.233205X_2 + 0.030565X_3 - 0.027468X_4 + 0.400763 - 0.834428$$

where:

X_1 = Basic Science GPA
X_2 = Math GPA
X_3 = ACT Natural Science
X_4 = ACT Social Studies
X_5 = Transfer GPA

The values of 0.330826, 0.233205, 0.030565, -0.027468 and 0.400763 are the weights by which the values of Basic

TABLE XII

THE INTERCORRELATION MATRIX OF THE SCORES FOR TEN PREDICTORS AND THE INDEPENDENT VARIABLE - GPA FIRST SEMESTER AFTER TRANSFER FOR STUDENTS TRANSFERRING FROM OKLAHOMA FOUR-YEAR COLLEGES
(N=38)

	1	2	3	4	5	6	7	8	9	10	A
1. Transfer GPA		.12	.59	.07	-.13	.23	.84	.65	.69	.88	.73
2. ACT English			.44	.52	.54	.85	.15	.16	.02	.13	.11
3. ACT Math				.07	.08	.52	.57	.37	.49	.59	.52
4. ACT Social Studies					.46	.77	-.00	.01	-.14	-.06	-.09
5. ACT Natural Science						.70	-.07	-.08	.02	-.11	-.01
6. ACT Composite							.20	.16	.11	.16	.15
7. Math GPA								.46	.58	.88	.75
8. Chemistry GPA									.43	.69	.52
9. Physics GPA										.77	.55
10. Basic Science GPA											.77
A. GPA First Semester After Transfer		.05 level of significance = .32 .01 level of significance = .41 .001 level of significance = .51									
Mean	2.89	19.89	25.97	22.71	24.73	23.42	2.66	3.04	2.76	2.82	2.01
Sigma	.53	3.91	3.67	4.85	4.07	2.97	.87	.75	.79	.67	.76

TABLE XIII

RESULTS OF STEPS ONE THROUGH FIVE FOR ENTERING A VARIABLE INTO THE REGRESSION EQUATION IN A STEP-WISE FASHION FOR CRITERION - GPA FIRST SEMESTER AFTER TRANSFER FOR STUDENTS FROM OKLAHOMA FOUR-YEAR COLLEGES (N=38)

Entering Variable	Standard Error of Estimate	Constant	Variables in Regression Equation	Coefficient of Variables in Regression Equation	Multiple Correlation Coefficient
Basic Science GPA	0.48	-0.461789	Basic Science GPA	0.875051	.77
Math GPA	0.48	-0.303395	Basic Science GPA	0.563975	.78
			Math GPA	0.270991	
ACT Natural Science	0.48	-0.658448	Basic Science GPA	0.580611	.79
			Math GPA	0.264309	
			ACT Natural Science	0.013169	
ACT Social Studies	0.48	-0.458350	Basic Science GPA	0.550366	.79
			Math GPA	0.288492	
			ACT Natural Science	0.023934	
			ACT Social Studies	-0.019603	
Transfer GPA	0.48	-0.834428	Basic Science GPA	0.330826	.80
			Math GPA	0.233205	
			ACT Natural Science	0.030565	
			ACT Social Studies	-0.027468	
			Transfer GPA	0.400763	

Science GPA, Math GPA, ACT Natural Science, ACT Social Studies and Transfer GPA, respectively are multiplied. The products of these multiplications and the constant (-0.834428) are summed for the predicted grade point average the first semester after transfer for students transferring from four-year colleges in Oklahoma. The predicted grade point average is compared with the actual grade point average in the Appendix (see Table XIX).

The standard error of estimate for step five was .48 which indicates that 68 times out of 100 the grade point average earned the first semester after transfer will be within the interval of the predicted grade point average range plus or minus 0.48. A review of Table XIX in the Appendix reveals that seventy-four percent of the predicted grade point averages were within one standard error of the estimate.

Testing the Regression Equation

Nine students classified as juniors transferred from four year colleges in Oklahoma to the College of Engineering at Oklahoma State University in 1968. This is a subgroup of the 31 students from two and four year colleges mentioned earlier in this chapter. Data from these students was utilized to test the predictive value of the regression equation previously developed. The regression equation based on the five variables; Basic Science GPA, Math GPA, ACT Natural Science, ACT Social Studies and

Transfer GPA produced a multiple correlation coefficient of 0.80. The standard error of estimate for the equation is 0.48. The results of the equation applied to the data for the aforementioned nine students are presented in Table XIV.

The following results were obtained in relation to predicted grade point average the first semester following transfer when compared to the grade point average actually earned. Fifty-five percent of the predicted grade point averages fell within one standard error of estimate and seventy-seven percent of the predicted grade point averages were within two standard errors of estimate.

