THE RELATIONSHIP OF THREE PREDICTOR VARIABLES TO OVERALL FOUR-YEAR GRADE POINT AVERAGE IN THE COLLEGES OF ARTS AND SCIENCE, AGRICULTURE, AND EDUCATION AT OKLAHOMA STATE UNIVERSITY

By

ROBERT LOUIS STANCLIFF

Bachelor of Science

Oklahoma State University

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Thesis Approved:

Harry K. Grobst
Thesis Adviser

Kenneth D. Sandvold

N Durham
Dean of the Graduate College

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CHAPTER I

INTRODUCTION

There have been many studies and investigations concerned with the prediction of scholastic achievement at the college level. Studies of this type serve, in part, intellectual interests. More importantly, results of such studies can be valuable tools in the hands of placement officials, advisors, and counselors. The information gained from these studies can aid in developing screening techniques and in making decisions as to the probable success of a student in a particular program.

High school achievement is one of the most widely used indices for predictive purposes. The argument in many instances is that the best indicator of future achievement in scholastic activity is past performance in scholastic activity. Many formal investigations concerned with prediction of college achievement have found that, indeed, high school achievement is the best single indicator of college work.

A good deal of time, expense, and effort have gone into the development of tests which will serve as indicators of future performance. Some of these tests, such as the American College Test, are designed primarily for the purpose of predicting achievement at the university level. In many

colleges a student, wishing to be considered for admission, must perform satisfactorily on one or more of these tests.

In developing a set of criteria for admission, many colleges and universities give consideration to both test scores and to high school record. It is argued that combining these indices results in a more complete appraisal of the student's capabilities. Formal studies have, in general, provided evidence in support of this argument.

A majority of studies concerning prediction of college achievement have used first semester or first year college grade point average as a criterion measure. Often, groups of pre-college variables are correlated with this criterion measure. Regression equations are then derived so the criterion can be estimated from known predictive indices.

Studies of prediction beyond the freshman year are less frequently seen. The extent to which pre-college variables can predict two-year or four-year cumulative grade point averages has not been investigated so thoroughly. Many researchers are reluctant, or are unable to wait two or four years in order to gather the data necessary for such a study.

In making predictions beyond the freshman year, it would seem logical to include the first semester college grade point average as a predictive index. Achievement at the freshman level, from a common sense view, would appear to be indicative of later college work. In addition, comparisons between pre-college variables as predictors and a

sample of college work as a predictor could be made.

Knowledge of the relationships between these variables and overall college achievement would be of use to advisors and counselors concerned with probable success of the students in various academic programs. Beginning college freshmen could be given a prediction of their overall college achievement, based on pre-college data. In addition, students who had completed a semester or more of college work could be given the same prediction, based on more complete information.

Purpose of the Study and Statement of the Problem

The purpose of this study was to examine the worth of a group of variables as predictors of overall, four-year college grades. Pre-college variables and a sample of college performance were used as predictive indices.

The information gained from this study and other studies of a similiar nature may be of assistance to counselors and advisors at Oklahoma State University. Decisions concerning a student's probable level of overall achievement may be made as a result of this study. It is hoped that more complete and adequate counseling and advisory programs will be developed from information gained in studies of this nature.

It was not assumed that perfect and complete answers would be found to the questions investigated in this study. A sizable portion of the variation in overall, four-year

college grades was attributable to factors not accounted for by this study. The goal of this study was to enable statements of prediction of the criterion measure to be made at a level above chance.

The problem under investigation considered the prediction of overall, four-year grade point average in the Colleges of Agriculture, Arts and Science, and Education at Oklahoma State University. A group of predictor variables were utilized in order to make statements of prediction of four year average. The predictor variables for the study included:

1. American College Test (ACT) Composite Score
2. High School Grade Point Average
3. First semester Grade Point Average at Oklahoma State University

Correlations were determined between the indices, alone and in combinations, and the criterion of overall, four-year grade point average. Regression equations, for predictive purposes, were developed.

The questions set forth to be answered by this study were concerned with the following:

1. What is the correlation between ACT composite score and overall, four-year average?
2. What is the correlation between high school grade point average and overall, four-year grade point average?
3. What is the correlation between first semester grade point average at Oklahoma State University and over-

all, four-year grade point average?

4. What are the multiple correlations between the indices in selected combinations and the criterion?

5. What are the resulting weights of the three predictive indices for the groups under study, and to what extent do they predict the criterion?

6. Is it necessary to use separate regression equations for each of the groups, or is a single equation based on pool data adequate for predictive purposes?

Limitations of the Study

The purpose of this study was to develop statements of prediction of overall grade point averages in the above-mentioned colleges. It may be well to note several limitations of this study. The investigation was conducted within three colleges at Oklahoma State University. The results of this study should not be considered applicable to other colleges within this university, or to other universities.

Consideration should be given to the extent to which these study groups are representative of the graduating senior classes of these respective colleges. The observations were made on the basis of available data, and upon the further requirement that the students progressed through four consecutive years of college work and did not change from one college to another during this time. The extent to which these groups' achievements are representative of their respective colleges' achievements is unknown.

The study groups for this investigation were quite small in size. In order to make valid generalizations from the results, larger groups of students would be needed.

As is the case in many studies of this kind, a considerable portion of the total criterion variance was unaccounted for. While the information gained from this type of study enables decisions to be made at a level much higher than chance, it would be most helpful to introduce other variables which would account for a portion of the remaining variance.

Although several limitations are evident, the study does utilize a group of variables to make predictions at a level above chance. It also offers a group of data and a start in the development of more adequate methods of making statements of prediction representative of these colleges.

CHAPTER II

REVIEW OF RELATED LITERATURE

The topic of academic prediction has been investigated by a variety of research methods. Many types of variables, both intellectual and nonintellectual, have been used for prediction of achievement at the university level. This study is not a replication of any of the investigations summarized in the review of related literature. Each reported summary does, however, provide information of direct relevance and importance to this investigation.

The literature will be classified into three main categories: (1) High school grades as predictors of college grades; (2) The American College Test (ACT) as a predictor of college grades; (3) Predictions beyond the freshman year.

High School Grades as Predictors of College Grades

Chahbazi conducted a study at Cornell University to determine the relative valdity of several aptitude and achievement tests, and secondary school averages for predicting first term grades for the 1951, 1952, and 1953 freshmen classes in the College of Agriculture. The tests included: (1) Cooperative Reading Test, Speed of Comprehension; (2) Cornell Mathematics Test; (3) Cooperative Science Test, and

(4) Ohio State Psychological Examination. Correlations were computed between each variable and all other variables and between each variable and the criterion of first term college grade point average. A multiple regression equation, for predictive purposes, was also derived. Secondary school average produced the largest beta weight, nearly twice as large as the next highest weight. The multiple correlation coefficient was .536.[1]

A study was conducted by Altus at the University of California to determine the coefficients of correlation for secondary school average with first semester University grades, in comparison with correlations for the verbal and mathematics sections of the Scholastic Aptitude Test. A 60-point questionnaire which proposed to measure attitudes associated with grade-getting was also included. The data in the article represented about half of the entering freshmen of 1958. The subjects were divided by sex for purposes of analysis. Secondary school grade point average yielded the highest correlation coefficients, .372 for men and .439 for women. The validity coefficients for the verbal and mathematics tests were .120 and .163, respectively, for males, and .337 and .386 for females. The major conclusions of the study were that females were more predictable, academically, than males, and high school grade point average

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[1]Parviz Chahbazi, "The prediction of Achievement in the College of Agriculture," Educational and Psychological Measurement, XV, (Winter, 1956), pp. 484-485.

was the best predictor variable.[2]

Michael and associates studied the predictive validity of high school grade point average and verbal, mathematic, and total (unweighted) scores on the Scholastic Aptitude Test of the College Entrance Examination Board (CEEB) individually, and in combination, relative to a criterion of freshman year grade point average. Subjects for the study were 209 men and 233 women who were freshmen in the College of Letters, Arts and Science at the University of Southern California during the 1960-61 school year. Correlational and multiple regression analysis was effected for each sex group. High school grade point average was the best predictor variable; .52 for females and .40 for males. The combination of high school GPA and CEEB total scores yielded coefficients of .44 for males and .56 for females. High school GPA and differentially weighted verbal and quantitative CEEB scores combined to produce correlations of .44 for males and .61 for females.[3]

Michael and Jones conducted an investigation of five sets of samples of freshmen males and freshmen females, who

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[2]William D. Altus, "Correlation Data for First-Semester Grade Averages at the University of California, Santa Barbara," The Journal of Genetic Psychology, XCVIII, (1961), pp. 303-305.

