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THE USE OF SELECTED STANDARDIZED TESTS AS PREDICTORS  
OF ACADEMIC SUCCESS AT OKLAHOMA COLLEGE FOR WOMEN

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THE USE OF SELECTED STANDARDIZED TESTS AS PREDICTORS  
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CHAPTER I

INTRODUCTION

The prediction of success in college is a matter of great importance to the student, to his family, and to all personnel concerned with educational services of the secondary school, the college or university. Investigation reveals that several types of evidence have been used in research studies related to this area of interest, and that varying degrees of success have been reported. For example, batteries of tests, illustrated by the examinations of the College Entrance Board, have been useful to college admissions officers; high school grades have been used with some success, as have combinations of achievement and intelligence tests and averages of grades made during the freshman year of college.

Traxler suggests that it might be well to compare the predictive value of comprehensive cumulative records from secondary school with scores made on entrance tests by entering college students. He calls attention to the fact that many personnel workers accept the hypothesis that the

carefully interpreted cumulative record is the best single basis of prediction available.<sup>1</sup>

As the school population increases, it becomes desirable that college personnel should know at what levels students should be placed wherein they are most likely to succeed. Furthermore, if college is to serve its primary purposes, it will contribute to the building of values and appreciations as well as to intellectual, economic, physical, and social skills. The total development of the individual is most effectively promoted when the college has as much information as possible about the personal resources of the students.

Three major areas of concern of most institutions of higher learning are the general and specific abilities, educational and vocational interests and personality characteristics of the students. Early exploration of student response to inquiry concerning their individual potentialities may have much to do with success or failure in college. Subjective devices such as autobiographies, observations, and rating scales give valuable information, but thorough understanding of students requires objective data as well. These data should be furnished by selected instruments completed by the student, interpreted intelligently, and utilized in

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<sup>1</sup>Arthur E. Traxler, "Educational Counseling," Encyclopedia of Educational Research, ed. Walter S. Monroe (New York: The Macmillan Company, 1950), p. 1301.



guidance and counseling services available to the student body. According to Humphreys and Traxler,

The testing program should have tests that yield facts the individual student needs or wants. Such tests . . . should aid the student to determine his long-time goals, his special abilities and his unique interests; they should also aid him in solving his specific and immediate problems.<sup>1</sup>

In the Encyclopedia of Educational Research, Monroe concludes that

. . . educational counseling, if it is to be anything more than a makeshift in scheduling programs, must take into account individual abilities; the total academic program of the student should be adapted to his particular abilities. . . . Unsatisfactory achievement in academic work may result from a variety of causes, e.g. personal problems, vocational uncertainty, or factors which may roughly be classified as academic.<sup>2</sup>

Lindquist reports that those who have been working in the field of prediction of scholastic success in college are aware of limitations in the area of aptitude and achievement tests; that under the most ideal conditions and with the best of present achievement and aptitude tests of high reliability used to predict success, validity coefficients of more than .70 are seldom found. In the area of assessment of personal qualities, he comments:

From the foregoing it is apparent that even when the most valid measures of aptitude and achievement are used, there still remains an unpredicted variance in average

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<sup>1</sup>Anthony J. Humphreys and Arthur E. Traxler, Guidance Services (Chicago: Science Research Associates, Inc., 1954), pp. 124-25.

<sup>2</sup>Walter S. Monroe (ed.), Encyclopedia of Educational Research (New York: The Macmillan Company, 1941), pp. 277-78.

college grades which amount to approximately one-half of the total variance. It seems probable that this unpredicted portion is due largely to such factors as persistence motivation, personal adjustment, interest, and study methods--factors difficult to quantify and measure.<sup>1</sup>

He suggests that further improvement in prediction of success in college will depend on improvement of reliable measures of personal factors referred to in the foregoing reference.<sup>2</sup>

Many studies have been made in the field of prediction of academic success on the collegiate level. Findings have been varied and general conclusions and recommendations point to the importance of continued analysis. A number of investigators have emphasized that one significant facet of the problem is its uniqueness in the matter of relationship of population with the institution. It is, therefore, appropriate that a study of this kind be made on the campus of a women's college.

#### Background and Need

The Oklahoma Industrial Institute and College, a senior liberal arts college for women, was established by an act of the First Legislature of Oklahoma. By special act of the Legislature in 1916, the name was changed to Oklahoma College for Women. The institution is under the control of

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<sup>1</sup>E. F. Lindquist (ed.), Educational Measurements (Washington, D. C.: American Council on Education, 1951), pp. 92-93.

<sup>2</sup>Ibid.

a board of regents and has been in operation since the school year 1909-10.

Admission requirements are graduation from an accredited high school and letters of recommendation. New students are oriented during the first week of school, and all freshmen participate in a two-hour one-year course, Social Fundamentals 1 and 2. This course touches on such areas as personality adjustment, educational and vocational interests, etiquette, and grooming. Some testing is done in the areas of interests and personality adjustment, but there has been no attempt to accumulate and organize results of these tests or to use the information in placement of students.

At the present time, the college does not have a placement program for freshmen, although an initial step was made in this direction by the English department at the beginning of the current school year. A test over the fundamentals of English grammar was given to all freshmen, and results were used in placing students in remedial classes when test results indicated a need for such work. The instrument used was one compiled by teachers in the English department of the college.

In February of the school year 1957-58, a reviewing team of the Committee on Colleges and Universities of the North Central Association visited the college. The report of this committee called attention to the fact that the testing program of the institution was minimal, that cumulative

personnel records had not been fully developed, and that guidance practices of the college were treated rather informally.

The implications of the report seemed of such significance as to warrant inquiry into the possibility of a study to investigate this problem. Conference with Dr. Freeman Beets, President, revealed that his immediate plans for the college were to include in the cumulative personnel records of the students test scores and other objective data that would contribute to a better understanding of those students in attendance at Oklahoma College for Women.

On the basis of this conference, the decision was made to administer selected tests and analyze scores to determine their value as predictors of college success.

#### Statement of Problem

It was the purpose of this study to investigate interrelationships which exist between academic success at Oklahoma College for Women and the general abilities, special abilities, interest patterns, and personality traits of the students.

The first phase of the problem was (1) to select tests to be used in measuring general abilities and such special abilities as seemed pertinent to success, (2) to select instruments which could be used in determining interest patterns and personality characteristics.

The second phase of the problem was (1) to investigate the relationships among the selected variables for each class and to compare the means for each of the variables between the classes, (2) to investigate the patterns of interests and personality traits, (3) to investigate the predictive value of the selected tests of general abilities and special abilities on the basis of the relationships found to exist among the variables in each of the classes, and (4) to formulate a regression equation for predicting success for a freshman, sophomore, junior, and senior student.

The study was planned to investigate the following hypotheses: (1) There are no significant differences between the general abilities and special abilities among the classes at Oklahoma College for Women; (2) there are no apparent differences between interest patterns of the students on the basis of class stratification; (3) there are no apparent differences between personality characteristics of students on the basis of class stratification.

#### Delimitation of the Study

Because of the nature of the sampling available, and of circumstances affecting sampling, the following limitations were deemed necessary:

1. Only white women enrolled as regular students at Oklahoma College for Women for the second semester, 1958-59, were included.

2. Only those students who completed the entire test battery were included.

3. Students who commuted and could not be present when tests were administered were omitted.

4. Freshman students whose high school grades were expressed as "S" or "E" grades were omitted.

5. Students from foreign countries whose grades could not be expressed in grade-point averages were omitted.

### Operational Definitions

1. Testing program: The battery of standardized tests used to measure abilities and to identify interests and personality characteristics.

2. Battery: A group of tests administered together.

3. Variable: The factors of the investigation which represent different values for each member of the population. The dependent value or variable in this study was the grade-point averages of the students. The independent variables were the six test scores.

4. Regular students: White college women enrolled in twelve or more semester hours.

5. Case number: The code number used for the purpose of identification of each student.

6. Grade-point average: Average of grades in which one hour of credit with a grade of "A" had a value of four points; "B," three points; "C," two points; and "D," one point.