Summary of Section III

Hypothesis III assumes that there is no significant relationship between grade point average earned the semester after transfer for students from four-year colleges in Oklahoma transferring into the College of Engineering at Oklahoma State University as juniors and the following predictor variables: Transfer GPA, ACT English, ACT Math, ACT Social Studies, ACT Natural Science, ACT Composite, Math GPA, Chemistry GPA, Physics GPA and Basic Science GPA.

Analysis of the data reveals that 6 of the 10 variables are significantly related to the criterion and may be used to predict grade point average following transfer. The null hypothesis is rejected for the following variables:

Basic Science GPA, Math GPA, Transfer GPA, Physics GPA, ACT Math and Chemistry GPA. The analysis gives cause to fail to reject the null hypothesis for the variables ACT Composite, ACT English, ACT Social Studies and ACT Natural Science. The regression equation based on the five predictor variables, Basic Science GPA, Math GPA, ACT Natural Science, ACT Social Studies and Transfer GPA, would appear to not consistently predict earned grade point average following transfer for a population other than the study group.

TABLE XIV

ACTUAL AND PREDICTED GRADE POINT AVERAGE FOR FIRST SEMESTER AFTER TRANSFER FOR STUDENTS TRANSFERRING FROM FOUR-YEAR COLLEGES IN OKLAHOMA FOR FALL SEMESTER 1968 (N=9)

Student Number	Actual GPA	Predicted GPA	Deviation
23	2.00	0.88	1.12
24	1.25	1.48	-0.23
25	0.73	2.43	-1.70
26	1.71	1.30	0.41
27	3.20	2.85	0.35
28	1.50	1.13	0.37
29	1.57	1.02	0.55
30	1.75	2.11	-0.36
31	1.31	2.16	-0.85

Addenda

Table XX (see Appendix) presents the first and second semester grade point averages, as well as retention for the third consecutive semester, for each subject in this study. Table XX indicates students transferring from some colleges tend to have greater third semester retention rates than students from other colleges. Seven students transferred from college number seven yet none continued in the engineering curriculum for three consecutive semesters. Twenty-one students transferred from college number three but only seven continued their enrollment in the College of Engineering for three consecutive semesters. Twenty-three students transferred from college number five yet 19 were enrolled in the engineering curriculum for the third consecutive semester.

Tables XV and XVI indicate that students continuing in the engineering curriculum for three consecutive semesters have higher grade point averages than students not continuing in the engineering curriculum as would be expected. However, the average second semester grade point average continues to be lower for both groups of students indicating the phenomena of "transfer shock" may continue beyond the first semester following transfer.

TABLE XV

GRADE POINT AVERAGE DISTRIBUTION FOR THE FIRST AND SECOND SEMESTERS AFTER TRANSFER FOR STUDENTS ENROLLED IN ENGINEERING FOR THREE CONSECUTIVE SEMESTERS (N=94)

Grade Point Average	First Semester	Second Semester
3.50 - 4.00	8	7
3.00 - 3.49	16	10
2.50 - 2.99	25	21
2.00 - 2.49	18	30
1.50 - 1.99	18	20
1.00 - 1.49	7	5
.50 - .99	2	1
.00 - .49	0	0
Mean	2.52	2.36
SD	.51	.63

TABLE XVI

GRADE POINT AVERAGE DISTRIBUTION FOR THE FIRST AND SECOND SEMESTERS AFTER TRANSFER FOR STUDENTS NOT ENROLLING IN ENGINEERING FOR THREE CONSECUTIVE SEMESTERS

Grade Point Average	First Semester	Second Semester
3.50 - 4.00	1	0
3.00 - 3.49	0	0
2.50 - 2.99	4	2
2.00 - 2.49	6	3
1.50 - 1.99	9	4
1.00 - 1.49	20	13
.50 - .99	16	7
.00 - .49	8	5
N	65	34
Mean	1.23	1.15
SD	.73	.68

CHAPTER V

SUMMARY AND CONCLUSION

General Summary of the Investigation

This investigation was concerned with students transferring from Oklahoma colleges into the College of Engineering at the junior level. Students transferring from two-year and four-year colleges were combined for a portion of the study and later divided into two sub-groups: (a) students from two-year colleges and (b) students from four-year colleges.

The purposes of this investigation were to study selected dimensions of academic aptitude and academic performance of students transferring into the College of Engineering at Oklahoma State University after earning 60 to 90 semester credit hours in Oklahoma colleges. Combinations of variables were used to determine if the predictive capacity of the individual variables could be increased.

In this investigation the American College Test was used for the purpose of measuring academic aptitude. Measures of academic performance were limited to the areas considered as prerequisite to the engineering sciences. Those areas were grade point average in mathematics,

chemistry and physics earned prior to transfer. An additional measure in this area was a composite grade point average of the three aforementioned basic science courses.