[3]William B. Michael, Robert A. Jones, Anna Cox, Arthur Gershon, Marvin Hoover, Kenneth Katz, and Dennis Smith, "High School Record and College Board Scores as Predictors of Success in a Liberal Arts Program During the Freshman Year of College," Educational and Psychological Measurements, XXII, (Summer, 1962), pp. 399-400.

entered the College of Letters, Arts and Science of the University of Southern California during the years of 1956, 1957, 1958, 1960, and 1961. Part and total scores of the Scholastic Aptitude Test (SAT) of the College Entrance Examination Board (CEEB), and grades in academic high school courses were used alone, and in combinations, to determine the magnitude of predictive validity, from class to class. The data were analyzed by correlational and multiple regression techniques. High school achievement was found to be the best single predictor of success in college work for both men and women. The beta weight for high school record received a weight approximately twice that associated with the next highest predictor variable. It was also found that a combination of high school record and scores on the SAT (either total score or part score) yielded higher validities than any single predictor.[4]

A study based on a variety of institutions over a period of five years was reported by Hills. The study was conducted within the University System of Georgia for the years 1958 through 1962. Data from 19 colleges were used in the study. The predictor variables included scores on the College Board's Scholastic Aptitude Test (SAT verbal and mathematics scores) and high school grade point average. The

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[4]William B. Michael and Robert A. Jones, "Stability of Predictive validities of High School Grades and Scores on the Scholastic Aptitude Test of the College Entrance Examination Board for Liberal Arts Students," Educational and Psychological Measurement, XXIII, (Summer, 1963), pp. 375-378.

criterion variable was first year college grade point average. Subjects for the study were all students who entered the System as beginning freshmen in the Fall of 1958, 1959, 1960, 1961, and 1962 and remained in school for the entire academic year.

Correlations were made individually between the predictor variables and the criterion, and multiple correlations were also computed. High school average was the best single predictor, having an average correlation of .55 for the five years. The average multiple correlation of the verbal scale, mathematics scale, and high school average with first year average was .65. In addition, females were found to be more predictable than males.[5]

There have been varied opinions as to the best method of expressing high school grades for purposes of prediction. At Georgia Tech, Willingham examined several possible methods of summarizing high school record. Efficiency of predicting freshman grades from high school grades, alone and in combination with admission test scores, was the evaluative criterion. The predictive measures included in the analysis were: (1) Scholastic Aptitude Test-Verbal; (2) Scholastic Aptitude Test-Mathematics; (3) College Board Mathematics Achievement Test; (4) College Board Science Achievement Test; (5) Math-Science Average; (6) High school

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[5]John R. Hills, "Prediction of College Grades for all Public Colleges of a State," Journal of Educational Measurement, XLII, (Winter, 1966), pp. 155-159.

average based only on courses considered academic; (7) Overall high school grades; (8) Academic average stanine; (9) High school rank-converted; (10) High school rank stanine; (11) Freshman average.

Data from two groups of students were used in the study. These were all students who entered Georgia Tech from a domestic high school in the Fall of 1957 with data for variables 1, 2, 5, 6, 7, 9, 10, and 11, and students who entered Georgia Tech in the Fall of 1960 with data for variables 1, 2, 3, 4, 6, 8, 9, 10, and 11. Correlations were made between the predictive indices and the criterion, and multiple correlations were computed. The results of the investigation were as follows: High school rank stanine was a better predictor than academic average (P=.02); when high school performance was expressed as an average grade, the average for academic courses and the average for all courses taken were equally valid; predictions based on test scores and rank stanine were better than predictors which included test scores and high school averages but the differences were quite small. The author concluded that one index of high school performance was unlikely to be better than another for predictive purposes.[6]

The question of "total" vs. "academic" high school average as a predictor variable was investigated by Hill and

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[6]Warren W. Willingham, "Validity of Several Methods of Expressing High School Achievement Level," College and University, XL, (Fall, 1964), pp. 49-54.

Klock. They analyzed data from a major state university, a coeducational state college, a four-year woman's college, and a two-year agriculture junior college in an effort to represent a variety of institutions. Multiple correlations of College Board SAT scores and "academic" high school averages versus SAT scores and "total" high school averages were computed relative to a criterion of first-year college grades. The authors concluded that there was not enough difference between the multiple correlations in the two pairs to warrant the extra effort of differentiating between academic and non-academic courses. It was noted, however, that it may not be safe to generalize the findings of this study to high school average used alone, without test scores as predictors.[7]

Elton, at the University of Kentucky, conducted a study to determine whether the difference between cumulative three-year high school average and senior year average was a reliable predictor of college achievement. The criterion measure for the investigation was grade-point average at the end of the freshman year. Analysis was made on the grade average of 65 males whose 12th grade average was higher than the average through the 11th grade; 70 males whose 12th grade average was lower than the average through the 11th grade; 49 females whose 12th grade average was higher than

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[7]John R. Hills and Joseph A. Klock, "Total" vs. "Academic" High School Averages in College Grade Prediction," College and University, XLII, (Winter, 1966), pp. 231-232.

the average through the 11th grade; and 54 females whose 12 grade average was lower than the three year cumulative average. American College Test (ACT) composite scores were also used and were found to be the most effective variable in predicting the criterion. The major findings of the study were: (1) 11th grade cumulative average is of equal importance as a predictor for both boys and girls; (2) 12th grade average, while not a significant variable, is a slightly better predictor for females than males; (3) the difference, either positive or negative, between the senior year grade average and the average earned through the junior year was not a reliable predictor of college achievement.[8]

The American College Test (ACT) as a Predictor of College Grades

The American College Test (ACT) was studied by Peters and Plog for its effectiveness in replacing the Ohio State University English and Mathematics placement tests and the Ohio State Psychological Examination. These tests served as predictors, and were correlated with a criterion of first quarter grades at Ohio State University. The ACT total score was found to be the best predictor of first quarter grades (r=.56). It was found that in mathematics courses, Ohio State University tests were more closely related to

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[8]Charles F. Elton, "The High School Average: When is a Difference Different?", College and University, XLII, (Winter, 1966), pp. 185-188.

course grades at the low and middle range of scores distributions than was the ACT math score. At the high range of scores, the two tests were the same with respect to correlation with grades. Correlations between OSU English Test scores and grades were consistently higher than correlations between grades and ACT English Test scores, with a single exception. The authors concluded that the difference between ACT predictability and OSU test predictability was that the latter tests were designed more for specific needs within a particular university.[9]

Brown and Wolins reported a summary of research done with the ACT at Iowa State University. The research was conducted over a three year period and the subjects were divided into five groups by college and sex. Major emphasis in the study was placed upon the ACT, an important tool in the university's testing program. Predictors for the study included high school grades, a battery of admission examinations, and the ACT with its subtests. The criterion was the first-quarter grade point average. The data were analyzed by the multiple regression model. The major results were as follows: (1) the best single predictor was high school performance (r=.47 to .72), followed by ACT-composite scores (r=.46 to .70); (2) the two-variable multiple correlation coefficients based upon ACT-Comp and high school grades give

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[9]Frank R. Peters and Eugenia A. Plog, "The Effectiveness of the ACT for Selection and Placement at the Ohio State University," Educational Research Bulletin, XL, (December, 1961), pp. 232-241, 252.

as good a prediction as high school grades plus the best test in the freshman battery; (3) grade prediction tables based on two variables are essentially as accurate as a three or four dimension predictor; (4) ACT composite was better as a predictor of grade point average than any of the subtests; (5) the ACT subtests are not difficult enough; (6) the battery is inefficient in terms of student time; (7) the subtests do not have differential validity.[10]

An investigation by Foster and Danskin at Kansas State University studied the relationship between: (1) first semester college grades and the American College Test (ACT) alone, and in combination with high school rank (HSR); (2) estimated and obtained grades; and (3) the ACT and grades in nine courses. The study was conducted in the Colleges of Agriculture, Arts and Science, Engineering, and Home Economics, with each college being divided into male and female groups. The results of the first study indicate that the ACT alone predicts 35 to 50 percent of the variance in obtained grades, and in combination with HSR predicts from 45 to 60 percent of the variance. The second study used regression weights developed in 1961 freshmen to estimate the grades of 1962 freshmen. The correlations between estimated and obtained grades point average ranged from .54 to .75. The results of the third study yielded correlations between

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[10]Fredrick G. Brown and Leroy Wolins, "An Empirical Evaluation of the American College Testing Program," Personnel and Guidance Journal, XLIII, (January, 1965), pp. 451-456.

a criterion of course grades and predictor variables, consisting of ACT subtests and composite scores and high school grades. The coefficients were around .60 for six of the courses and between .42 and .55 for three.[11]

DeSena and Weber conducted an investigation to: (1) find the correlations between the Verbal, Quantitative, and Total scores of the School and College Ability Test (SCAT) and grade point average of students who had completed two semesters of work at Notre Dame College; (2) find the correlation between the subtests, and composite scores, of the ACT and grade point averages of another class that had completed two semesters of work at Notre Dame College; and (3) find the better of the two tests for purposes of prediction of successful college achievement. Analysis of the data yielded a correlation of .52 between ACT composite scores and the criterion. The highest correlation of an ACT subtest was .44, for mathematics. SCAT total correlated .67 with the criterion, SCAT Verbal .60, and SCAT Quantitative .62. The authors concluded that there was not a significant difference between the correlations for ACT Composite and SCAT Total scores. The observed difference suggested that the SCAT Total may be the better predictor of college achievement.[12]

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[11]James M. Foster and David G. Danskin, "The American College Test (ACT) Tested Three Ways," Personnel and Guidance Journal, XLII, (May, 1965), pp. 904-909.