7. Academic success: Maintenance of a "C" average, or better, in total course work completed.

### Review of Literature

A survey of the literature related to this study disclosed that investigations regarding intelligence tests with college students were launched by Cattell in 1896, and that real interest in prediction of success in college became apparent within the next few years. Frank S. Freeman, writing in the Journal of Educational Research in February, 1931, reported that the use of intelligence tests had been the practice for more than ten years, but that their value for predicting success was still doubtful. In his analysis of tests of mental ability, represented by the ACE Psychological Examination, in relation to college survival, he found mental tests useful but inadequate as single selective instruments. His evidence for this conclusion was that through persistent effort on the part of students who had been on probation or dropped for a semester, requirements for the degree were met.<sup>1</sup>

Examples of similar early studies are those made by May (1923) and Guiler (1927). At the University of Syracuse May used a measure of intelligence, high school, and first-semester college grade-point averages to predict success of

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<sup>1</sup>Frank S. Freeman, "Predicting Academic Survival," Journal of Educational Research, XXIII (1931), pp. 113-23.

450 Liberal Arts freshmen, obtaining a correlation of .60. He summarized the study by stating: "High correlation between success and the agencies of success will not result until we can measure some of the more or less intangible traits of character and personality."<sup>1</sup>

In his survey of 80 freshmen at Miami University, Guiler administered three widely used group tests of intelligence which he studied in relation to first and second semester grades. The tests were found to be of about equal value as predictors and correlations were found to be .69.<sup>2</sup> Freeman reported in 1931 that early studies had shown correlations of mental test scores with college grades ranging roughly from .20 to .70.<sup>3</sup> The findings of the studies noted above are in agreement with these figures.

Grater and Thalman, working with the graduating class of 1950 at Southern Illinois University, made a study in which they correlated scores made on the ACE Psychological Examination during the freshman year with grade-point averages at the time of graduation. A correlation of .68 was found between the quantitative section of the test and the criterion, leading to the conclusion that use of this

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<sup>1</sup>Mark A. May, "Predicting Academic Success," Journal of Educational Psychology, XIV (1923), pp. 429-40.

<sup>2</sup>W. S. Guiler, "The Predictive Value of Group Intelligence Tests," Journal of Educational Research, XVI (1927), pp. 365-74.

<sup>3</sup>Freeman, op. cit.



information for predicting grade-point average would reduce by .27 the percentage of errors resulting from prediction based on chance alone.<sup>1</sup> This percentage of correlation is not sufficiently high to be used as the only basis for prediction of success but these ratings can furnish one valuable basis for guidance.

Votaw at Southwest Texas State College in 1946,<sup>2</sup> and Anderson at Peabody Institute for Teachers in 1953,<sup>3</sup> made comparable studies involving freshmen at the end of two semesters of study. They each used the ACE Psychological Examination and a form of the Cooperative English Test; Votaw included a test on Use of the Library and Study Materials and Anderson added two simple practice tests, the latter to familiarize the students with practice in objective tests and experience with machine-scored answer sheets. Anderson found that the Cooperative English Test contributed most substantially to prediction of freshman grade-point average at Peabody, but the test on Use of the

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<sup>1</sup>Harry Grater and W. A. Thalman, "A Statistical Analysis of the Relationship between ACE Psychological Examination Ratings and Grade Point Averages," Journal of Educational Research, XLIX (1955), pp. 307-10.

<sup>2</sup>David S. Votaw, "A Comparison of Test Scores of Entering College Freshmen and Instruments for Predicting Subsequent Scholarship," Journal of Educational Research, XL (1946), pp. 215-18.

<sup>3</sup>Scarvia B. Anderson, "Prediction and Practice Tests at the College Level," Journal of Applied Psychology, XXXVII (1953), pp. 256-59.

Library and Study Materials proved to be the best predictor in Votaw's study.

In their survey at the University of Georgia in 1946, Osborne, Sanders, and Green used the entire freshman class of 958 students. Their purpose was to investigate various relationships of partial scores of the ACE Psychological Examination, quarterly marks, yearly marks, marks on specific college courses, and marks in broad subject areas. Their findings were: that the combinations used were more accurate predictors of scores of women than of men; that higher reliabilities were obtained in natural science and language; and that first-quarter marks were better predictors of marks in subsequent quarters than any of the ACE Psychological Examination scores.<sup>1</sup> This conclusion is in agreement with Smith's statement that the best single indicator of scholastic success in any given period is the previous semester's record.<sup>2</sup>

In a study by Jackson at Michigan State College in the Fall of 1952, attention was given to the relationship between performance on a selected group of tests and academic success as measured by first-term grade-point average. Tests used were the ACE Psychological Examination, the Michigan

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<sup>1</sup>R. Travis Osborne, Wilma B. Sanders, and James E. Green, "The Differential Prediction of College Marks by ACE Scores," Journal of Educational Research, XLIV (1950), pp. 107-15.

<sup>2</sup>Francis F. Smith, "The Use of Previous Record in Estimating College Success," Journal of Educational Psychology, XXXVI (1945), pp. 167-76.

State College Reading Test, the Hickok Test of English Usage, and the Arithmetic Proficiency Test constructed by the Arithmetic Improvement Service. The multiple regression approach with two or more variables was used and showed the reading test, with a correlation of .64 for women and .50 for men, to be the best single predictor of success.<sup>1</sup>

These studies illustrate progress in testing as evidenced by early use of measures of intelligence alone, and later experiences which included contributing adjuncts to individual success, such as achievement in particular fields of study.

The fact is well known to educators that the college can serve best those individuals about whom it has the most complete information. Personal adjustment as it is related to scholastic aptitude and achievement is an important problem of concern to those working with college students. Similarly, interests of individual students are an integral part of the search for success in reaching educational goals.

These and other important but "difficult-to-measure" factors which increase the level of achievement have been referred to in the literature. Some of the findings of studies which have attempted to weigh the "intangibles" as implements of success are of interest in relation to this study.

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<sup>1</sup>Robert A. Jackson, "Prediction of Academic Success in College," Journal of Educational Psychology, XLVI (1955), pp. 296-301.

Berdie did a follow-up study of 500 freshmen who were tested in 1939, to find the relationship between test performance, grades, and curriculum from which graduated. He found that vocational interest tests differentiated better among curricular groups than did other kinds of tests, and that differential interests appeared to be more important than differential abilities at the college level. He also found that ". . . prediction of which curriculum a student graduates from can be made better with an interest test than with either aptitude or achievement tests."<sup>1</sup>

In a study made at Harvard University, covering data on 195 students at the end of their freshman year, it was found that the Kuder Preference Record can give useful information to students who are undecided about a field of concentration. It was also concluded that interest scores made on this inventory can furnish information which can decrease academic dissatisfaction among students.<sup>2</sup>

Assum and Levy investigated the relationship of personal adjustment to success at the University of Chicago during the 1945-46 school year. They classified students into two groups--the Center Group and the Non-Center Group--

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<sup>1</sup>Ralph F. Berdie, "Aptitude, Achievement, Interest, and Personality Tests," Journal of Applied Psychology, XXXIX (1955), pp. 103-04.

<sup>2</sup>Andrew R. Baggaley, "The Relation between Scores Obtained by Harvard Freshmen on the Kuder Preference Record and Their Fields of Concentration," Journal of Educational Psychology, XXVII (1947), pp. 421-27.

depending upon whether or not the student had used the counseling center of the university during that time. The scholastic aptitude tests given to entering students were the ACE Psychological Test, College Reading Ability, and College Writing Ability Tests. The achievement test used was the College Comprehensive Examination. Their primary purpose was to determine the truth or falsity of the statement sometimes made that the maladjusted student is above his fellow student intellectually, but that he may or may not fall below the norm in achievement. They reported no statistically significant difference between the means for the two groups on measures of scholastic aptitude but a comparison of the means for the two groups in regard to academic achievement showed that there was significant difference. The conclusion was that the two groups were comparable in academic ability but that the adjusted group rated higher in achievement.<sup>1</sup>

In a survey of 267 freshmen women at the University of California, Frick suggested that personality factors affect performance in the form of ability scores at any time and also that they affect "performance over a longer period of time in the form of grades."<sup>2</sup> This was an investigation

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<sup>1</sup>Arthur L. Assum and Sidney J. Levy, "A Comparative Study of Two Groups of College Students," Journal of Educational Psychology, XXXVII (1948), pp. 307-10.

<sup>2</sup>J. W. Frick, "Improving the Prediction of Academic Achievement by Use of the Minnesota Multiphasic Personality Inventory," Journal of Applied Psychology, XXXIX (1955), pp. 49-52.

in which criteria used were grade-point average, ACE Psychological Examination and Minnesota Multiphasic Personality Inventory.