A coefficient of correlation was used to determine relationships between grade point average earned the first semester after transfer and each of the variables. An application of multiple regression analysis, step-wise regression, was performed in order that raw scores weights for variables contributing the most value to the correlation coefficient could be determined for predicting the criterion. The regression equations were applied to data from a hold out group of students in order to test the predictive capacity of the equations.

Summary of Results

In the analysis of data, when students transferring from two-and four-year colleges were combined, it was revealed that the grade point average for the first semester work after transfer dropped almost one grade point (.96) as compared to the cumulative grade point average at the time of transfer. For this group all variables were significantly related to the grade point average earned the first semester after transfer; however, the academic performance variables were more highly correlated to the criterion than were the academic aptitude variables.

The multiple regression equation selected for prediction purposes included six steps. The equation

included four academic performance variables, Basic Science GPA, Math GPA, Transfer GPA and Chemistry GPA, and two academic aptitude variables, ACT Composite and ACT English. When the equation was applied to data from a holdout group of transfer students the predicted grade point average was consistent within the range of the standard error of estimate (.67).

The original pool of data was divided into two subgroups: (a) students previously attending two-year colleges and (b) students previously attending four-year colleges.

When the data for students previously attending two-year colleges were analyzed, it was revealed that grade point average for the first semester's work after transfer was almost one grade point (.98) lower than the cumulative grade point average at the time of transfer. Nine of the variables were significantly related to the criterion. These variables were Basic Science GPA (r=.66), Transfer GPA (r=.65), Math GPA (r=.62), Physics GPA (r=.54), Chemistry GPA (r=.41), ACT Composite (r=.39), ACT Social Studies (r=.36), ACT Natural Science (r=.33), and ACT Math (r=.30). The academic performance variables were more highly related to the criterion than were the academic aptitude variables.

The step-wise regresssion equation selected for predicting the criterion contained the same six variables as the equation used for the combined groups. Those six

variables were Basic Science GPA, ACT Composite, Chemistry GPA, Transfer GPA, ACT English, and Math GPA. Although the variables were identical, the weights assigned to the variables were different from the weights in the equation for the combined groups. When the equation was applied to a pool of hold out students it was consistent in predicting grade point average within the limits of the standard error of estimate.

Upon analyzing the data for students transferring from four-year colleges it was found that grade point average after transfer dropped almost nine-tenths of a point (.88) which is somewhat less than for students from two-year colleges (.98). The five performance variables, Transfer GPA (r=.73), Basic Science GPA (r=.77), Math GPA (r=.75), Physics GPA (r=.55), Chemistry GPA (r=.52), and the ACT Math (r=.52) variable were significantly related to the criterion when zero order correlations were computed.

The variables contained in the step-wise regression equation were composed of three academic performance variables, Basic Science GPA, Math GPA, and Transfer GPA, and two academic aptitude variables, ACT Natural Science and ACT Social Studies. The ACT Natural Science and ACT Social Studies scores seem to be closely related to reading skill. It seems somewhat unusual that these two

scores would be included rather than the ACT Math since mathematics is so closely associated with the engineering curriculum.

The multiple regression equation was consistent in predicting the criterion for the study group; however, it predicted only fifty-five percent of the small (N=9) validating group's grade point average within the parameters of the standard error of estimate.

Conclusions and Recommendations

Within the limits and findings of this study, the following conclusions and recommendations are suggested:

1. It should be expected that the grade point average earned the first semester after transfer will be approximately one point lower than the cumulative grade point average at the time of transfer for students transferring into the College of Engineering from two-and four-year colleges in Oklahoma.

2. Previous academic performance is more closely related to grade point average after transfer than academic aptitude as measured by the American College Test.

3. Academic aptitude scores enhance the predictive capacity of multiple regression equations used to predict grade point average after transfer.

4. Predictive capacity can be improved when transfer students from four-year colleges are considered separately from transfer students from two-year colleges.

5. The standard error of estimate associated with the equations for the combined groups of students and for the students from two-year colleges is too large for practical use in screening students for admission to the College of Engineering. The equation may be useful in counseling with students anticipating transferring into the College of Engineering.

6. The standard error of estimate associated with the equation for students transferring from four-year colleges is quite large (.48) but could be useful to the student and academic advisor in counseling with students anticipating transfer to the engineering programs at Oklahoma State University.

The Admission Office at Oklahoma State University provides the Student Personnel officer at each college within the university with a transcript evaluation for each transfer student. The student personnel office could obtain the ACT scores from the student's transcript or from the institution from which the student is transferring. With this information the student's adviser could multiply the appropriate variable weights plus the constant value and approximate the transfer student's grade point average for the first semester after transfer. The informed student could then, if necessary, adjust his schedule, study habits, and other factors that might effect his academic work. Some students could be positively

reinforced in continuing in the engineering curriculum while other students might desire to select some other curriculum.