[12]Paul A. DeSena and Louise Ann Weber, "The Predictive

Predictions Beyond the Freshman Year

A study was conducted by Ahman in the Division of Engineering at Iowa State College to devise an instrument to predict the probability of academic success of students in engineering who transferred from other institutions of higher learning. The criterion was defined as graduation from the engineering program at Iowa State College. Predictor variables included Linguistic and Quantitative raw scores on the American Council of Education Psychological Examination, 1945 Edition; high school grade point averages; raw scores on the United States Armed Forces Institute Test of Correctness and Effectiveness of Expression, College Level; ratings of each student's prior achievement based on the transcript of his credits; and first quarter grade point averages at Iowa State College. Biserial correlations were computed between the criterion and all predictor variables, and multiple biserial coefficients were derived. The highest biserial correlations were for first quarter average, .655, rating of prior achievement, .396, and high school average .312. The multiple biserial coefficient obtained by use of all predictor variables except the Linguistic score of the ACE test was .686. Tables of chances in 100 of graduating were computed so predictions based on var-

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Validity off the School College Ability Test (SCAT) and the American College Test (ACT) at a Liberal Arts College for Women," Educational and Psychological Measurement, XXV, (Winter, 1965), pp. 1149-1151.

iable scores could be made. First quarter grade point average was the best predictor variable in this instance, the maximum predictive ability being 75 chances in 100 of graduating.[13]

French reported a validity study, using the Scholastic Aptitude Test, Verbal and Mathematical; CEEB English Composition Test; high school record; and a group of newly developed aptitude tests. The validities of these indices for predicting freshman grade point averages were compared with their ability to predict cumulative four-year average and graduation vs. non-graduation. In addition, freshman grades within the areas of Science and Math, Social Science, and Humanities and Language were compared with cumulative grades in these same areas. The major findings of the study were: (1) tests that are valid for predicting freshman grades are equally valid, within very minor changes, for predicting cumulative grades. For use in validity studies, freshman grade average is a satisfactory substitute for four-year cumulative average; (2) high school record correlated as highly with cumulative average as with freshman average, .46 in both instances; (3) high school record predicts freshman average grades better than it predicts grades in major field work; (4) SAT-V correlated with freshman average .44 and with cumulative average .43; (5) two of the experimental

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[13]J. Stanley Ahman, "Prediction of the Probability of Graduation of Engineering Transfer students," Journal of Experimental Education, XXII, (June, 1955), pp. 281-287.

tests, Government and Literature Information, were more valid for predicting cumulative four-year average than SAT, when they had been corrected for restriction of range and test length; (6) none of the indices has an appreciable validity for predicting graduation.[14]

In the Georgia University System, an investigation was conducted by Hills, Bush, and Klock to determine the worth of the Scholastic Aptitude Test scores, Verbal and Mathematics, and High school averages as predictors of cumulative sophomore average grades and cumulative senior average grades. Data from 16 colleges, representing 3,303 students, were used in the study. The multiple correlation between the predictors and cumulative sophomore average for males was .58, and for cumulative senior average .65. The predicted freshman average grades, based on SAT Verbal and Mathematical scores and high school average, correlated in the .60's with obtained cumulative sophomore and cumulative senior averages.[15]

The School and College Ability Test (SCAT) was used by Distefano and Rice to predict academic performance at Louisiania College. Verbal, Quantitative, and Total scores of 698 entering freshmen were correlated with first year grade

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[14]John W. French, "Validation of New Item Types Against Four-Year Academic Criteria," Journal of Educational Psychology, XLIX, (April, 1958), pp. 67-76.

[15]John R. Hills, Marilyn L. Bush, and Joseph A. Klock, "Predicting Grades Beyond the Freshman Year," College Board Review, LIV, (Fall, 1964), pp. 23-25.

point average. The resulting coefficients were .48, .16, and .48, respectively. The four-year grade point averages of 110 students were correlated with the Verbal, Quantitative, and Total scales, with resulting coefficients of .68, .38, and .61, respectively. The Verbal scale was found to be the best predictor of academic performance.[16]

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[16]M. K. Distefano, Jr. and Mary L. Rice, "Predicting Academic Performance in a Small Southern College," Educational and Psychological Measurement, XXVI, (Summer, 1966), pp. 487-489.

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 were chosen from students who enrolled in the Colleges of Agriculture, Arts and Science, and Education at Oklahoma State University in the Fall of 1963. At this time the American College Test (ACT) was administered to them. The selection of students for this study was made in the Spring of 1967. Criteria for selection included the following: (1) The students enrolled as first-semester freshmen in the Fall of 1963; (2) The students completed the requirements for the baccalaureate degree in the Spring of 1967; (3) The students did not change colleges while completing this degree work. All subjects within these colleges for whom the necessary data were available were chosen.

The subjects were divided into groups according to college and sex. This division yielded the following groups:

1. Education-Female, 41 students

2. Agriculture-Male, 43 students

3. Arts and Science-Male, 53 students

4. Arts and Science-Female, 59 students

A fifth group based on pooled data from all four groups was also established. Sex differences were taken into account because review of the literature indicated that females are often more predictable, academically, than are males. A group of male students from the College of Education and a female group from the College of Agriculture were not included because of insufficient numbers of subjects with necessary data.

Ten subjects were randomly selected from each of the four study groups. Data from these subjects were used to provide a check of the predictive accuracy of the regression equations. Statistical analysis for the study was conducted on the basis of 31 females in the College of Education, 33 males in the College of Agriculture, 43 males in the College of Arts and Science, and 49 females in the College of Arts and Science. Group five, based on pooled data, consisted of 156 males and females.

These particular colleges were chosen for several reasons. First, the largest groups of students with all the necessary data were in these colleges. These colleges have different curriculum programs, and thus success may be determined by a different set of factors within each college. A final consideration was the fact that less research has been done at this university within these colleges than

within other colleges.

The Predictive Indices

The predictive indices for the current study include the American College Test (ACT) composite score, high school grade point average, and first semester grade point average at Oklahoma State University.

American College Test

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 19 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.[1] The program has continued to grow and to become a most useful, and required, or strongly recommended, instrument for advisors and placement personnel.

The test consists of four parts: English Usage, Mathematical Usage, Social Studies Reading, and Natural Science Reading. Scores are obtained for each subtest, plus a composite score. The English Usage Test is an 80-item, 50-minute test which proposes to measure educational development

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[1]Oscar K. Buros, Sixth Mental Measurement Yearbook, (New Jersey, 1965), p. 2.

in the use of basic elements of correct and effective writing. The elements include punctuation, capitalization, diction, phraseology, and organization.

The Mathematics Usage Test consists of 40 items, with a 50-minute time limit. Two general types of problems are contained in this test: quantitative reasoning based on timely situations, and formal exercises in geometry, first-year algebra, and advanced arithmetic. This subtest proposes to measure educational development in the use of mathematical principles for solving quantitative problems and in the interpretation of graphs and charts.

The Social Studies Reading Test is a 52-item, 40-minute test designed to measure ability to read materials from the social studies with critical understanding and to engage in types of reasoning and problem solving relevant to these fields. Necessary skills tested include reasoning and taking into account the author's biases and points of view, evaluating the evidence and distinguishing between facts and opinions, grasping implied meanings, detecting the techniques of the demagogue, and recognizing faulty logic.

The Natural Science Reading Test proposes to measure ability to interpret and evaluate reading materials in the natural sciences. It consists of 52 items and has a time limit of 40 minutes. A large number of items require the student to demonstrate an understanding of the purposes of experiments, the hypothesis tested by them, the logical relationships among them, and valid generalizations or conclu-

sions that can be inferred from the series of experiments as a whole. Some of the passages present materials unfamiliar to most high school students. The task in this case is to assimilate and master new materials.[2]

The ACT appears to be a rather sound testing program which fulfills several purposes. It is useful in determining admission to college, and is helpful in guidance work at the university level. It is a helpful tool in determining placement in different courses within the four major areas covered by the test, as well as being a significant predictor of overall grade point average. In some instances, it is used as a criterion for awarding loans and scholarships.[3]

For colleges and universities participating in the ACT research program, a group of predictions of academic success are made. These include predictions of grades in English, Mathematics, Social Science, and Natural Science, as well as overall grade point average. A set of predictions are made on the basis of ACT subtest scores and composite scores only, and another set using these indices in combination with high school grades.

Engelhart, in a review, reported on the reliability of the ACT, form-AC, for a sample of 990 high school seniors. The odd-even reliability coefficients were .90, .89, .86, and .83 for English, Mathematics, Social Sciences, and Natu-

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[2]Ibid., p. 3.

[3]Ibid., p. 2.

ral Sciences, respectively. The odd-even reliability on the composite standard score was .95.[4]

Findlay noted that the 1961 ACT Technical Report showed split-half reliabilities for the ACT tests of .83 to .88. The lowest reliabilities were for the two reading tests (.83 to .86). He concluded that the composite score is adequate as a predictor of college achievement, but the separate tests do not have differential predictability.[5]

The composite score will be used in this study. The review of the literature and the critical reviews presented in Buros' Sixth Mental Measurement Yearbook suggest that this is the best index for prediction of grade point average.

High School Grade Point Average

This index has characteristically been found to be one of the best predictors of college grades. A brief recall of the literature reviewed for this study will support this statement. A majority of the studies employing high school grades have made predictions of first semester or first year grade point average only. It may be worthwhile to investigate the use of this variable as a predictor of overall grades in college.

The high school grades were obtained from the Regis-

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[4]Ibid., p. 6.