Using the same personality inventory, Jensen investigated the effect of non-intellectual factors in academic ability and achievement at Brigham Young University in 1955-56. A conclusion of the study was that students of low scholastic ability as compared to other groups are at a disadvantage with respect to non-intellectual aspects of college life. The general tendency throughout the study was for non-achievers of low scholastic ability to have more adjustment problems than the students with whom they were compared, although there were some exceptions.<sup>1</sup>

An analysis of the findings of a survey of students from sixty-seven women's colleges in the United States during the years 1954-57 emphasized the importance of effective service to students. This survey showed that the holding power of colleges can be attributed in part to how well needs of students are met by the individual institution. It also revealed that in many of the colleges admissions policy does not include sufficient data concerning the students. Approximately twenty per cent of the students indicated that the orientation programs of colleges could be much more

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<sup>1</sup>Vern H. Jensen, "Influence of Personality Traits on Academic Success," Personnel and Guidance Journal (1958), pp. 497-500.

effective. Sophomores suggested that the counseling situation should be strengthened for freshmen and sophomores. One item of faculty responsibility which received low rating was that the advisors gave insufficient guidance in choosing first-term courses. Finally, the survey showed that colleges lose nearly fifty per cent of their students, about half of whom have the ability, but lack the interest to continue.<sup>1</sup>

An attempt has been made to report examples of various types of prediction studies. No research was found which included personality characteristics and interests with abilities and achievements, although a number of investigations have indicated the importance to success of motivation factors other than mental ability and achievement.

Reviewing the prediction problem as it is reflected in the literature reveals that early investigators used two variables, intelligence and grades. Gradually other variables were included, e.g., various combinations of achievement tests, aptitude tests in particular fields of study, interests, and personality inventories.

From the studies cited it is apparent that a variety of combinations of tests have been used in the investigation of prediction of academic success. The ACE Psychological Examination, which was used most frequently, seemed to be

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<sup>1</sup>Sister Alice Joseph, "The Women's College in an Age of Automation," Paper read at the Thirty-fourth Annual Meeting of the Southern Association of Colleges for Women, 1957.

the best predictor of academic success. However, first-quarter marks appeared to be better predictors of success in subsequent quarters than any of the ACE Psychological Test scores.

In most of the correlation studies use of single tests were not warranted as bases for prediction; however, information revealed that single tests were useful for guidance purposes. Differential interests were found to be more important in prediction of academic success than differential abilities at the college level. Baggsley found the Kuder Preference Record useful with students who were undecided about a field of concentration, concluding that scores made on interest tests were useful in decreasing academic dissatisfaction among students. Likewise, academic achievement is affected adversely for students who have disturbing adjustment problems.



## CHAPTER II

### DESIGN OF THE STUDY

The design of this study included analysis of the relationships of tests of general ability and specific abilities to academic success at Oklahoma College for Women. Interest patterns and personality characteristics of the students were examined subjectively according to high and low achievers. High school grade-point averages of freshmen and cumulative college grade-point averages of the sophomore, junior, and senior classes were the criteria used to constitute the dependent variable. Total raw scores for the ability test, consisting of a verbal response, a quantitative response, and a total score, and tests of specific abilities in English, mathematics, and reading were the six independent variables.

Zero order coefficients of correlation between pairs of total raw scores for the seven variables were computed for each class for the purpose of discovering the relationships between these variables. Means, standard deviations, and standard error of the means for each variable were determined by academic classification for the purpose of comparing

class averages by use of the critical ratio.

Multiple correlation coefficients, correlating the six independent variables simultaneously with the dependent variable, were computed for each class. The highest possible relationships between the collective variables were represented by this coefficient. This procedure was followed in order to ascertain how well the combination of independent variables predicts grade-point average.

Regression equations were written for each class to be used for prospective students providing the students have similar characteristics to those who made up the sample of this study. The foregoing limitation is in accord with the opinions of analysts that "prediction must be made with reference to a specified group of individuals."<sup>1</sup>

Profiles of individual students were prepared on both the Kuder Vocational Interest Inventory and the Guilford-Zimmerman Temperament Survey. All were examined for the purpose of identifying noticeable differences between classes with respect to interest patterns and personality traits.

Findings of this investigation are reported in tabular form with appropriate explanations.

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<sup>1</sup>Paul Horst et al., The Prediction of Personal Adjustment, A Survey of Logical Problems and Research Techniques, with Illustrative Application to Problems of Vocational Selection, School Success, Marriage, and Crime, Prepared for the Committee on Social Adjustment under the Direction of the Subcommittee on Prediction of Social Adjustment, Bulletin No. 48 (New York: Social Science Research Council, 1941), p. 26.

### Sources of Data

The data used in this study were the total raw scores on each variable included in the following test battery and cumulative grade-point averages. The standardized tests used for this study follow:

School and College Ability Test, Form 1A, for measurement of general abilities or aptitudes.<sup>1</sup>

Sequential Tests of Educational Progress in Mathematics, Form 1A,<sup>2</sup> and Reading, Form 1A,<sup>3</sup> and the Cooperative English Test, Form PM, Part 1,<sup>4</sup> as measurement devices in special abilities.

Kuder Preference Record, Vocational, Form C, as a measure of interests.<sup>5</sup>

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<sup>1</sup>Scarvia B. Anderson et al., School and College Ability Test, Form 1A (Princeton: Educational Testing Service, 1957).

<sup>2</sup>Margaret Brydegaard et al., Sequential Tests of Educational Progress, Mathematics, Form 1A (Princeton: Educational Testing Service, 1957).

<sup>3</sup>Harvey Alpert et al., Sequential Tests of Educational Progress, Reading, Form 1A (Princeton: Educational Testing Service, 1957).

<sup>4</sup>M. F. Carpenter et al., Cooperative English Test; Higher Level, Form PM: English Usage (Princeton: Educational Testing Service, 1939).

<sup>5</sup>Frederick G. Kuder, Kuder Preference Record: Vocational, Form CH (Chicago: Science Research Associates, 1948).

Guilford-Zimmerman Temperament Survey, for determining personality characteristics.<sup>1</sup>

The tests used in this study were chosen for two reasons: (1) because of their extensive use and general acceptance, and (2) because of their relatively high reliability and validity. The statistical data regarding these tests is subsequently delineated.

The School and College Ability Test (SCAT),<sup>2</sup> and Sequential Tests of Educational Progress (STEP), Mathematics<sup>3</sup> and Reading<sup>4</sup> Tests, Form 1A, are used to measure abilities. SCAT is intended to measure the ability of the student to succeed in future academic work. The validity of SCAT was determined by a study made by Educational Testing Service in which it was found that the test "can predict with a considerable degree of success how students will perform on standard end-of-course achievement tests."<sup>5</sup> Studies reported indicated the validity range for total scores to be .43 to .57; for verbal scores, .36 to .55; and for quantitative scores, .30 to .48.<sup>6</sup>

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<sup>1</sup>J. P. Guilford and Wayne S. Zimmerman, The Guilford-Zimmerman Temperament Survey (Beverly Hills: Sheridan Supply Company, 1949).

<sup>2</sup>Anderson, op. cit.

<sup>3</sup>Brydegaard, op. cit.

<sup>4</sup>Alpert, op. cit.

<sup>5</sup>Scarvia B. Anderson et al., SCAT-STEP Supplement (Princeton: Educational Testing Service, 1958), p. 5.

<sup>6</sup>Ibid., p. 13.

Reliabilities reported for SCAT in the First Technical Report were .95 for total scores, .92 for verbal scores, and .93 for quantitative scores.<sup>1</sup>

The STEP Mathematics test is intended to measure achievement of the important objectives of mathematics in general education.<sup>2</sup> The STEP Reading test is intended to measure reading comprehension skills in five major areas.<sup>3</sup> The separate manuals describe the STEP tests as follows:

STEP Reading (Mathematics) test results are useful to the teacher, the counselor, the school administrator, the person conducting educational research, the parent of the student, and--most important--to the student himself.<sup>4</sup>

Reliability for STEP Reading is .90 and for Mathematics, .80. These reliabilities were computed from basic data from a 10 per cent random sample of the students tested in the National College Freshmen Testing Program, 1957.

This group of tests was the outgrowth of a review of the ACE Psychological Examination, which is now expected to

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<sup>1</sup>Scarvia B. Anderson et al., SCAT First Technical Report (Princeton: Educational Testing Service, 1957), p. 11.

<sup>2</sup>Margaret Brydegaard (ed.), STEP Manual for Interpreting Scores, Mathematics (Princeton: Educational Testing Service, 1957), p. 7.

<sup>3</sup>Harvey Alpert, STEP Manual for Interpreting Scores, Mathematics (Princeton: Educational Testing Service, 1957), p. 9.