7. The predictive capacity of the regression equations developed in the present study were improved by considering students from two-year colleges and four-year colleges separately. Future studies may find that grouping by individual college will further improve the capacity of predictive equations.

8. Academic achievement in the basic sciences was closely related to earned grade point average following transfer. A number of students in the present study had credit in mathematics courses which combined analytical geometry and calculus in a two semester sequence. Other students had credit in mathematics courses that treated calculus as separate courses in a three semester sequence. Some students had credit in general physics courses that used a mathematics base of algebra and trigonometry while others had credit in calculus based physics courses. Future studies may find it feasible to examine the level of preparation in mathematics and physics as a predictor of academic achievement in the engineering science courses requiring mathematics and physics as prerequisites.

9. The population size for future studies of this type could be significantly increased by considering students that transfer from out of state colleges. The increased population size may increase the R and reduce

the standard error of estimate of future multiple regression equations developed for predicting grade point average.

10. Non-academic variables such as age, marital status, socio-economic status and work experience or knowledge in fields related to the engineering profession may contribute to persistence and achievement factors not measured by the academic variables included in the present study. Future studies may find it advantageous to consider the aforementioned academic and non-academic variables in predicting a student's academic success in the engineering curriculum following transfer.

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APPENDIX

TABLE XVII

ACTUAL AND PREDICTED GRADE POINT AVERAGE FOR FIRST SEMESTER AFTER TRANSFER FOR STUDENTS FROM OKLAHOMA TWO-AND FOUR-YEAR COLLEGES (N=128)

Subject Number	Actual GPA After Transfer	Predicted GPA After Transfer	Deviation
1	0.35	1.29	-0.94
2	0.37	1.82	-1.45
3	2.31	1.90	0.41
4	0.00	1.17	-1.17
5	2.13	1.15	0.98
6	2.56	3.04	-0.48
7	1.15	1.36	-0.21
8	1.64	1.82	-0.18
9	2.71	1.30	1.41
10	2.50	1.85	0.65
11	1.33	1.07	0.26
12	2.27	2.11	0.16
13	0.92	2.08	-1.16
14	1.25	1.92	-0.67
15	0.71	1.00	-0.29
16	0.88	1.39	-0.51
17	0.60	2.16	-1.56
18	1.28	0.75	0.53
19	2.25	2.43	-0.18
20	0.25	1.07	-0.82
21	0.00	1.32	-1.32
22	0.87	2.39	-1.52
23	0.40	1.59	-1.19
24	2.37	2.36	0.01
25	1.60	2.22	-0.62
26	0.60	0.85	-0.25
27	1.66	1.60	0.06
28	1.64	1.66	-0.02
29	2.78	1.02	1.76
30	3.53	3.07	0.46
31	3.26	2.51	0.75
32	1.13	1.45	-0.32
33	2.42	2.93	-0.51
34	2.38	1.86	0.52
35	3.82	2.66	1.16
36	2.69	2.09	0.60
37	2.21	2.55	-0.34
38	3.13	2.96	0.17
39	1.55	0.89	0.66
40	2.05	1.64	0.49

TABLE XVII (Continued)

Subject Number	Actual GPA After Transfer	Predicted GPA After Transfer	Deviation
41	2.55	2.24	0.31
42	2.87	2.32	0.55
43	2.08	0.84	1.24
44	1.25	1.41	-0.16
45	0.60	1.29	-0.69
46	0.60	1.51	-0.91
47	1.60	1.74	-0.14
48	2.78	1.74	1.04
49	1.60	1.84	-0.24
50	1.88	1.90	-0.02
51	2.00	2.69	-0.69
52	3.06	2.92	0.14
53	3.29	2.83	0.46
54	0.70	1.15	-0.45
55	3.66	2.58	1.08
56	3.00	3.14	-0.14
57	2.66	2.43	0.23
58	1.13	1.97	-0.84
59	3.17	2.51	0.66
60	3.82	3.15	0.67
61	2.60	2.29	0.31
62	0.81	1.19	-0.38
63	2.20	1.59	0.61
64	3.13	2.87	0.26
65	1.14	1.09	0.05
66	2.26	1.58	0.68
67	3.06	1.49	1.57
68	0.60	1.67	-1.07
69	0.71	1.02	-0.31
70	2.66	1.93	0.73
71	1.84	1.04	0.80
72	2.13	2.01	0.12
73	2.60	2.90	-0.30
74	1.80	1.85	-0.05
75	1.80	2.61	-0.81
76	2.80	2.63	0.17
77	3.20	2.84	0.36
78	3.53	3.19	0.34
79	2.13	1.81	0.32
80	2.53	2.69	-0.16
81	0.68	1.58	-0.90
82	0.66	1.05	-0.39
83	1.09	1.91	-0.82
84	3.50	3.32	0.18