[5]Ibid., p. 8.

trar's files at Oklahoma State University. The grades were recorded on transcripts, in several different grading systems. These various grading systems were converted to a common scale with the following weights:

A = 4 points

B = 3 points

C = 2 points

D = 1 point

F = 0 points

By converting the grades to this system, the high school grades were made comparable to first semester college grades and overall, four-year grade point averages.

In computing the average grade, all courses taken in high school for which grades were assigned, were used. It will be recalled from the review of the literature that high school grades based on all coursework are as good for predicting college work as are high school grades based on "academic" course work.

First Semester College Grades

Many prediction studies make use of this index as a criterion measure. It would seem a logical choice as a predictor of grades beyond the freshman year. It makes use of a sample of university level work for predictions of further university work. Also, comparisons can be made between the predictive power of early college work and pre-college data.

These grades were obtained from the Registrar's office

at Oklahoma State University. The grades from all courses taken during the first semester were used to compute the mean grade point average. The university grading system of A = 4 points, B = 3 points, C = 2 points, D = 1 point, and F = 0 points was used in computing these averages.

The Criterion

The criterion measure for this study was overall grade point average for the four years of college work. These grades were also obtained from the Registrar's files at Oklahoma State University. In computing these averages, grades received in all course work were used. It would seem that by considering all courses taken in the computation of overall grade point average, a more representative index of ability would be obtained. The university grading system was used for these grades also.

Method of Analysis

Five study groups were used in the statistical analysis. These included the College of Education-Female, N = 31; College of Agriculture-Male, N = 33; College of Arts and Science-Male, N = 43; College of Arts and Science-Female, N = 49, and a group based on pooled data from all four groups, N = 156. Analysis began with the computation of zero-order correlation coefficients between each predictive index and every other index, and between the criterion and each index. In Chapter IV the correlation matrices for each

of the study groups will be presented.

A step-wise regression analysis was used in further analyzing the data. By this method, partial correlation coefficients are derived between each variable and the criterion measure. The variable whose partial correlation with the criterion measure is highest is entered in the first step of the multiple correlation matrix. The second step involves combining the variable whose partial coefficient of correlation with the criterion is second highest with the variable used in step one. This step-wise buildup continues until all the predictor variables have been included. The resulting matrices of multiple correlation for each study group will be presented in Chapter IV.

Multiple regression equations based on raw score weights were next developed. By use of these equations, the criterion of overall, four-year grade point average can be predicted from known predictive indices.

The predictive accuracy of the multiple regression equations was tested by means of data from the four hold-out groups. It will be recalled that ten subjects were randomly selected from each of the first four study groups for this purpose, and the data from these subjects' records were not used in the statistical analysis. For group V, based on pooled data, all forty of the hold-out subjects were used. The data from these subjects were substituted into the appropriate equations, and the resulting predicted grade point averages were compared with the obtained average grades of

these students.

A more detailed discussion of the analysis, along with the results, will be presented in Chapter IV.

CHAPTER IV

TREATMENT OF THE DATA AND ANALYSIS OF RESULTS

The current chapter is concerned with the presentation and analysis of the results of this investigation. The intercorrelations between the predictor variables for the five groups will be presented. These include the correlations derived between values of ACT composite score, high school grade point average, and first semester college grade point average. Correlations will also be presented between each predictor variable for each group, and the criterion of overall, four-year grade point average.

Multiple correlations will be developed on a step-wise buildup between the indices in combinations and the criterion measure. Regression equations for purposes of predicting the criterion from known predictor variables will be listed. These equations will be tested for their predictive value by means of data from the hold-out groups.

Matrices of Intercorrelation for the Predictor Variables

The computations necessary for this study were derived by means of the 7040 IBM computer at the University Computer Center. Computations for the intercorrelation matrices included the means of the predictor and criterion variables,

the sums and sums of squares for each variable, the sums of cross-products for each variable, and zero-order correlation coefficients between each predictor variable and the criterion measure. The intercorrelations for groups I, II, III, IV, and V are presented in tables I, II, III, IV and V respectively.

TABLE I

COEFFICIENTS OF CORRELATION OF THREE PREDICTOR VARIABLES WITH A CRITERION OF OVERALL FOUR-YEAR GRADE POINT AVERAGE IN THE COLLEGE OF EDUCATION, (GROUP I), N = 31 FEMALES

Predictor Variable	1	2	3	Criterion
1. ACT Composite Score		.268	.332	.448
2. First Semester GPA			.490	.679
3. High School GPA				.513

TABLE II

COEFFICIENTS OF CORRELATION OF THREE PREDICTOR VARIABLES WITH A CRITERION OF OVERALL FOUR-YEAR GRADE POINT AVERAGE IN THE COLLEGE OF AGRICULTURE, (GROUP II), N = 33 MALES

Predictor Variable	1	2	3	Criterion
1. ACT Composite Score		.482	.541	.327
2. First Semester GPA			.518	.575
3. High School GPA				.514

TABLE III

COEFFICIENTS OF CORRELATION OF THREE PREDICTOR VARIABLES WITH A CRITERION OF OVERALL FOUR-YEAR GRADE POINT AVERAGE IN THE COLLEGE OF ARTS AND SCIENCE, (GROUP III), N = 43 MALES

Predictor Variable	1	2	3	Criterion
1. ACT Composite Score		.436	.495	.419
2. First Semester GPA			.470	.777
3. High School GPA				.459

TABLE IV

COEFFICIENTS OF CORRELATION OF THREE PREDICTOR VARIABLES WITH A CRITERION OF OVERALL FOUR-YEAR GRADE POINT AVERAGE IN THE COLLEGE OF ARTS AND SCIENCE, (GROUP IV), N = 49 FEMALES

Predictor Variable	1	2	3	Criterion
1. ACT Composite Score		.411	.467	.412
2. First Semester GPA			.577	.800
3. High School GPA				.501

TABLE V

COEFFICIENTS OF CORRELATION OF THREE PREDICTOR VARIABLES WITH A CRITERION OF OVERALL FOUR-YEAR GRADE POINT AVERAGE IN THE COLLEGES OF EDUCATION, AGRICULTURE, AND ARTS AND SCIENCE TREATED AS A SINGLE GROUP, (GROUP V), N = 156 MALES AND FEMALES

Predictor Variable	1	2	3	Criterion
1. ACT Composite Score		.427	.443	.388
2. First Semester GPA			.524	.723
3. High School GPA				.501

By inspecting the tables it was found that the highest intercorrelations among predictor variables in the groups of Education-Females, Arts and Science-Female, and Group V, based on pooled data, were between first semester grade point average and high school grade point average. The coefficients of correlation were .490, .577, and .524, respectively. The implication is that these two variables have the highest degree of common elements.

For the groups of Agriculture-Males and Arts and Science-Males, the highest intercorrelations were between ACT composite score and high school grade point average. The coefficients of correlation were .541 and .495, respectively. These results indicate the possibility of sex differences with respect to the intercorrelations of these variables.

In every group, the intercorrelation of ACT composite score and first semester grade point average yielded the lowest coefficients of correlation. These coefficients were .268, .482, .436, .411, and .427 for groups I, II, III, IV, and V, respectively. The relationship between these two variables appears to be the lowest of any combination of variables.

Correlations of the Predictive Indices With Overall, Four-Year Grade Point Average

In comparing correlations between the predictor variables and the criterion measure, it was found that first semester college grade point average yielded the highest coefficient for each of the groups. The coefficients were .679, .575, .777, .800, and .723 for groups I, II, III, IV, and V, respectively. This finding indicates that the best single indicator of overall college achievement is a sample of this achievement.

The smallest coefficients of correlation were between ACT composite score and the criterion measure. For groups I, II, III, IV, and V, the coefficients were .448, .327, .419, .412, and .388, respectively. It would seem that in order to make useful statements of prediction of overall college grades, the ACT scores would have to be combined with other predictive measures.

High school grade point averages had a relatively high correlation with overall grade point average. The correla-

tions for this index were .513, .514, .459, .501, and .501 for groups I, II, III, IV, and V, respectively.

After examining the relationship of the predictive indices to the criterion measure individually, it would seem worthwhile to combine them in an effort to obtain a multiple correlation coefficient which is appreciably larger than the correlation of any single variable. The next step in the investigation dealt with this problem.

In determining the multiple correlations and the resulting weights, a step-wise procedure was followed. According to this procedure, partial correlation coefficients between the predictor variables and the criterion measure were computed. The variable whose partial correlation coefficient with the criterion was highest was entered in the first step of the procedure. Step two of the procedure involved taking the predictor variable whose partial correlation with the criterion was second highest, and combining it with the variable used in step one. In the third step of the procedure, the remaining variable was combined and the coefficient determined.

Matrices of multiple correlations were developed. Tables VI, VII, VIII, IX, and X summarize the results of these computations.

First semester grade point average was the variable entered in the first step of the procedure. This was true for each of the five groups. The correlations of this variable with the criterion were .679, .575, .777, .799, and .723 for

groups I, II, III, IV, and V, respectively.