<sup>4</sup>Ibid., p. 10.

be out of print in 1960.<sup>1</sup> The March, 1959, issue of Developments published by Educational Testing Service calls attention to the value of these tests for guidance purposes.

This particular selection of tests was made for several reasons. The ACE Psychological Examination has perhaps been the most widely used test of its kind for a number of years. Tests considered adequate replacements for such an instrument should be used and evaluated. These tests are recommended as especially good for measuring progress toward goals of general education and as good measures of information needed by each individual concerned with the success of the student--especially by the student himself. Validity of the SCAT tests is adequate and empirical checks on observed validities of STEP are being made. Reliability is excellent.

The Cooperative English Test, Form PM, Part 1, was chosen to measure English usage, the basic content of English 1 and 2 at Oklahoma College for Women. This complete test has been considered for use as part of Freshmen Orientation for the 1959-60 school year at the college.

The Guilford-Zimmerman Temperament Survey, used to determine personality characteristics in this study, measures the following ten traits: general activity, restraint, ascendance, sociability, emotional stability, objectivity,

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<sup>1</sup>Cooperative Tests, Programs, Services for Elementary Schools, High Schools, Colleges, Catalog (Princeton: Educational Testing Service, 1959), p. 3.

friendliness, thoughtfulness, personal relations, and masculinity-femininity. Reliability of the separate factor scores ranges from .75 to .84.<sup>1</sup> Scaled scores for the traits are interpreted on the Temperament Profile by means of locating scores and connecting them on the profile sheet.

Freeman considers the Guilford-Zimmerman Temperament Survey one of the most carefully developed inventories available, and suggests that the statistical data and psychological rationale furnish a satisfactory background for reliable interpretation of results. He further states that the low intercorrelations between separate scores give additional evidence of the existence of ten separate characteristics.<sup>2</sup> This survey is considered to be particularly useful in counseling at the upper high school and college levels.

Interests were measured on the Kuder Preference Record, Vocational, Form CH. This inventory indicates likes and dislikes with respect to interests in the areas of outdoor, mechanical, computational, scientific, persuasive, artistic, literary, musical, social service, and clerical. The major purpose of this instrument is to indicate relative interest in a small number of broad areas, rather than in

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<sup>1</sup>J. P. Guilford and Wayne S. Zimmerman, The Guilford-Zimmerman Temperament Survey Manual of Instructions and Interpretations (Beverly Hills: Sheridan Supply Company, 1949), p. 6.

<sup>2</sup>Frank S. Freeman, Theory and Practice of Psychological Testing (New York: Henry Holt and Company, 1955), p. 478.

specific occupations. The range of reliabilities between areas is reported as .84 to .93. Intercorrelations ranging from -.34 to .50 are low, and indicate greater differentiating value.<sup>1</sup>

Cronbach emphasizes the effectiveness of interest tests in guidance programs, pointing out that they are useful means of attracting students to the counseling office, that such tests give clues regarding adjustment and personality, and that they are not threatening to the ego of the student.<sup>2</sup> Freeman suggests that the Kuder record has value for purposes of guidance with young individuals due to the fact that preferences and interests are given in general rather than in specific patterns; that motivation prompted by interests, values, and preferences is sometimes the deciding factor in the student's course choices; and that information obtained from interest inventories is valuable when used with results of other instruments.<sup>3</sup>

High school grade-point averages for freshmen were obtained from the transcripts and cumulative grade-point averages for the sophomores, juniors, and seniors were

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<sup>1</sup>G. Frederick Kuder, Examiner Manual for the Kuder Preference Record: Vocational, Form C (Rev. ed., Chicago: Science Research Associates, 1956), p. 21.

<sup>2</sup>Lee J. Cronbach, Essentials of Psychological Testing (New York: Harper and Brothers, 1949), pp. 350-53.

<sup>3</sup>Freeman, Theory and Practice of Psychological Testing, p. 478.



obtained from the Office of Admissions and Records at Oklahoma College for Women.

### Population

One hundred twenty-two freshmen students were enrolled in Social Fundamentals 2 for the second semester, 1958-59. Seven of the 122 freshmen students were enrolled in fewer than 12 semester hours and high school grades were not available for 7 students. The foreign students were omitted from this investigation. Eighty-three (76 per cent) of the freshman class met the requirements for inclusion in this study.

Of the 84 students listed as sophomores, six were not regular students, seven commuted and could not be reached for testing, and one had no available transcript of credits. Of the 70 students who were taking 12 or more hours of work, 50 students completed the test battery. These 50 students (70 per cent) were included in the investigation.

Eighty-eight juniors were enrolled but because of reasons similar to the ones listed above, 18 were not available for testing. Fifty juniors (71 per cent) of the eligible population, completed the tests.

Of the 87 senior students, 21 could not be included in the study. Fourteen were enrolled in fewer than 12 hours, two held degrees in other fields, and three were not available during the testing periods. Forty-eight seniors (73 per cent

of the regular senior students) finished the test battery.

Approximately 300 students met the limitation for classification as regular students. Of this number, 231 of those who completed the tests comprise the sample for this investigation.

Class distribution of the students in the sample is given in Table 1.

TABLE 1  
DISTRIBUTION OF STUDENTS IN SAMPLE

Class	Number in Class	Number Eligible for Study	Number in Sample	Per Cent of Regular Students in Study
Freshman	122	108	83	76
Sophomore	84	70	50	71
Junior	88	70	50	71
Senior	87	66	48	73
Total	381	314	231	73

## CHAPTER III

### COLLECTION AND ANALYSIS OF DATA

This study was chiefly concerned with the interrelationship among the variables included in the test battery, as well as the relationship between these variables and grade-point average. The secondary objective was to examine the interest patterns and personality characteristics of the high and low achievers with respect to academic success. The two groups selected were the highest and lowest 25 per cent at each end of the profile range.

Chambers utilized this method in a study in which he split off character traits tests on the basis of high and low quartile grades made on intelligence tests. His supposition was that "if differences existed they would be most marked in a comparison of the extremes of the distribution of scholastic ability."<sup>1</sup>

#### Collection of Data

The data for the study were collected on the selected

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<sup>1</sup>Othniel R. Chambers, "Character Trait Tests and the Prognosis of College Achievement," Journal of Abnormal and Social Psychology, XX (1924-25), pp. 303-11.

battery of standardized tests administered to the freshmen students during the Social Fundamentals classes, and to the sophomore and upper division classes in groups of 20 to 25 during regularly scheduled sessions. The few students who missed one or more of the tests were encouraged and were given the opportunity to complete the battery during one of the several times scheduled for make-up.

The raw scores for each test and the cumulative grade-point averages are listed in Appendices A through D.

### Processing of Data

In order to facilitate the statistical calculations the test data were processed on the IBM 650 by the computer laboratory at the University of Oklahoma. The raw data sent to the computer laboratory included classification, case number, grade-point average, and raw data on the several tests. Results of the test battery were separated into six variables: English Usage, STEP Mathematics, STEP Reading, and three scores, the SCAT Total, Verbal and Quantitative.

To further facilitate handling of the data and for the purpose of brief identification, appropriate symbols were chosen as follows:

- $X_1$  Grade-point averages of students--high school grades in the case of freshmen and cumulative college grades for sophomores, juniors, and seniors,
- $X_2$  Raw scores of students on English Usage,
- $X_3$  Raw scores of students on SCAT Total,

- $X_4$  Raw scores of students on SCAT Verbal,
- $X_5$  Raw scores of students on SCAT Quantitative,
- $X_6$  Raw scores of students on STEP Mathematics,
- $X_7$  Raw scores of students on STEP Reading.

Processed data obtained from the computer laboratory included means, standard deviations, and correlation coefficients for each of the four classes. A matrix of inter-correlations for the seven variables was prepared for each class and is presented in Tables 2 through 5. Means and standard deviations for the several variables are included with each matrix. Evaluation of the significance of the obtained coefficients of correlation was determined through the use of Garrett's table, recommending correlation coefficients at the 5 per cent and 1 per cent levels of significance.<sup>1</sup>

#### Analysis of Data

With the freshman class ( $N = 83$ ), with 81 degrees of freedom, coefficients of .217 or above were found to be significant at the .05 level and those of .283 or above at the .01 level of confidence. The sophomore and junior classes ( $N = 50$ ), with 48 degrees of freedom, and the senior class ( $N = 48$ ), with 46 degrees of freedom, required coefficients of .288 or above, for significance at the .05 level and .372

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<sup>1</sup>Henry E. Garrett, Statistics in Psychology and Education (New York: Longmans, Green and Co., 1953), p. 200.