TABLE XVII (Continued)

Subject Number	Actual GPA After Transfer	Predicted GPA After Transfer	Deviation
85	1.31	1.39	-0.08
86	1.07	2.22	-1.15
87	0.00	0.81	-0.81
88	3.66	3.01	0.65
89	3.66	2.99	0.67
90	1.86	1.02	0.84
91	2.80	2.11	0.69
92	2.00	1.79	0.21
93	1.66	1.43	0.23
94	1.72	1.24	0.48
95	1.42	1.81	-0.39
96	1.42	1.06	0.36
97	1.63	2.04	-0.41
98	3.20	3.03	0.17
99	2.26	2.38	-0.12
100	2.58	1.71	0.87
101	3.05	2.86	0.19
102	0.93	2.15	-1.22
103	1.11	1.07	0.04
104	0.73	0.29	0.44
105	1.42	1.76	-0.34
106	1.00	0.81	0.19
107	3.12	2.77	0.35
108	2.75	2.31	0.44
109	1.33	2.62	-1.29
110	1.84	2.65	-0.81
111	1.80	1.39	0.41
112	2.20	2.25	-0.05
113	2.80	3.28	-0.48
114	1.00	1.64	-0.64
115	3.00	2.24	0.76
116	1.66	1.88	-0.22
117	1.37	1.59	-0.22
118	2.78	2.54	0.24
119	2.31	2.05	0.26
120	2.81	2.39	0.42
121	1.54	1.38	0.16
122	2.93	2.19	0.74
123	2.50	2.69	-0.19
124	1.43	1.48	-0.05
125	3.63	3.22	0.41
126	1.46	1.37	0.09
127	2.00	1.88	0.12
128	1.33	1.37	-0.04

TABLE XVIII

ACTUAL AND PREDICTED GRADE POINT AVERAGE FOR FIRST SEMESTER AFTER TRANSFER FOR STUDENTS FROM OKLAHOMA TWO-YEAR COLLEGES (N=90)

Subject Number	Actual GPA After Transfer	Predicted GPA After Transfer	Deviation
1	0.35	1.15	-0.80
2	0.37	1.79	-1.42
3	2.31	1.97	0.34
4	0.00	1.08	-1.08
5	2.13	1.09	1.04
6	2.56	3.00	-0.44
7	1.15	1.25	-0.10
8	1.64	1.70	-0.06
9	2.71	1.42	1.29
10	2.50	1.95	0.55
11	1.33	0.94	0.39
12	2.27	2.01	0.26
13	0.92	2.13	-1.21
14	1.25	1.95	-0.70
15	0.71	1.22	-0.51
16	0.88	1.28	-0.40
17	0.60	2.02	-1.42
18	1.28	0.69	0.59
19	2.25	2.33	-0.08
20	0.25	0.97	-0.72
21	0.00	1.26	-1.26
22	0.87	2.17	-1.30
23	0.40	1.51	-1.11
24	2.37	2.34	0.03
25	1.60	2.17	-0.57
26	0.60	0.76	-0.16
27	1.66	1.49	0.17
28	1.64	1.42	0.22
29	2.78	0.70	2.08
30	3.53	3.08	0.45
31	3.26	2.48	0.78
32	1.13	1.27	-0.14
33	2.42	3.03	-0.61
34	2.38	1.81	0.57
35	3.82	2.83	0.99
36	2.69	2.14	0.55
37	2.21	2.55	-0.34
38	3.13	3.09	0.04
39	1.55	0.95	0.60
40	2.05	1.68	0.37

TABLE XVIII (Continued)