TABLE VI

COEFFICIENTS OF MULTIPLE CORRELATION BETWEEN THE CRITERION OF OVERALL FOUR-YEAR GRADE POINT AVERAGE AND SELECTED COMBINATIONS OF PREDICTOR VARIABLES FOR THE COLLEGE OF EDUCATION, (GROUP I), N = 31 FEMALES

First Semester GPA	.679
First Semester GPA X ACT Composite Score	.733
First Semester GPA X ACT Composite Score X High School GPA	.747

TABLE VII

COEFFICIENTS OF MULTIPLE CORRELATION BETWEEN THE CRITERION OF OVERALL FOUR-YEAR GRADE POINT AVERAGE AND SELECTED COMBINATIONS OF PREDICTOR VARIABLES FOR THE COLLEGE OF AGRICULTURE, (GROUP II), N = 33 MALES

First Semester GPA	.575
First Semester GPA X High School GPA	.628
First Semester GPA X High School GPA X ACT Composite Score	.629

TABLE VIII

COEFFICIENTS OF MULTIPLE CORRELATION BETWEEN THE CRITERION OF OVERALL FOUR-YEAR GRADE POINT AVERAGE AND SELECTED COMBINATIONS OF PREDICTOR VARIABLES FOR THE COLLEGE OF ARTS AND SCIENCE, (GROUP III), N = 43 MALES

First Semester GPA	.777
First Semester GPA X High School GPA	.784
First Semester GPA X High School GPA X ACT Composite Score	.786

TABLE IX

COEFFICIENTS OF MULTIPLE CORRELATION BETWEEN THE CRITERION OF OVERALL FOUR-YEAR GRADE POINT AVERAGE AND SELECTED COMBINATIONS OF PREDICTOR VARIABLES FOR THE COLLEGE OF ARTS AND SCIENCE, (GROUP IV), N = 49 FEMALES

First Semester GPA	.799
First Semester GPA X ACT Composite Score	.805
First Semester GPA X ACT Composite Score X High School GPA	.805

TABLE X

COEFFICIENTS OF MULTIPLE CORRELATION BETWEEN THE CRITERION OF OVERALL FOUR-YEAR GRADE POINT AVERAGE AND SELECTED COMBINATIONS OF PREDICTOR VARIABLES FOR THE COLLEGES OF EDUCATION, AGRICULTURE, AND ARTS AND SCIENCE TREATED AS A SINGLE GROUP, (GROUP V), N = 156 MALES AND FEMALES

First Semester GPA	.723
First Semester GPA X High School GPA	.737
First Semester GPA X High School GPA X ACT Composite Score	.739

For group I, ACT composite score was entered in step two of the procedure. The R was raised to .733. The addition of high school GPA in step three raised the coefficient to .747, a gain of only .014. Approximately 56 percent of the total criterion variance was accounted for in this group. It appears that high school GPA and ACT composite score, in combination, could be used for predictive purposes with a negligible loss in predictive power as a result of the omission of high school GPA.

High school GPA was entered in step two of the procedure for group two. The R was increased from .575 to .628. Addition of ACT composite score in step three increased the R by only .001, to .629. Approximately 40 percent of the total criterion variance was accounted for in this group. For predictive purposes, ACT composite score could be omit-

ted with little loss in predictive power.

In group three, high school GPA was the variable entered in step two, with a resulting increase in R from .777 to .784. Combining ACT composite score raised the coefficient to .786, an increase of only .002. Approximately 62 per cent of the criterion variance was accounted for within this group. The combination of first semester GPA and high school GPA appears to be sufficient for predictive purposes in this group.

The combination of ACT composite score and first semester GPA was entered in step two for group four. The R was raised, as a result of this addition, from .799 to .805. The combining of high school GPA in step three of this procedure gave no observable increase in the coefficient. For this particular group, the predictor variables accounted for approximately 65 per cent of the criterion variance. The data support the use of first semester GPA and ACT composite score, without high school GPA, for predictive purposes.

Table X summarizes the information obtained from pooling the data of groups I, II, III, and IV. In step two, high school GPA and first semester GPA were combined, and the R was increased from .723 to .737. Addition of ACT composite score increased the R to .739, an increase of only .002. Approximately 55 per cent of the criterion variance was accounted for by pooling the data.

For the purpose of predicting the criterion measure from known predictor variables, regression equations were

derived. The raw score weights of the predictor variables, the constants for the equations, and the standard errors of estimate for the criterion variables are present in table XI. The regression equations for each of the groups can readily be written from this information.

The regression equation for group I, College of Education, is $Y = .030X_1 + .364X_2 + .146X_3 + .904$.

TABLE XI

RAW SCORE WEIGHTS, AND CONSTANTS FOR THE REGRESSION EQUATIONS FOR THE FIVE GROUPS, AND STANDARD ERRORS OF ESTIMATE OF THE CRITERION VARIABLE

Group	X_1 (ACT Composite Score)	X_2 (First Semester GPA)	X_3 (High School GPA)	Constant	Standard Error of Estimate of Y
I	.030	.364	.146	.804	.283
II	-.006	.297	.276	1.267	.358
III	.008	.507	.088	.948	.249
IV	.011	.553	.023	.992	.297
V	.006	.435	.131	1.095	.296

The values .030, .364, and .146 are the weights by which the values of ACT composite score, first semester GPA,

and high school GPA, respectively, are multiplied. The products of these multiplications and the constant (.804) are summed. The summation of these values results in the predicted overall, four-year grade point average. Equations of a similiar nature may be developed for each of the five groups. These equations were developed and presented in Chapter V.

Included within Table XI are the standard errors of estimate associated with each of the five equations. For group I, this value is .283. The meaning of the standard error of estimate, in this instance, is that sixty-eight times out of a hundred the obtained overall four-year average will be in the interval of the predicted average plus or minus .283 grade points.

Results of Hold-Out Groups

The predictive values of the regression equations were next tested by use of data from the four hold-out groups. As mentioned earlier, ten subjects were chosen on a random basis from each of the first four study groups. For an estimate of the predictability of the equation derived for group V, the data from all four hold-out groups were utilized.

For group I, Education-Females, 90 per cent of the cases fell within one standard error of estimate of the predicted values, and all ten cases were within three standard errors. For group II, Agriculture-Male, 80 per cent of the

cases were within one standard error of estimate, 90 per cent were within two standard errors, and all ten were within three standard errors. In group III, Arts and Science-Male, 70 per cent of the hold-out group were within one standard error, 90 per cent were within two standard errors, and one case was four standard errors away. In the case of group IV, Arts and Science-Female, 50 per cent of the subjects were within one standard error, and 100 per cent were within two standard errors. For group V, based on pooled data from the first four groups, 75 per cent of the cases were within one standard error of estimate of the predicted values, 92 per cent were within two standard errors, 97 per cent were within three standard errors, and one case was four standard errors away.

From inspection of these results, it would seem possible to use the regression equation based on pooled data for predictive purposes within all four groups. The probabilities are that 68 per cent of the obtained scores are within one standard error of estimate of the predicted scores, 95 per cent are within two standard errors of estimate, and 99 per cent are within two-and-one-half standard errors. Predictions made by use of the regression equation derived from pooled data give reasonable approximations of these percentages.

In order to illustrate the variations in the variables more completely, table XII was developed. This table presents the means and standard deviations of each of the pre-

dictor variables, and the criterion measures, for each of the five groups.

TABLE XII

MEANS AND STANDARD DEVIATIONS OF THE PREDICTOR VARIABLES AND THE CRITERION MEASURE OF GROUP I, EDUCATION-FEMALE; GROUP II, AGRICULTURE-MALE; GROUP III, ARTS AND SCIENCE-MALE; GROUP IV, ARTS AND SCIENCE-FEMALE; AND GROUP V, BASED ON POOLED DATA FROM GROUPS I, II, III, AND IV.

Group	N	ACT Composite Score		First Semester Grade Point Average		High School Grade Point Average		Overall, Four-Year Grade Point Average	
		Mean	Sigma	Mean	Sigma	Mean	Sigma	Mean	Sigma
I	31	21.77	3.28	2.77	.575	3.27	.474	2.95	.397
II	33	21.57	3.85	2.62	.635	3.25	.505	2.81	.432
III	43	24.19	3.25	2.89	.530	3.22	.422	2.88	.382
IV	49	23.12	4.00	3.02	.647	3.36	.582	2.99	.480
V	156	22.82	3.78	2.85	.618	3.28	.502	2.91	.352

CHAPTER V

INTERPRETATION OF RESULTS

The purposes of the present chapter are to review the objectives of this investigation, to report the conclusions and summarizations drawn from the study, and to make recommendations on the basis of this study's findings.

Review of Objectives

The problem set forth in this study was concerned with the prediction of four-year overall grade point average in the Colleges of Agriculture, Arts and Science, and Education at Oklahoma State University. A group of predictor variables, namely American College Test (ACT) composite scores, high school grade point averages, and first semester grade point averages at Oklahoma State University, were utilized in order to develop statements of prediction of four year grade point average. The questions set forth to be answered by the study were as follows:

1. What is the correlation between ACT composite score and overall, four-year grade point average?

2. What is the correlation between high school grade point average and overall, four-year grade point average?

3. What is the correlation between first semester

grade point average at Oklahoma State University and overall, four-year grade point average?

4. What are the multiple correlations between the indices in selected combinations and the criterion?

5. What are the resulting weights of the three prediction indices for the groups under study, and to what extent do they predict the criterion?

6. Is it necessary to use separate regression equations for each groups, or is a single equation based on pooled data adequate for predictive purposes?