TABLE 2

COEFFICIENTS OF CORRELATION BETWEEN HIGH SCHOOL  
GRADE-POINT AVERAGES AND TEST SCORES FOR  
SECOND SEMESTER FRESHMEN, 1958-59  
(N = 83)

Variable	Grade-point Averages and Test Scores						
	X <sub>1</sub>	X <sub>2</sub>	X <sub>3</sub>	X <sub>4</sub>	X <sub>5</sub>	X <sub>6</sub>	X <sub>7</sub>
X <sub>1</sub>		.19	.59**	.41**	.62**	.51**	.52**
X <sub>2</sub>	.19		.10	.10	.09	.15	.15
X <sub>3</sub>	.59**	.10		.87**	.88**	.51**	.71**
X <sub>4</sub>	.41**	.10	.87**		.55**	.29**	.68**
X <sub>5</sub>	.62**	.09	.88**	.55**		.61**	.58**
X <sub>6</sub>	.51**	.15	.51**	.29**	.61**		.41**
X <sub>7</sub>	.52**	.15	.71**	.68**	.58**	.41**	
Mean	2.99	13.73	61.82	31.49	30.33	19.73	44.33
Sigma	.68	9.13	17.37	9.74	10.01	5.57	10.65

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

TABLE 3

COEFFICIENTS OF CORRELATION BETWEEN HIGH SCHOOL  
GRADE-POINT AVERAGES AND TEST SCORES FOR  
SECOND SEMESTER SOPHOMORES, 1958-59  
(N = 50)

Variable	Grade-point Averages and Test Scores						
	X <sub>1</sub>	X <sub>2</sub>	X <sub>3</sub>	X <sub>4</sub>	X <sub>5</sub>	X <sub>6</sub>	X <sub>7</sub>
X <sub>1</sub>		.51**	.67**	.51**	.62**	.48**	.56**
X <sub>2</sub>	.51**		.68**	.64**	.51**	.25	.73**
X <sub>3</sub>	.67**	.68**		.85**	.86**	.45**	.78**
X <sub>4</sub>	.51**	.64**	.85**		.45**	.29*	.84**
X <sub>5</sub>	.62**	.51**	.86**	.45**		.46**	.50**
X <sub>6</sub>	.48**	.25	.45**	.29*	.46**		.29*
X <sub>7</sub>	.56**	.73**	.78**	.84**	.50**	.29*	
Mean	2.53	12.39	63.34	34.28	29.06	21.22	46.94
Sigma	.49	2.97	16.63	9.71	10.01	4.61	10.62

\*Significant at the .05 level of significance.

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

TABLE 4

COEFFICIENTS OF CORRELATION BETWEEN HIGH SCHOOL  
GRADE-POINT AVERAGES AND TEST SCORES FOR  
SECOND SEMESTER JUNIORS, 1958-59  
(N = 50)

Variable	Grade-point Averages and Test Scores						
	X <sub>1</sub>	X <sub>2</sub>	X <sub>3</sub>	X <sub>4</sub>	X <sub>5</sub>	X <sub>6</sub>	X <sub>7</sub>
X <sub>1</sub>		.43**	.44**	.53**	.52**	.40**	.34*
X <sub>2</sub>	.43**		.53**	.70**	.56**	.49**	.51**
X <sub>3</sub>	.44**	.53**		.66**	.64**	.47**	.83**
X <sub>4</sub>	.53**	.70**	.66**		.48**	.69**	.66**
X <sub>5</sub>	.52**	.56**	.64**	.48**		.49**	.35*
X <sub>6</sub>	.40**	.49**	.47**	.69**	.49**		.44**
X <sub>7</sub>	.34*	.51**	.83**	.66**	.35*	.44**	
Mean	2.44	11.13	59.57	34.46	26.86	19.16	44.68
Sigma	.48	2.80	17.89	10.54	9.38	4.86	12.23

\*Significant at the .05 level of significance.

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



TABLE 5

COEFFICIENTS OF CORRELATION BETWEEN HIGH SCHOOL  
GRADE-POINT AVERAGES AND TEST SCORES FOR  
SECOND SEMESTER SENIORS, 1958-59  
(N = 50)

Variable	Grade-point Averages and Test Scores						
	X <sub>1</sub>	X <sub>2</sub>	X <sub>3</sub>	X <sub>4</sub>	X <sub>5</sub>	X <sub>6</sub>	X <sub>7</sub>
X <sub>1</sub>		.34*	.53**	.52**	.38**	.19	.41**
X <sub>2</sub>	.34*		.51**	.45**	.41**	.24	.47**
X <sub>3</sub>	.53**	.51**		.81**	.86**	.54**	.55**
X <sub>4</sub>	.52**	.45**	.81**		.40**	.31*	.60**
X <sub>5</sub>	.38**	.41**	.86**	.40**		.56**	.36*
X <sub>6</sub>	.19	.24	.54**	.31*	.56**		.29*
X <sub>7</sub>	.41**	.47**	.55**	.60**	.36*	.29*	
Mean	2.69	12.40	68.21	36.48	31.93	22.42	48.54
Sigma	.48	2.35	15.75	9.10	10.13	5.61	9.04

\*Significant at the .05 level of significance.

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

or above, at the .01 level of confidence. Application of these tests to the tables of intercorrelation indicated that the SCAT-STEP tests were found to intercorrelate significantly rather consistently.

Highest correlations for the freshman class were  $r_{35} = .88$ . Additional high intercorrelations were  $r_{34} = .87$  and  $r_{37} = .71$ ; for the sophomore class high intercorrelations were evident between variables on the SCAT-STEP series ( $r_{34} = .85$ ,  $r_{35} = .86$ ,  $r_{47} = .84$ , and  $r_{37} = .78$ ). The junior class pattern was slightly different with the highest correlation between SCAT Total and STEP Reading and between English Usage and SCAT Verbal ( $r_{37} = .83$ ,  $r_{24} = .70$ ). Highest correlations for the seniors were  $r_{35} = .86$ ,  $r_{34} = .81$ .

In order to determine the significance of differences between the means of the four classifications of the sample, critical ratios were computed and are presented in Tables 6 through 11.

Formulas used in calculating standard error of the mean ( $SE_{\bar{X}}$ ), standard error of the difference ( $SE_D$ ), and critical ratio (CR) follow.<sup>1</sup>

$$SE_{\bar{X}} = \frac{\sigma}{\sqrt{N}}$$

where

$\sigma$  = standard deviation of the population and

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<sup>1</sup>Ibid., p. 182.

N = number of cases in the sample.

Standard error of the difference between two independent means was solved by the following formula:<sup>1</sup>

$$\bar{X}_1 - \bar{X}_2 = \sqrt{\sigma^2 \bar{X}_1 + \sigma^2 \bar{X}_2}$$

where

$\bar{X}_1$  = standard error of the mean for freshmen,

$\bar{X}_2$  = standard error of the mean for sophomores,

$SE_D$  = standard error of the difference between the classes.

Critical ratio was obtained by dividing the difference between means by the standard error of the difference.<sup>2</sup>

$$CR = \frac{D}{\sigma_D}$$

where

D = difference between means of the variables and

$\sigma_D$  = standard error of the difference.

The table of normal distribution was used to determine the probability of the obtained critical ratios.<sup>3</sup> No significant differences between means of the separate variables for the freshman and sophomore classes were

<sup>1</sup>Ibid., p. 213.

<sup>2</sup>Ibid., p. 215.

<sup>3</sup>Ibid., p. 424.

found.

With critical ratios of 2.41 and 2.02 significant at the .05 level for  $X_2$  and  $X_5$ , respectively, the freshman and junior classes were significantly different between means of the two variables. Critical ratios between freshmen and seniors were significant on four of the variables compared: 2.15 on  $X_3$ , 2.95 on  $X_4$ , 2.41 on  $X_7$ , at the .05 level; and 4.37 for  $X_6$  significant at the .01 level.

Consideration of the sophomore-junior mean comparisons revealed critical ratios of 3.16 for  $X_2$  significant at the .01 level and 2.18 for  $X_6$  significant at the .05 level. Only one critical ratio was found to be significant when the sophomore and senior classes were compared; this was  $X_6$  with a critical ratio of 2.05 which was significant at the .05 level.

Differences between the junior and senior classes were 2.59 for  $X_1$ , and 4.71 for  $X_2$  significant at the .01 level; and 2.43 for  $X_2$ , 2.54 for  $X_3$  and 2.57 for  $X_5$  were significant at the .05 level.