Subject Number	Actual GPA After Transfer	Predicted GPA After Transfer	Deviation
41	2.55	2.27	0.28
42	2.87	2.32	0.55
43	2.08	0.84	1.24
44	1.25	1.38	-0.13
45	0.60	1.12	-0.52
46	0.60	1.36	-0.76
47	1.60	1.40	0.20
48	2.78	1.52	1.26
49	1.60	1.73	-0.13
50	1.88	1.86	0.02
51	2.00	2.57	-0.57
52	3.06	3.01	0.05
53	3.29	2.90	0.39
54	0.70	1.09	-0.39
55	3.66	2.59	1.07
56	3.00	3.30	-0.30
57	2.66	2.51	0.15
58	1.13	2.15	-1.02
59	3.17	2.71	0.46
60	3.82	3.24	0.58
61	2.60	2.65	-0.05
62	0.81	1.16	-0.35
63	2.20	1.33	0.87
64	3.13	2.99	0.14
65	1.14	1.18	-0.04
66	2.26	1.47	0.79
67	3.06	1.42	1.64
68	0.60	1.66	-1.06
69	0.71	0.99	-0.28
70	2.66	1.83	0.83
71	1.84	1.16	0.68
72	2.13	2.04	0.09
73	2.60	2.94	-0.34
74	1.80	1.79	0.01
75	1.80	2.53	-0.73
76	2.80	2.60	0.20
77	3.20	2.80	0.40
78	3.53	3.23	0.30
79	2.13	1.67	0.46
80	2.53	2.72	-0.19
81	0.68	1.41	-0.73
82	0.66	1.24	-0.58
83	1.09	2.08	-0.99
84	3.50	3.39	0.11
85	1.31	1.14	0.17

TABLE XVIII (Continued)

Subject Number	Actual GPA After Transfer	Predicted GPA After Transfer	Deviation
86	1.07	2.26	-1.19
87	0.00	0.75	-0.75
88	3.66	3.03	0.63
89	3.66	3.14	0.52
90	1.86	1.29	0.57

TABLE XIX

ACTUAL AND PREDICTED GRADE POINT AVERAGE FOR FIRST SEMESTER AFTER TRANSFER FOR STUDENTS FROM OKLAHOMA FOUR-YEAR COLLEGES (N=38)

Subject Number	Actual GPA After Transfer	Predicted GPA After Transfer	Deviation
91	2.80	2.41	0.39
92	2.00	1.84	0.16
93	1.66	1.76	-0.10
94	1.72	1.46	0.26
95	1.42	1.51	-0.09
96	1.42	1.08	0.34
97	1.63	1.84	-0.21
98	3.20	2.89	0.31
99	2.26	2.11	0.15
100	2.58	2.14	0.44
101	3.05	2.99	0.06
102	0.93	2.11	-1.18
103	1.11	1.22	-0.11
104	0.73	0.64	0.09
105	1.42	1.62	-0.20
106	1.00	0.89	0.11
107	3.12	2.69	0.43
108	2.75	2.48	0.27
109	1.33	2.38	-1.05
110	1.84	2.76	-0.92
111	1.80	1.53	0.27
112	2.20	2.06	0.14
113	2.80	3.10	-0.30
114	1.00	1.59	-0.59
115	3.00	2.32	0.68
116	1.66	2.16	-0.50
117	1.37	1.58	-0.21
118	2.78	2.76	0.02
119	2.31	2.22	0.09
120	2.81	2.18	0.63
121	1.54	1.31	0.23
122	2.93	2.25	0.68
123	2.50	2.74	-0.24
124	1.43	1.95	-0.52
125	3.63	2.95	0.68
126	1.46	1.32	0.14
127	2.00	1.97	0.03
128	1.33	1.53	-0.20

TABLE XX

GRADE POINT AVERAGES FOR FIRST AND SECOND SEMESTER AFTER TRANSFER - STUDY AND VALIDATION GROUPS COMBINED (N=159)

Student Number	Previous College	First Semester	Second Semester	Deviation	Enrolled in Eng'r for Third Consecutive Semester
1	1	0.35	0.00	-0.35	No
2	2	0.37	0.00	-0.37	No
3	3	2.31	2.53	0.22	Yes
4	3	0.00			No
5	3	2.13	1.64	-0.49	Yes
6	3	2.56			No
7	3	1.15			No
8	3	1.67	0.78	-0.89	No
9	3	2.71	2.35	-0.36	Yes
10	3	2.50	2.00	-0.50	Yes
11	3	1.33			No
12	3	2.27	2.20	-0.07	No
13	3	0.92	1.00	0.08	No
14	3	1.25	1.80	0.55	No
15	3	0.74	1.33	0.59	No
16	3	0.88			No
17	3	0.60	1.13	0.53	No
18	3	1.28			No
19	3	2.25	2.40	0.15	Yes
*201	3	2.20	1.94	-0.26	Yes
202	3	0.33	1.00	0.67	No
203	3	1.57	1.53	-0.04	Yes
204	3	1.80	0.71	1.09	No
20	4	0.25			No
21	4	0.00			No
22	4	0.87			No
23	4	0.40	1.80	1.40	No
24	4	2.37	2.07	-0.30	Yes
25	4	1.60	1.80	-0.20	Yes
26	4	0.60	0.00	-0.60	No
205	4	2.81	2.62	-0.19	Yes
27	5	1.16	0.66	-1.50	No
28	5	1.64	2.26	0.62	Yes
29	5	2.78	2.42	-0.36	Yes
30	5	3.53	2.68	0.85	Yes
31	5	3.26	3.06	-0.20	Yes
32	5	1.33			No
33	5	2.42	3.06	0.64	Yes