The data were subjected to statistical analysis and answers to the above-listed questions were established. The correlations between ACT composite score and the criterion measure were .448 for the College of Education-Female, .327 for the College of Agriculture-Male, .419 for the College of Arts and Science-Male, .412 for the College of Arts and Science-Female, and .388 for the group based on pooled data from groups I, II, III, IV, and V.

The correlations between first semester grade point average and the criterion were .679 for the College of Education-Female, .574 for the College of Agriculture-Male, .777 for Arts and Science-Male, .779 for the College of Arts and Science-Female, and .723 for the group based of pooled data.

High school grade point average correlated with the criterion measure .513 for the College of Education-Female, .514 for the College of Agriculture-Male, .459 for the Col-

lege of Arts and Science-Male, .500 for the College of Arts and Science-Female, and .501 for the group based on pooled data.

Multiple correlations between the predictor variables, in selected combinations, and the criterion measure were developed. These computations were derived by means of a step-wise procedure. The resulting coefficients were .747 for the College of Education-Female, .629 for the College of Agriculture-Male, .786 for the College of Arts and Science-Male, .805 for the College of Arts and Science-Female, and .739 for the group based on pooled data.

Raw score weights for multiple regression equations were derived for the five groups under study. The regression equation for Group I, College of Education-Female, was $Y = .030X_1 + .364X_2 + .146X_3 + .804$. Approximately 56 per cent of the criterion variance was accounted for in this group. For the College of Agriculture-Male, the derived equation was $Y = -.006X_1 + .297X_2 + .276X_3 + 1.267$. The predictor variables accounted for approximately 40 per cent of the criterion variance in this group. The equation for the College of Arts and Science-Male was $Y = .008X_1 + .507X_2 + .088X_3 + .948$. Approximately 62 per cent of the criterion variance was accounted for in this group. For the College of Arts and Science-Female, the equation was $Y = .011X_1 + .553X_2 + .023X_3 + .992$. The predictor variables accounted for approximately 65 per cent of the criterion variance for this group. For the group based on pooled data, the regres-

sion equation was $Y = .006X_1 + .435X_2 + .131X_3 + 1.096$. In the case of the pooled data, the predictor variables accounted for approximately 55 per cent of the criterion variance.

The predictive ability of the regression equations was tested by means of data from hold-out groups. Ten subjects were chosen on a random basis from each group, and the data from these subjects were substituted into the appropriate equations. Data from all four hold-out groups were substituted into the equation for the pooled data. By using the equation based on pooled data, 75 per cent of the cases were within one standard error of estimate of the obtained grade, 92 per cent were within two standard errors, 97 per cent were within three standard errors. The standard error of estimate associated with this equation was .296 grade points. For predictive purposes within all the study groups, it would seem practicable to use this equation based on pooled data.

Summary and Conclusions

The objectives and goals of the study appear to have been met, and several conclusions seem apparent. Overall, four-year grade point average can be predicted within these colleges at a level above chance. By use of ACT composite scores, high school grades, and first semester grade point average, 40 to 65 per cent of the criterion variance was accounted for within the Colleges of Education, Agriculture,

and Arts and Science.

In making statements of prediction for these colleges, first semester college grade point average was found to be the most effective predictor variable. This variable alone accounted for 32 to 64 per cent of the criterion variance.

This investigation supported the use of pre-college indices as predictors of overall college achievement. ACT composite score correlated with the criterion measure .33 to .45. High school grade point average had correlation coefficients of .46 to .51 with the criterion.

The data from hold-out groups supported the use of a single regression equation for prediction of overall, four-year grades in the three colleges. This equation was based on pooled data from the four groups under study. This equation may be expressed in the form of $Y = .006X_1 + .435X_2 + .131X_3 + 1.096$. The standard error associated with this equation is .296 grade points.

In considering these conclusions, it should be emphasized that this study dealt with only a portion of the graduating classes within these three colleges at Oklahoma State University. Generalizations to other universities, or colleges within this university, would introduce unknown error factors.

Recommendations

It has been previously stated that this study dealt with only a small portion of the graduating seniors in these

colleges. Findings based on so few observations are of questionable value. In order to develop norms representative of graduating seniors within these colleges, it is recommended that groups of 100 students, randomly selected from graduating classes, be used in future studies of this kind.

It is further recommended that studies of this type be conducted within other colleges of this university. The results of such studies could provide useful information for advisors and counselors in these colleges. In addition, comparisons of the predictive values of these indices could be made across a wider variety of curriculum programs.

The intellectual variables used in this study accounted for 40 to 65 per cent of the criterion variance. By use of these variables, predictions above chance level can be made. It is recommended, however, that nonintellectual variables be used in combination with these intellectual variables, in an effort to account for a portion of the remaining variance.

More specifically, it is recommended that the Academic Attitude Preference Inventory (AAPI) and the Brown-Holtzman Survey of Study Habits and Attitudes (SSHA) be used as the nonintellectual variables. Juola conducted a study at Michigan State University to determine the effectiveness of these variables relative to a criterion of first year grade point average. Subjects for the study included 212 males and 210 females who were entering freshmen. The correlations for the AAPI were .48 for both males and females. Correlations for the SSHA relative to the same criterion

were .32 for males and .44 for females.[1]

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[1]Arvo E. Juola, "The Development of an Academic Predictor Scale Based on Students' Attitudes Toward Education," Personnel and Guidance Journal, XLII (December, 1963), pp. 381-386.

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APPENDIX

TABLE XIII

ACTUAL AND PREDICTED OVERALL FOUR-YEAR GRADE POINT AVERAGES AND DEVIATIONS FOR THE COLLEGE OF EDUCATION, (GROUP I), N = 31 FEMALES

Subject Number	Actual GPA	Predicted GPA	Deviation
1.	3.31400	3.27359	0.04041
4.	2.99200	2.89984	0.09216
6.	2.73000	2.53091	0.19909
7.	2.51100	2.61428	-0.10328
8.	2.51100	2.54070	-0.02970
9.	3.20300	3.14796	0.05504
10.	2.88200	3.10132	-0.21932
11.	3.40100	3.30598	0.09502
12.	2.53200	2.62619	-0.10319
13.	3.21400	3.39232	-0.17832
14.	2.71000	2.72524	-0.01524
16.	2.79600	2.93868	-0.14268
18.	3.21400	3.39232	-0.17832
19.	2.77600	2.59394	0.18206
20.	3.49200	3.31316	0.17884
21.	2.61100	3.23294	-0.62194
22.	3.29600	3.10972	0.18628
24.	2.46600	2.46813	-0.00213
25.	2.39600	2.52738	-0.13138
27.	3.33300	2.98234	0.35066
28.	3.67400	3.29564	0.37836
29.	2.83800	2.78586	0.05214
30.	2.57400	2.73639	-0.16239
31.	3.15500	3.12765	0.02735
33.	3.30500	3.45225	-0.14725
34.	2.82000	3.04733	-0.22733
35.	2.39500	2.87731	-0.48231
36.	3.32000	2.99288	0.32712
37.	2.66000	2.65991	0.00009
40.	3.81200	2.99058	0.82142
41.	2.43500	2.67625	-0.24125

TABLE XIV

ACTUAL AND PREDICTED OVERALL FOUR-YEAR GRADE POINT AVERAGES AND DEVIATIONS FOR THE COLLEGE OF AGRICULTURE, (GROUP II), N = 33 MALES

Subject Number	Actual GPA	Predicted GPA	Deviation
1.	2.47700	2.82476	-0.34776
2.	2.79100	2.57553	0.21547
4.	3.02900	2.70238	0.32662
5.	3.10600	2.95239	0.15361
6.	3.26500	3.01345	0.25155
7.	2.86300	2.54709	0.31581
9.	2.65600	2.74459	-0.08859
10.	2.08500	2.63251	-0.54751
11.	3.42800	2.96073	0.46727
12.	2.98500	2.83195	0.15305
13.	2.37300	2.60919	-0.23619
14.	2.78400	2.82119	-0.03719
15.	2.99200	2.91178	0.08022
16.	2.09400	2.24431	-0.15031
17.	2.56000	2.91751	-0.35751
20.	2.80000	2.56355	0.23645
21.	3.00000	3.23614	-0.23614
22.	3.13800	2.75344	0.38456
23.	2.43900	2.55590	-0.11690
25.	2.56200	2.55759	0.00441
26.	2.56200	2.66120	-0.09920
27.	2.81000	2.45842	0.35158
28.	3.13300	3.19830	-0.06530
30.	2.71900	2.55846	0.16054
31.	2.17000	2.43720	-0.26720
32.	3.62600	3.39300	0.23300
33.	2.89200	2.80697	0.08503
34.	3.06900	2.88612	0.18288
35.	3.41800	2.93976	0.47824
36.	3.50300	3.31036	0.19264
38.	2.41900	2.81543	-0.39643
39.	1.76200	2.96887	-1.20687
43.	3.23000	3.34992	-0.11992

TABLE XV

ACTUAL AND PREDICTED OVERALL FOUR-YEAR GRADE POINT AVERAGES AND DEVIATIONS FOR THE COLLEGE OF ARTS AND SCIENCE, (GROUP III), N = 43 MALES