Statistical comparison of grade-point averages of the freshmen with other classes was not made since high school grades were used for these first-year students.

TABLE 6  
CRITICAL RATIOS OF THE DIFFERENCES BETWEEN MEANS  
FOR THE FRESHMAN AND SOPHOMORE CLASSES,  
SECOND SEMESTER, 1958-59

Information	Grade-point Averages and Test Scores						
	$X_1^a$	$X_2$	$X_3$	$X_4$	$X_5$	$X_6$	$X_7$
$\bar{X}_1^b$		13.73	61.82	31.49	30.33	19.73	44.33
$\bar{X}_2$		12.39	63.34	34.28	29.06	21.22	46.98
$SE_{\bar{X}_1}^c$		1.00	1.91	1.07	1.10	.61	1.17
$SE_{\bar{X}_2}$		.42	2.38	1.37	1.41	.65	1.50
$SE_D^d$		1.00	3.05	1.73	1.79	.89	1.90
$CR^e$		1.33	.40	1.61	.71	1.67	1.37

<sup>a</sup> Grade-point averages omitted for freshmen since high-school grade points were not comparable to grade-point averages for other college classifications.

<sup>b</sup>  $\bar{X}$  = Mean

<sup>c</sup>  $SE_{\bar{X}}$  = Standard Error of Mean

<sup>d</sup>  $SE_D$  = Standard Error of Difference

<sup>e</sup> CR = Critical Ratio

TABLE 7

CRITICAL RATIOS OF THE DIFFERENCES BETWEEN MEANS  
FOR THE FRESHMAN AND JUNIOR CLASSES,  
SECOND SEMESTER, 1958-59

Information	Grade-point Averages and Test Scores						
	$X_1$	$X_2$	$X_3$	$X_4$	$X_5$	$X_6$	$X_7$
$\bar{X}_1$		13.73	61.82	31.49	30.33	19.73	44.33
$\bar{X}_3$		11.13	59.57	34.46	26.86	19.16	44.68
$SE_{\bar{X}_1}$		1.00	1.91	1.07	1.10	.61	1.17
$SE_{\bar{X}_3}$		.40	2.53	1.49	1.33	.69	1.73
$SE_{\bar{X}_1} SE_{\bar{X}_3}$		1.08	3.17	1.83	1.72	.92	2.09
CR		2.41*	.71	1.62	2.02*	.62	.17

\*.05 level of significance.

TABLE 8

CRITICAL RATIOS OF THE DIFFERENCES BETWEEN MEANS  
FOR THE FRESHMAN AND SENIOR CLASSES  
SECOND SEMESTER, 1958-59

Information	Grade-point Averages and Test Scores						
	$X_1$	$X_2$	$X_3$	$X_4$	$X_5$	$X_6$	$X_7$
$\bar{X}_1$		13.73	61.82	31.49	30.33	19.73	44.33
$\bar{X}_4$		12.40	68.21	36.48	31.93	22.42	49.54
$SE_{\bar{X}_1}$		1.00	1.90	1.07	1.10	.61	1.17
$SE_{\bar{X}_4}$		.34	2.28	1.32	1.46	.81	1.31
$SE_{\bar{X}_1} SE_{\bar{X}_4}$		1.06	2.97	1.69	1.83	.62	1.75
CR		1.26	2.15*	2.95*	.88	4.37**	2.41*

\*.05 level of significance.

\*\* .01 level of significance.

TABLE 9  
CRITICAL RATIOS OF THE DIFFERENCES BETWEEN MEANS  
FOR THE SOPHOMORE AND JUNIOR CLASSES,  
SECOND SEMESTER, 1958-59

Information	Grade-point Averages and Test Scores						
	$X_1$	$X_2$	$X_3$	$X_4$	$X_5$	$X_6$	$X_7$
$\bar{X}_2$	2.53	12.39	63.34	34.28	29.06	21.22	46.94
$\bar{X}_3$	2.44	11.13	59.57	34.46	26.86	19.16	44.68
$SE_{\bar{X}_2}$	.07	.42	2.38	1.37	1.42	.65	1.50
$SE_{\bar{X}_3}$	.07	.34	2.28	1.32	1.46	.81	1.31
$SE_{\bar{X}_2} SE_{\bar{X}_3}$	.10	.40	3.47	2.03	1.94	.95	2.29
CR	.93	3.16**	1.09	.09	1.14	2.18*	.99

\*.05 level of significance.

\*\* .01 level of significance.



TABLE 10  
 CRITICAL RATIOS OF THE DIFFERENCES BETWEEN MEANS  
 FOR THE SOPHOMORE AND SENIOR CLASSES,  
 SECOND SEMESTER, 1958-59

Information	Grade-point Averages and Test Scores						
	$X_1$	$X_2$	$X_3$	$X_4$	$X_5$	$X_6$	$X_7$
$\bar{X}_2$	2.53	12.30	63.34	34.28	29.06	21.22	49.96
$\bar{X}_4$	2.69	12.40	68.21	36.48	31.93	22.42	48.54
$SE_{\bar{X}_2}$	.07	.42	2.38	1.37	1.42	.65	1.50
$SE_{\bar{X}_4}$	.07	.34	2.28	1.32	1.46	.81	1.31
$SE_{\bar{X}_2} \quad SE_{\bar{X}_4}$	.10	.34	3.29	1.90	2.04	.59	1.99
CR	1.63	.01	1.48	1.16	1.41	2.05*	.80

\*.05 level of significance.

TABLE 11  
 CRITICAL RATIOS OF THE DIFFERENCES BETWEEN MEANS  
 FOR THE JUNIOR AND SENIOR CLASSES,  
 SECOND SEMESTER, 1958-59

Information	Grade-point Averages and Test Scores						
	X <sub>1</sub>	X <sub>2</sub>	X <sub>3</sub>	X <sub>4</sub>	X <sub>5</sub>	X <sub>6</sub>	X <sub>7</sub>
$\bar{X}_3$	2.44	11.13	59.57	34.46	26.86	19.16	44.68
$\bar{X}_4$	2.69	12.40	68.21	36.48	31.93	22.42	48.54
SE $\bar{X}_3$	.07	.40	2.53	1.49	1.33	.69	1.73
SE $\bar{X}_4$	.07	.34	2.28	1.32	1.46	.81	1.31
SE $\bar{X}_3$ SE $\bar{X}_4$	.10	.52	3.40	1.99	1.97	.69	2.17
CR	2.59**	2.44*	2.54*	1.02	2.57*	4.71**	1.78

\*.05 level of significance.

\*\* .01 level of significance.

### The Coefficient of Multiple Correlation

The coefficient of multiple correlation (R) indicates the relationship between one variable and two or more additional variables taken simultaneously. It measures the extent to which the dependent variable,  $X_1$ , is associated with the joint relationship of the independent variables  $X_2, X_3, \dots, X_7$ .

In the solution of the multiple correlation coefficient, Beta coefficients, found in Table 12, were paired with appropriate correlation coefficients from Tables 2, 3, 4, and 5. The formula for the solution of R from Beta coefficients suggested by Guilford is:<sup>1</sup>

$$R = B_{12}r_{12} + B_{13}r_{13} + B_{14}r_{14} + B_{15}r_{15} + B_{16}r_{16} + B_{17}r_{17}$$

Utilizing this formula, the following values were found:

Freshmen:  $R_{1.234567} = .52$

Sophomore:  $R_{1.24567} = .70$

Junior:  $R_{1.234567} = .61$

Senior:  $R_{1.234567} = .50$

With R, standard error of the estimate is used as it is with simple r. For example, the formula would read:<sup>2</sup>

<sup>1</sup>Guilford, op. cit., p. 409.

<sup>2</sup>Tate, op. cit., p. 310.

$$\sigma_{1.234567} = \sigma_1 \sqrt{1 - R^2_{1.234567}}$$

where

$\sigma_1$  = standard deviation of the mean for  $X_1$  in each class.

Using this formula and the appropriate standard deviation scores, standard errors of the estimate for the four classes were:

Freshmen = .07

Sophomores = .05

Juniors = .15

Seniors = .06

Standard error of the estimate indicates how far the predicted values would deviate from the obtained values.

Guilford<sup>1</sup> suggests that when testing the significance of  $R$ , his Table D--significant coefficients of correlation and  $t$  ratios--is most convenient. The multiple correlation of  $R = .52$ ,  $R = .70$ ,  $R = .61$ , and  $R = .50$  for the freshmen, sophomores, juniors, and seniors, respectively, were all significant at the .05 level of significance. It is evident that a multiple correlation exists in this population sample.