TABLE XX (Continued)

Student Number	Previous College	First Semester	Second Semester	Deviation	Enrolled in Eng'r for Third Consecutive Semester
34	5	2.38	2.66	0.28	Yes
35	5	3.82	3.80	-0.02	Yes
36	5	2.69	1.70	-0.99	Yes
37	5	2.21	3.18	0.97	Yes
38	5	3.13	2.87	-0.26	Yes
39	5	1.55	1.41	-0.14	Yes
40	5	2.05	1.64	-0.41	Yes
41	5	2.55	2.64	0.09	Yes
42	5	2.87	2.44	-0.43	Yes
43	5	2.08			No
206	5	2.62	2.18	-0.44	Yes
207	5	1.42	1.40	-0.02	Yes
208	5	1.52	1.78	0.26	Yes
209	5	3.11	2.66	-0.45	Yes
210	5	1.07	1.35	0.28	No
211	5	3.18	2.62	-0.56	Yes
44	6	1.25			No
45	6	0.60			No
46	6	0.60			No
47	6	1.60	1.46	-0.14	No
48	6	2.78	2.50	-0.28	No
49	6	1.60	2.43	0.83	Yes
50	6	1.88	1.43	-0.45	Yes
51	6	2.00	2.43	0.43	Yes
212	6	1.52	1.81	0.29	Yes
52	7	3.06	2.56	-0.50	Yes
53	7	3.29	2.35	-0.94	Yes
54	7	0.70			No
55	7	3.66	2.52	-1.14	Yes
56	7	3.00	3.60	0.60	Yes
57	7	2.66			No
58	7	1.13			No
59	7	3.17	2.88	-0.29	Yes
60	7	3.82	3.64	-0.18	Yes
61	7	2.60	2.60	0.00	Yes
62	7	0.81	1.75	0.94	Yes
63	7	2.20	2.40	0.20	Yes
64	7	3.13	2.66	-0.47	Yes
65	7	1.14	2.46	1.32	Yes
66	7	2.26	2.25	-0.01	Yes
67	7	3.06	2.11	-0.95	Yes
213	7	2.22			No
214	7	2.60	2.62	0.02	Yes

TABLE XX (Continued)

Student Number	Previous College	First Semester	Second Semester	Deviation	Enrolled in Eng'r for Third Consecutive Semester
215	7	0.25	0.00	-0.25	No
216	7	0.80			No
217	7	1.92	2.06	0.14	Yes
218	7	3.00	3.18	0.18	Yes
68	8	0.60			No
69	8	0.71			No
70	8	2.66	1.55	-1.11	Yes
71	8	1.84	1.78	-0.06	Yes
72	8	2.13	0.60	-1.53	Yes
73	8	2.60	2.17	-0.43	Yes
74	8	1.80	2.00	0.20	Yes
75	8	1.80	2.14	0.34	Yes
76	8	2.80	3.00	0.20	Yes
77	8	3.20	2.81	0.29	Yes
78	8	3.53	3.25	-0.28	Yes
79	8	2.13	2.36	0.23	Yes
80	8	2.53	1.20	-1.33	Yes
219	8	1.87	1.93	0.06	Yes
220	8	1.81	2.62	0.81	No
221	8	2.75	2.12	-0.63	Yes
222	8	1.06			No
81	9	0.68			No
82	9	0.66	1.92	1.26	No
83	9	1.09	0.60	-0.49	No
84	9	3.50			No
85	9	1.31	0.75	-0.56	No
86	9	1.07	1.00	-0.07	No
87	9	0.00			No
88	10	3.66	2.64	-1.02	Yes
89	11	3,66	3.56	-0.10	Yes
90	11	1.86			No
91	12	2.80	2.93	0.13	Yes
92	12	2.00	1.12	-0.88	No
93	12	1.66	2.20	0.54	Yes
223	12	2.00	1.53	-0.47	No
224	12	1.25	2.16	0.91	Yes
225	12	0.73	0.76	0.03	No
94	13	1.72	1.00	-0.72	No
95	13	1.42	1.62	0.20	Yes
96	13	1.42	1.33	-0.09	No
97	13	1.63			No
226	13	1.71	1.41	-0.30	No

TABLE XX (Continued)