Subject Number	Actual GPA	Predicted GPA	Deviation
1.	2.39000	2.44136	-0.05136
3.	2.60200	2.73492	-0.13292
4.	2.32000	2.20681	0.11319
5.	3.20400	3.31863	-0.11463
6.	2.54800	2.52570	0.02230
7.	3.22200	3.01565	0.20635
8.	2.76300	2.97183	-0.20883
9.	2.78200	3.21181	-0.42981
10.	2.36700	2.40493	-0.03793
13.	2.56300	2.71460	-0.15160
14.	2.33500	2.70503	-0.37003
15.	3.61900	3.51133	0.10767
16.	3.32000	3.25942	0.06058
17.	3.34600	3.32675	0.01925
20.	3.26500	3.18844	0.07656
21.	2.84800	2.52508	0.32292
22.	3.07600	2.95581	0.12019
23.	3.24200	2.99292	0.24908
24.	2.83800	2.93194	-0.09394
25.	2.61900	2.82934	-0.21034
26.	3.16200	3.22866	-0.06666
29.	2.84300	2.91810	-0.07510
30.	3.64300	3.23435	0.40865
31.	2.78700	2.90966	-0.12266
32.	3.18600	2.96668	0.21932
33.	2.82900	2.36077	0.46823
34.	2.90400	2.85201	0.05199
36.	3.26000	2.97546	0.28454
37.	2.25300	2.50735	-0.25435
39.	3.13200	2.94393	0.18807
40.	3.10900	2.93287	0.17613
41.	2.67900	2.62939	0.04961
42.	2.21200	2.69874	-0.48674
43.	2.64700	2.76547	-0.11847
44.	3.64300	3.11088	0.53212
45.	2.91500	2.98784	-0.07284
46.	3.15300	3.31834	-0.16534
47.	2.92400	2.91515	0.00885
48.	2.11600	2.53669	-0.42069
49.	2.90000	3.18389	-0.28389
50.	2.69700	2.52381	0.17319
52.	2.68000	2.93593	-0.25593
53.	2.84300	2.57773	0.26527

TABLE XVI

ACTUAL AND PREDICTED OVERALL FOUR-YEAR GRADE POINT AVERAGES AND DEVIATIONS FOR THE COLLEGE OF ARTS AND SCIENCE, (GROUP IV), N = 49 FEMALES

Subject Number	Actual GPA	Predicted GPA	Deviation
1.	2.05300	2.34240	-0.28940
4.	2.87900	3.07141	-0.19241
6.	3.26800	3.14481	0.12319
7.	3.74800	3.49035	0.25765
8.	2.64500	3.00015	-0.35515
9.	3.55400	3.54772	0.00628
10.	3.13600	3.41786	-0.28186
11.	3.22700	3.14359	0.08341
12.	3.03000	2.72743	0.30257
13.	3.28500	3.15463	0.13037
14.	3.23200	3.18690	0.04510
15.	2.71700	2.96878	-0.25178
16.	3.27400	3.15550	0.11850
17.	3.73600	3.59588	0.14012
18.	2.73600	2.74738	-0.01138
19.	3.67400	3.47212	0.20188
20.	3.07900	3.14756	-0.06856
22.	2.77400	2.82285	-0.04885
25.	2.35600	2.58969	-0.23369
26.	2.85000	2.59856	0.25144
27.	2.64500	2.41530	0.22970
28.	2.44100	3.00646	-0.56546
29.	2.60800	2.56779	0.04021
30.	3.12800	3.03375	0.09425
31.	3.71000	3.07050	0.63950
32.	3.72200	3.32274	0.39926
33.	2.92600	2.72236	0.20364
34.	2.64800	2.99466	-0.34666
35.	3.37000	3.31112	0.05888
36.	2.26300	2.09577	0.16723
37.	2.70400	2.80955	-0.10555
39.	2.83900	2.86274	-0.02374
40.	3.38400	3.01249	0.37151
41.	2.91200	2.87991	0.03209
42.	3.57800	3.38041	0.19759
43.	2.52400	2.63477	-0.11077
44.	3.86700	3.41323	0.45377
45.	3.21400	3.20478	0.00922
46.	2.17900	2.51869	-0.33969
47.	3.42600	3.18350	0.24250
48.	2.62500	3.05556	-0.43056

TABLE XVI (CONTINUED)

Subject Number	Actual GPA	Predicted GPA	Deviation
49.	3.33500	3.55042	-0.21542
50.	2.24100	2.32314	-0.08214
51.	3.15200	3.43260	-0.28060
52.	2.56300	3.54489	-0.98189
55.	3.29000	3.34383	-0.05383
56.	3.49600	3.08504	0.41096
57.	2.01500	2.04870	-0.03370
59.	2.63200	2.53972	0.09228

TABLE XVII

ACTUAL AND PREDICTED OVERALL FOUR-YEAR GRADE POINT AVERAGES AND DEVIATIONS FOR THE COLLEGES OF EDUCATION, AGRICULTURE, AND ARTS AND SCIENCE TREATED AS A SINGLE GROUP, (GROUP V), N = 156 MALES AND FEMALES

Subject Number	Actual GPA	Predicted GPA	Deviation
1.	2.05300	2.42106	-0.36806
4.	2.87900	3.01419	-0.13519
6.	3.26800	3.16933	0.09867
7.	3.74800	3.45791	0.29009
8.	2.64500	3.03202	-0.38702
9.	3.55400	3.50193	0.05207
10.	3.13600	3.38306	-0.24706
11.	3.22700	2.98538	0.24162
12.	3.03000	2.80422	0.22578
13.	3.28500	3.14092	0.14408
14.	3.23200	3.20234	0.02966
15.	2.71700	2.96472	-0.24772
16.	3.27400	3.06639	0.20761
17.	3.73600	3.53757	0.19843
18.	2.73600	2.79055	-0.05455
19.	3.67400	3.41710	0.25690
20.	3.07900	3.19161	-0.11261
22.	2.77400	2.86963	-0.09563

TABLE XVII (CONTINUED)

Subject Number	Actual GPA	Predicted GPA	Deviation
25.	2.35600	2.67501	-0.31901
26.	2.85000	2.68081	0.16910
27.	2.64500	2.53060	0.11440
28.	2.44100	3.07929	-0.63829
29.	2.60800	2.53598	0.07202
30.	3.12800	3.06508	0.06292
31.	3.71000	3.05742	0.65258
32.	3.72200	3.26244	0.45956
33.	2.92600	2.80827	0.11773
34.	2.64800	3.05761	-0.40961
35.	3.37000	3.27375	0.09625
36.	2.26300	2.35152	-0.08852
37.	2.70400	2.81747	-0.11347
39.	2.83900	2.88895	-0.04995
40.	3.38400	3.04455	0.33945
41.	2.91200	2.91182	0.00018
42.	3.57800	3.32551	0.25249
43.	2.52400	2.70365	-0.17965
44.	3.86700	3.40285	0.46415
45.	3.21400	3.17828	0.03572
46.	2.17900	2.59316	-0.41416
47.	3.42600	3.21870	0.20730
48.	2.62500	3.02794	-0.40294
49.	3.33500	3.48599	-0.15099
50.	2.24100	2.34244	-0.10144
51.	3.15200	3.40912	-0.25712
52.	2.56300	3.47464	-0.91164
55.	3.29000	3.23247	0.05753
56.	3.49600	3.03917	0.45683
57.	2.01500	2.07334	-0.05834
59.	2.63200	2.49290	0.13910
1.	2.39000	2.54551	-0.15551
3.	2.60200	2.76708	-0.16508
4.	2.32000	2.29445	0.02555
5.	3.20400	3.35332	-0.14932
6.	2.54800	2.57802	-0.03002
7.	3.22200	3.04865	0.17335
8.	2.76300	2.99307	-0.23007
9.	2.78200	3.21945	-0.43745
10.	2.36700	2.52218	-0.15518
13.	2.56300	2.78904	-0.22604
14.	2.33500	2.77584	-0.44084
15.	3.61900	3.51022	0.10878
16.	3.32000	3.25353	0.06647
17.	3.34600	3.31878	0.02722
20.	3.26500	3.21227	0.05273

TABLE XVII (CONTINUED)

Subject Number	Actual GPA	Predicted GPA	Deviation
21.	2.84800	2.60441	0.24359
22.	3.07600	3.02355	0.05245
23.	3.24200	3.07248	0.16952
24.	2.83800	2.99155	-0.15355
25.	2.61900	2.88304	-0.26404
26.	3.16200	3.25372	-0.09172
29.	2.84300	2.97584	-0.13284
30.	3.64300	3.23283	0.41017
31.	2.78700	2.94284	-0.15584
32.	3.18600	3.01316	0.17284
33.	2.82900	2.47353	0.35547
34.	2.90400	2.89695	0.00705
36.	3.26000	3.03131	0.22869
37.	2.25300	2.58385	-0.33085
39.	3.13200	2.98282	0.14918
40.	3.10900	3.02204	0.08696
41.	2.67900	2.69720	-0.01820
42.	2.21200	2.79746	-0.58546
43.	2.64700	2.86423	-0.21723
44.	3.64300	3.12121	0.52179
45.	2.91500	3.03449	-0.11949
46.	3.15300	3.30764	-0.15464
47.	2.92400	2.98645	-0.06245
48.	2.11600	2.61694	-0.50094
49.	2.90000	3.21709	-0.31709
50.	2.69700	2.61270	0.08430
52.	2.68000	2.99218	-0.31218
53.	2.84300	2.68130	0.16170
1.	2.47700	2.85358	-0.37658
2.	2.79100	2.48620	0.30480
4.	3.02900	2.62751	0.40149
5.	3.10600	2.91363	0.19237
6.	3.26500	3.08161	0.18339
7.	2.86300	2.35997	0.50303
9.	2.65600	2.70495	-0.04895
10.	2.08500	2.59944	-0.51444
11.	3.42800	2.88696	0.54104
12.	2.98500	2.91101	0.07399
13.	2.37300	2.41150	-0.03850
14.	2.78400	2.73118	0.05282
15.	2.99200	2.92130	0.07070
16.	2.09400	2.28999	-0.19599
17.	2.56000	2.88364	-0.32364
20.	2.80000	2.59582	0.20418
21.	3.00000	3.37094	-0.37094
22.	3.13800	2.81903	0.31897