The coefficients of multiple determination ( $R^2$ ) for this problem were: Freshmen  $R^2 = .27$ , Sophomores  $R^2 = .49$ , Juniors  $R^2 = .37$ , and Seniors  $R^2 = .25$ .

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<sup>1</sup>Guilford, op. cit., p. 399.

TABLE 12  
BETA COEFFICIENTS, (b) COEFFICIENTS,  
AND CONSTANT (K)

Freshman	Sophomore	Junior	Senior
<u>Beta Coefficients</u>			
X <sub>2</sub> .1237	X <sub>2</sub> .0926	X <sub>2</sub> .0574	X <sub>2</sub> .0519
X <sub>3</sub> .0222	X <sub>3</sub>	X <sub>3</sub> .0449	X <sub>3</sub> .0880
X <sub>4</sub> .0208	X <sub>4</sub> .0407	X <sub>4</sub> .2007	X <sub>4</sub> .1535
X <sub>5</sub> .0602	X <sub>5</sub> .3534	X <sub>5</sub> .0602	X <sub>5</sub> .1254
X <sub>6</sub> .1820	X <sub>6</sub> .2637	X <sub>6</sub> .0438	X <sub>6</sub> .1038
X <sub>7</sub> .1828	X <sub>7</sub> .1446	X <sub>7</sub> .0145	X <sub>7</sub> .0916
<u>(b) Coefficients</u>			
X <sub>2</sub> .0070	X <sub>2</sub> .9161	X <sub>2</sub> .0123	X <sub>2</sub> .0107
X <sub>3</sub> .0070	X <sub>3</sub>	X <sub>3</sub> .0025	X <sub>3</sub> .0272
X <sub>4</sub> .0067	X <sub>4</sub> .0021	X <sub>4</sub> .0212	X <sub>4</sub> .0454
X <sub>5</sub> .0194	X <sub>5</sub> .0166	X <sub>5</sub> .0214	X <sub>5</sub> .0373
X <sub>6</sub> .0215	X <sub>6</sub> .0229	X <sub>6</sub> .0050	X <sub>6</sub> .0091
X <sub>7</sub> .0129	X <sub>7</sub> .0097	X <sub>7</sub> .0010	X <sub>7</sub> .0054
<u>Constant (K)</u>			
.6657	.8177	.7475	-2.5334

The coefficient of multiple determination is a measure of the percentage of variation of the dependent variable as influenced by the interaction of the several independent variables. In light of this understanding, the obtained values of  $R^2$  indicate that from 25 per cent to 50 per cent of the variation in over-all grade-point average can be directly attributable to the stated variables considered within the scope of this study.

### The Multiple Regression Equation

The regression coefficients are calculated so that regression equations can be written for purposes of prediction. In processing the raw data in order to obtain regression coefficients it was found that the data for the sophomore class would not invert. As suggested by the director of the laboratory, the sophomore class data were reprocessed, omitting a different variable each time to determine which set of scores were preventing the inversion. It was found that the process would progress to completion when variable  $X_3$  was omitted; therefore, the data for this class were analyzed by using six variables.

The coefficient constant (K) was obtained by the following formula recommended by Guilford:<sup>1</sup>

$$K = \bar{X}_1 - b_{12}\bar{X}_2 - b_{13}\bar{X}_3 - b_{14}\bar{X}_4 - b_{15}\bar{X}_5 - b_{16}\bar{X}_6 - b_{17}\bar{X}_7$$

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<sup>1</sup>Guilford, op. cit., p. 409.

where

$K$  = the constant coefficient,

$b$  = coefficient derived from Beta coefficients,

$\bar{X}$  = mean of the corresponding variable.

The value of  $K$  was computed for the freshman, sophomore, junior, and senior classes and found to be .6657, .8177, .7475, and -2.5334, respectively.

Utilizing this constant, the regression equation may be stated as:<sup>1</sup>

$$X'_1 = K + b_{12}X_2 + b_{13}X_3 + b_{14}X_4 + b_{15}X_5 + b_{16}X_6 + b_{17}X_7$$

where

$K$  = the constant in a multiple regression equation,

$b$  = the coefficient,

$X_n$  = test scores of the individual independent variables.

By substituting appropriate scores for  $b$  and  $X$  values and  $K$ 's, this equation can be used for prediction purposes. The regression equation for each class can be written accordingly:

#### Freshman

$$X'_1 = .6657 + (.0070)(X_2) + (.0070)(X_3) + (.0067)(X_4) \\ + (.0194)(X_5) + (.0215)(X_6) + (.0129)(X_7)$$

#### Sophomore

$$X'_1 = .8177 + (.9161)(X_2) + (.0021)(X_4) + (.0166)(X_5) \\ + (.0029)(X_6) + (.0097)(X_7)$$

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<sup>1</sup>Ibid., p. 411.

Junior

$$X'_1 = .7475 + (.0123)(X_2) + (.0025)(X_3) + (.0212)(X_4) \\ + (.0214)(X_5) + (.0050)(X_6) + (.0010)(X_7)$$

Senior

$$X'_1 = -2.5334 + (.0107)(X_2) + (.0272)(X_3) + (.0454)(X_4) \\ + (.0373)(X_5) + (.0091)(X_6) + (.0054)(X_7)$$

Interest Patterns and Personality Characteristics

The profiles of interest patterns and personality characteristics which were selected on the basis of the lower and upper 25 per cent of achievers in each class were examined subjectively. No trends in profile patterns were found; therefore, these data were not submitted to any form of profile analysis.

Summary

In analyzing these data no significant differences were found to exist between the mean scores for the freshman and sophomore classes. Only one difference of significance was found between the sophomore and senior classes and two between the sophomore and junior classes. The greatest number of differences between means were found between the freshman and senior classes, and between the junior and senior classes.

The coefficient of multiple correlation equations were worked out for each class. All multiple R scores were



found to be significant at the .05 level.

As indicated by the respective coefficients of multiple determination, this particular battery of tests does not seem to be an outstanding indicator of academic success as measured by grade-point average.

The interest patterns and personality characteristics of these students did not warrant statistical analysis in relation to this study.

## CHAPTER IV

### SUMMARY AND CONCLUSIONS

This study involved a sample group of 231 students at Oklahoma College for Women for the second semester of the 1958-59 school year. The purpose of this study was to investigate interrelationships which exist between academic success and the general abilities, special abilities, interest patterns, and personality traits of the students at the College. The problem was to formulate regression equations for use in predicting academic success for each class level.

The hypotheses tested were:

1. There are no significant differences between the general abilities and special abilities between the classes.
2. There are no apparent differences between interest patterns of the students on the basis of class stratification.
3. There are no apparent differences between personality characteristics of students on the basis of class stratification.

The hypothesis of no differences in general and specific abilities between classes was accepted for the

freshman and sophomore classes. There were significant differences between the freshman and junior classes on two variables,  $X_2$  English Usage and  $X_5$  SCAT Quantitative. The hypothesis of no differences was thus rejected on these two variables.

It was apparent that there were significant differences between the freshman and senior classes; therefore, the null hypothesis was rejected on four of the variables,  $X_3$  SCAT Total,  $X_4$  SCAT Verbal,  $X_6$  STEP Mathematics, and  $X_7$  STEP Reading.

Consideration of the sophomore-junior differences revealed significance between two variables; however, only one critical ratio was found to be significant when the sophomore and senior classes were compared. The hypothesis of no differences was rejected for these three variables,  $X_2$  English Usage, and for  $X_6$  STEP Mathematics, between the sophomore and senior classes; and  $X_6$  STEP Mathematics, between the sophomore and senior classes.

The null hypothesis was rejected for the junior-senior class relationships since there were significantly different ratios between five of the variables,  $X_1$  Grade-point Average,  $X_2$  English Usage,  $X_3$  SCAT Total,  $X_5$  SCAT Quantitative, and  $X_6$  STEP Mathematics.

Comparison of the profiles of the Kuder Preference Record and the Guilford-Zimmerman Temperament Survey did not reveal any trend indicative of class differences. The

hypothesis that there were no apparent differences between interest patterns of students on the basis of class stratification was accepted, as was the hypothesis of no apparent differences between personality characteristics of students on the basis of class stratification.<sup>1</sup>

Zero-order coefficients of correlation indicate that significant relationships existed within the sophomore, junior, and senior classes; however,  $X_1$  Grade-point Average and  $X_2$  English Usage were not significant for the freshman class.