Student Number	Previous College	First Semester	Second Semester	Deviation	Enrolled in Eng'r for Third Consecutive Semester
98	14	3.20	3.33	0.13	Yes
99	14	2.26	2.31	0.05	Yes
100	14	2.58	1.28	-0.30	Yes
101	14	3.05	3.14	0.09	Yes
102	14	0.93	1.27	0.34	Yes
103	14	1.11	1.61	0.50	Yes
104	14	0.73			No
105	14	1.42	1.38	-0.04	No
106	14	1.00			No
107	15	2.53	2.83	0.30	Yes
108	15	2.56	2.65	0.09	Yes
109	15	2.71	2.00	-0.71	Yes
110	15	2.82	2.40	-0.42	Yes
111	15	2.00	1.88	-0.12	Yes
112	15	2.20			No
113	15	2.80	2.23	-0.57	Yes
114	15	1.00	1.29	0.29	No
227	16	3.20	3.62	0.32	Yes
115	17	3.00	3.14	0.14	Yes
116	17	1.66	2.64	0.98	Yes
117	17	1.37	2.06	0.69	No
118	17	2.78	1.94	-0.84	Yes
119	17	2.31	2.75	0.44	Yes
120	17	2.81	2.15	-0.66	Yes
228	17	1.50	1.53	0.03	Yes
121	18	1.54	0.00	-1.54	No
122	18	2.93	3.06	0.09	Yes
123	18	2.50			No
124	18	1.43	0.66	-0.77	No
125	18	3.63	3.55	-0.08	Yes
126	18	1.46	2.16	0.70	No
127	18	2.00	3.52	1.52	Yes
128	18	1.33	2.00	0.67	Yes
229	18	1.57	1.88	0.31	Yes
230	18	1.75	2.06	0.31	Yes
231	18	1.31	2.46	1.15	Yes

* 200 series number indicate students in the validation group, students transferring in the fall 1968.

Students 1 through 90 transferred from two-year colleges.
Students 91 through 231 transferred from four-year colleges.

LETTER OF INTRODUCTION

OKLAHOMA STATE UNIVERSITY
Stillwater, Oklahoma

March 6, 1969

TO WHOM IT MAY CONCERN:

This will advise interested persons that Mr. Eugene C. Mouser is a candidate for the Doctor of Education degree at the Oklahoma State University. As part of his doctoral program, he is conducting a study of the academic program of students that are or have been enrolled in the College of Engineering at Oklahoma State University. Your cooperation in providing him with information concerning these students will assist the College of Engineering, Oklahoma State University and your own institution if you desire an abstract of the data.

Sincerely,

(Signed)

Harry K. Brobst
Professor, Department of Psychology

REQUEST FOR ACT SCORES

OKLAHOMA STATE UNIVERSITY
Stillwater, Oklahoma

March 6, 1969

Dear Sir:

As part of a doctoral program, I am conducting a study of the academic achievement and persistence to graduation of students transferring into the College of Engineering at Oklahoma State University from the several institutions of higher education in Oklahoma. In connection with this study, I need the ACT Standard Scores of students transferring from your institution into the College of Engineering at Oklahoma State University.

According to our records, the student(s) on the accompanying record form(s) were enrolled in the College of Engineering for one or more semesters. Would your office furnish the required information and return the forms in the enclosed envelope?

Thank you for your cooperation.

Sincerely,

(Signed)

Eugene C. Mouser

Encl.

VITA

Eugene Cobb Mouser, Jr.

Candidate for the Degree of

Doctor of Education

Thesis: A PREDICTION STUDY OF STUDENTS TRANSFERRING FROM OKLAHOMA COLLEGES AS JUNIORS INTO THE COLLEGE OF ENGINEERING AT OKLAHOMA STATE UNIVERSITY

Major Field: Student Personnel and Guidance

Biographical:

Personal Data: Born at El Dorado, Kansas, April 3, 1929, the son of Eugene C. and Mary L. Mouser.

Education: Graduated from Drumright High School, Drumright, Oklahoma, in 1947; received the Bachelor of Music Education degree from Oklahoma State University, Stillwater, Oklahoma in May 1951; received the Master of Science degree with a major in school administration from Oklahoma State University, Stillwater, Oklahoma, in August 1956; completed the requirements for the Doctor of Education degree in July, 1972.

Professional Experience: Served as school band director in Carmen, Oklahoma, 1951-1953; served as school music instructor in Geary, Oklahoma, 1953-1954; served as high school music instructor in Drumright, Oklahoma, 1955-1965; served as high school counselor in Drumright, Oklahoma, 1965-1966; served as Engineering Student counselor, College of Engineering, Oklahoma State University, Stillwater, Oklahoma, 1966-1969; served as Dean of Men, Southwestern State College, Weatherford, Oklahoma, 1969-1970; served as Director of Counseling and Testing, Missouri Southern College, Joplin, Missouri, 1970-1972.

Professional Organizations: American Personnel and Guidance Association, American College Personnel Association, American School Counselors Association, Missouri Guidance Association, and Phi Delta Kappa.