TABLE XVII (CONTINUED)

Subject Number	Actual GPA	Predicted GPA	Deviation
23.	2.43900	2.50321	-0.06421
25.	2.56200	2.45782	0.10418
26.	2.56200	2.58546	-0.02346
27.	2.81000	2.44978	0.36022
28.	3.13300	3.23190	-0.09890
30.	2.71900	2.33859	0.38041
31.	2.17000	2.53072	-0.36072
32.	3.62600	3.53757	0.08843
33.	2.89200	2.93688	-0.04488
34.	3.06900	2.80886	0.26014
35.	3.41800	3.05682	0.36118
36.	3.50300	3.44774	0.05526
38.	2.41900	2.78655	-0.36755
39.	1.76200	2.98653	-1.22453
43.	3.23000	3.39639	-0.16639
1.	3.31400	3.24909	0.06491
4.	2.99200	2.78339	0.20861
6.	2.73000	2.56179	0.16821
7.	2.51100	2.49104	0.01996
8.	2.51100	2.41949	0.09151
9.	3.20300	3.10669	0.09631
10.	2.88200	2.87465	0.00735
11.	3.40100	3.26393	0.13707
12.	2.52300	2.70229	-0.17929
13.	3.21400	3.22633	-0.01233
14.	2.71000	2.65879	0.05121
16.	2.79600	2.76316	0.03284
18.	3.21400	3.22633	-0.01233
19.	2.77600	2.45915	0.31685
20.	3.49200	3.22184	0.27016
21.	2.61100	3.14445	-0.53345
22.	3.29600	2.98211	0.31389
24.	2.46600	2.37880	0.08720
25.	2.39600	2.48216	-0.08616
27.	3.33300	2.96334	0.36966
28.	3.67400	3.23152	0.42248
29.	2.83800	2.79790	0.04010
30.	2.57400	2.55248	0.02152
31.	3.15500	3.13121	0.02379
33.	3.30500	3.31946	-0.01446
34.	2.82000	2.99507	-0.17507
35.	2.39500	2.99826	-0.60326
36.	3.32000	3.01426	0.30574
37.	2.66000	2.57257	0.08743
40.	3.81200	2.83199	0.98001
41.	2.43500	2.58343	-0.14843

TABLE XVIII

ACTUAL AND PREDICTED OVERALL FOUR-YEAR GRADE POINT AVERAGES AND DEVIATIONS OF THE HOLD-OUT GROUP FOR THE COLLEGE OF EDUCATION, (GROUP I), BASED ON TEN RANDOMLY SELECTED FEMALE SUBJECTS

Subject Number	Actual GPA	Predicted GPA	Deviation
15.	3.582	3.632	-0.050
5.	3.271	3.250	0.021
32.	2.867	2.020	0.847
26.	2.731	2.879	-0.148
38.	2.924	2.943	-0.019
17.	2.882	2.875	-0.053
23.	2.674	2.698	-0.024
39.	2.568	2.814	-0.246
2.	2.500	2.678	-0.178
3.	3.076	3.127	-0.051

TABLE XIX

ACTUAL AND PREDICTED OVERALL FOUR-YEAR GRADE POINT AVERAGES AND DEVIATIONS OF THE HOLD-OUT GROUP FOR THE COLLEGE OF AGRICULTURE, (GROUP II), BASED ON TEN RANDOMLY SELECTED MALE SUBJECTS

Subject Number	Actual GPA	Predicted GPA	Deviation
40.	3.171	3.137	0.034
8.	2.542	2.681	-0.139
18.	3.118	3.064	0.054
29.	3.133	3.280	-0.147
41.	3.300	2.979	0.321
19.	2.200	2.706	-0.506
3.	2.685	2.659	0.026
42.	2.425	2.178	0.247
37.	2.325	2.604	-0.279
24.	1.954	2.566	-0.612

TABLE XX

ACTUAL AND PREDICTED OVERALL FOUR-YEAR GRADE POINT AVERAGES AND DEVIATIONS OF THE HOLD-OUT GROUP FOR THE COLLEGE OF ARTS AND SCIENCE, (GROUP III), BASED ON TEN RANDOMLY SELECTED MALE SUBJECTS

Subject Number	Actual GPA	Predicted GPA	Deviation
2.	2.746	2.559	0.187
12.	2.830	2.703	0.127
19.	3.250	3.094	0.156
18.	3.676	3.160	0.516
38.	2.849	2.571	0.278
51.	3.183	3.251	-0.068
28.	2.922	2.943	-0.021
27.	3.390	3.146	0.244
11.	1.979	2.164	-0.185
35.	1.874	2.747	-0.873

TABLE XXI

ACTUAL AND PREDICTED OVERALL FOUR-YEAR GRADE POINT AVERAGES AND DEVIATIONS OF THE HOLD-OUT GROUP FOR THE COLLEGE OF ARTS AND SCIENCE, (GROUP IV), BASED ON TEN RANDOMLY SELECTED FEMALE SUBJECTS

Subject Number	Actual GPA	Predicted GPA	Deviation
38.	2.685	3.034	-0.349
53.	3.119	2.721	0.398
21.	3.582	2.942	0.640
5.	2.440	2.909	-0.469
54.	3.119	3.419	-0.300
2.	3.000	3.262	-0.262
3.	2.830	2.856	-0.026
58.	3.044	3.372	-0.328
24.	3.753	3.560	0.193
23.	2.856	2.923	-0.067

TABLE XXII

ACTUAL AND PREDICTED OVERALL FOUR-YEAR GRADE POINT AVERAGES AND DEVIATIONS OF THE HOLD-OUT GROUP FOR THE COLLEGES OF EDUCATION, AGRICULTURE, AND ARTS AND SCIENCES TREATED AS A SINGLE GROUP, (GROUP V), BASED ON FORTY RANDOMLY SELECTED MALE AND FEMALE SUBJECTS

Subject Number	Actual GPA	Predicted GPA	Deviation
15.	3.582	3.496	0.086
5.	3.271	3.163	0.108
32.	2.867	2.887	-0.020
26.	2.731	2.733	-0.002
38.	2.924	2.826	0.098
17.	2.822	2.716	0.106
23.	2.674	2.927	-0.253
39.	2.568	2.557	0.011
2.	2.500	2.485	0.015
3.	3.076	3.003	0.073
40.	3.171	2.903	0.268
8.	2.542	2.378	0.164
18.	3.118	2.890	0.220
29.	3.133	3.113	0.020
41.	3.300	2.682	0.618
19.	2.200	2.935	-0.735
3.	2.685	2.686	-0.001
42.	2.425	1.925	0.500
37.	2.325	2.396	-0.071
24.	1.954	2.430	-0.476
2.	2.746	2.608	0.138
12.	2.830	2.790	0.040
19.	3.250	3.137	0.113
18.	3.676	3.177	0.499
38.	2.849	2.698	0.151
51.	3.183	3.233	-0.050
28.	2.922	2.966	-0.044
27.	3.390	3.141	0.249
11.	1.979	2.243	-0.264
35.	1.874	2.799	-0.925
38.	2.685	2.999	-0.314
53.	3.119	2.774	0.345
21.	3.582	2.998	0.584
5.	2.440	2.908	-0.468
54.	3.119	3.163	-0.044
2.	3.000	3.168	-0.168
3.	2.830	2.891	-0.061
58.	3.044	3.294	-0.250
24.	3.753	3.496	0.257
23.	2.856	2.929	-0.073

VITA

Robert Louis Stancliff

Candidate for the Degree of

Master of Science

Thesis: THE RELATIONSHIP OF THREE PREDICTOR VARIABLES TO OVERALL FOUR-YEAR GRADE POINT AVERAGE IN THE COLLEGES OF ARTS AND SCIENCE, AGRICULTURE, AND EDUCATION AT OKLAHOMA STATE UNIVERSITY

Major Field: Psychology

Biographical:

Personal Data: Born in Roseburg, Oregon, March 6, 1943, the son of Frank and Inez Stancliff.

Education: Attended elementary and secondary schools in Roseburg, Oregon, graduated from Roseburg Senior High School in 1960; attended first year of college at Fort Lewis A and M Junior College, Durango, Colorado, 1961-1962; attended Arkansas City Junior College, Arkansas City, Kansas, 1963-1964; received the Bachelor of Science degree with a major in Psychology from Oklahoma State University, Stillwater, Oklahoma, May, 1966; completed requirements for the Master of Science degree from Oklahoma State University, with a major in Psychology, in May, 1968.

Professional Experience: Prior to completion of this degree, no experience of a professional nature has been gained.