The multiple correlations were interpreted in terms of multiple determination. This was used to show the proportion of variance in grade-point average that is dependent upon, or predicted by, the six variables combined with the regression weights. With multiple correlation scores of  $R = .52$  for freshmen,  $R = .70$  for sophomores,  $R = .61$  for juniors, and  $R = .50$  for seniors; and with  $R^2 = 27.03$ ,  $R^2 = 49.50$ ,  $R^2 = 37.09$ , and  $R^2 = 25.90$  for freshmen, sophomores, juniors, and seniors, respectively, it was found that this battery of tests was not particularly effective in predicting academic success as measured by grade-point average.

It can be concluded that the battery of tests used in this study is of little practical value in predicting

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<sup>1</sup>These profiles are in the files of cumulative records now being assembled for the office of the Dean of the College.

academic success at Oklahoma College for Women.

It is recommended that this study be extended by computing partial correlations in order to determine those tests which do not contribute to the prediction of academic success.

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## APPENDICES

## APPENDIX A

RAW DATA FOR SECOND SEMESTER FRESHMAN CLASS  
1958-59

Case Number	Grade- point Average $X_d$	Test Scores					
		$X_1$	$X_2$	$X_3$	$X_4$	$X_5$	$X_6$
1	3.33	144	63	39	24	19	54
2	3.05	143	67	20	47	25	43
3	3.08	131	45	25	20	12	44
4	3.53	135	83	41	42	34	56
5	3.17	164	72	32	40	21	36
6	3.50	126	68	45	23	27	47
7	2.07	101	57	24	32	23	28
8	3.11	141	44	22	22	15	43
9	2.12	79	31	22	9	15	32
10	3.17	152	65	44	21	13	51
11	3.41	143	77	36	41	23	53
12	2.68	132	60	35	25	18	49
13	3.47	137	76	36	40	20	51
14	3.20	149	73	37	36	21	58
15	3.62	147	81	39	42	24	51
16	3.73	153	89	46	43	25	54
17	3.55	156	72	36	36	26	58
18	3.37	75	53	23	30	11	48
19	4.00	165	91	50	41	22	62
20	2.67	132	75	36	39	19	54
21	2.67	140	61	32	29	15	35
22	3.24	144	69	36	33	19	57
23	3.15	152	62	31	31	26	52
24	3.26	117	68	35	33	21	39
25	3.81	122	58	31	27	23	34
26	3.76	120	60	30	30	21	34
27	3.55	113	65	36	29	25	56
28	3.81	152	75	30	45	30	55
29	2.36	149	55	34	21	17	24
30	2.00	136	46	23	23	13	34

## APPENDIX A (Continued)

Case Number	Grade- point Average $X_1$	Test Scores					
		$X_1$	$X_2$	$X_3$	$X_4$	$X_5$	$X_6$
31	1.39	72	27	16	11	14	29
32	3.20	142	72	36	36	20	43
33	3.51	138	83	47	36	19	56
34	1.00	66	20	13	7	11	10
35	2.26	120	48	20	28	25	33
36	3.58	110	68	29	29	18	37
37	2.80	123	72	37	35	14	58
38	3.59	135	35	14	21	12	37
39	2.58	98	42	21	21	19	33
40	4.00	123	59	22	37	19	36
41	3.06	153	65	31	34	16	40
42	2.81	117	45	27	18	15	41
43	1.93	105	45	24	21	15	44
44	3.93	144	77	31	46	23	48
45	2.06	119	63	35	28	23	46
46	3.08	93	47	25	22	22	42
47	3.42	155	62	32	30	23	44
48	3.00	142	65	32	33	11	46
49	3.05	101	55	38	17	16	47
50	2.29	75	32	17	15	16	25
51	3.85	145	78	39	39	30	56
52	2.73	93	42	16	26	19	31
53	4.00	145	88	39	49	30	60
54	2.56	126	47	30	17	13	43
55	3.33	150	69	34	35	25	59
56	2.23	134	60	40	20	7	41
57	2.53	108	47	19	28	21	31
58	2.37	124	41	18	23	24	54
59	3.40	111	64	30	34	21	43
60	3.25	170	86	50	36	20	59
61	1.53	77	53	23	30	20	38
62	3.22	119	76	43	33	28	51
63	2.45	93	27	16	11	17	26
64	2.05	81	36	20	16	16	38
65	2.79	117	39	14	25	17	38

## APPENDIX A (Continued)

Case Number	Grade- point Average $X_d$	Test Scores					
		$X_1$	$X_2$	$X_3$	$X_4$	$X_5$	$X_6$
66	2.61	122	99	56	46	15	37
67	3.50	118	63	29	34	13	45
68	3.26	137	59	31	28	14	55
69	3.22	164	88	48	40	24	61
70	2.31	72	37	17	20	21	35
71	4.00	155	84	49	35	25	56
72	2.50	72	44	24	20	16	32
73	3.50	159	76	29	47	21	52
74	2.80	159	69	37	32	28	59
75	3.58	140	78	35	43	26	37
76	2.17	141	93	46	47	18	61
77	1.50	113	38	27	11	8	38
78	3.64	155	71	34	37	19	46
79	3.78	144	52	30	32	21	42
80	3.18	115	51	20	31	21	27
81	1.68	96	73	44	29	13	46
82	3.88	161	92	42	50	36	54
83	3.18	162	68	32	34	21	41



## APPENDIX B

RAW DATA FOR THE SECOND SEMESTER SOPHOMORE CLASS  
1958-59

Case number	Grade- point Average $X_1$	Test Scores					
		$X_1$	$X_2$	$X_3$	$X_4$	$X_5$	$X_6$
1	1.66	71	35	22	13	16	28
2	2.00	100	56	32	24	21	50
3	2.29	109	48	33	15	22	41
4	2.81	125	53	22	31	24	42
5	2.15	124	69	35	34	20	51
6	2.87	140	45	34	11	17	50
7	2.24	89	54	36	18	24	42
8	2.82	137	69	34	35	24	55
9	3.59	149	96	55	41	25	67
10	3.08	51	61	18	43	19	26
11	2.66	130	76	34	42	21	52
12	3.16	170	84	44	40	21	51
13	2.27	128	71	40	31	19	54
14	2.13	96	44	25	19	19	34
15	2.12	138	65	42	23	17	54
16	2.73	123	68	31	37	25	53
17	2.98	126	54	30	24	20	52
18	1.93	99	64	28	36	18	45
19	1.66	113	45	24	21	21	38
20	2.50	149	79	44	35	22	46
21	2.52	156	73	37	36	17	46
22	2.19	134	52	28	24	15	38
23	2.37	151	81	39	42	24	49
24	2.44	170	91	49	42	23	62
25	2.27	100	61	42	19	14	51
26	2.50	133	79	46	33	10	61
27	2.28	116	60	37	23	20	46
28	1.50	33	31	26	5	22	20
29	2.86	139	69	35	34	24	45
30	2.65	114	49	21	28	21	41

## APPENDIX B (Continued)

Case Number	Grade- point Average $X_d$	Test Scores					
		$X_1$	$X_2$	$X_3$	$X_4$	$X_5$	$X_6$
31	2.94	167	91	53	38	27	58
32	2.60	135	46	26	20	18	49
33	2.93	113	65	31	34	27	46
34	2.83	104	66	33	33	21	40
35	2.29	120	54	24	30	30	39
36	3.11	122	86	51	36	29	61
37	3.34	149	86	51	35	21	63
38	3.11	125	88	48	40	31	61
39	2.58	153	49	39	10	16	56
40	3.67	159	80	36	44	34	49
41	2.27	120	55	34	21	22	43
42	2.40	123	63	28	35	16	33
43	2.80	162	91	45	46	28	67
44	2.53	143	59	29	30	19	50
45	2.60	120	61	37	24	24	47
46	2.70	153	68	37	31	24	55
47	1.38	45	18	8	10	15	27
48	2.09	146	60	32	28	18	46
49	2.05	125	40	20	20	19	27
50	3.00	99	58	29	29	17	40

## APPENDIX C

## RAW DATA FOR THE SECOND SEMESTER JUNIOR CLASS

Case Number	Grade- point Average $X_i$	Test Scores					
		$X_1$	$X_2$	$X_3$	$X_4$	$X_5$	$X_6$
		EU	ST	SV	SQ	SM	SR
1	2.51	86	64	33	31	18	47
2	2.86	128	85	48	37	26	56
3	2.02	90	56	29	27	15	41
4	1.74	92	47	20	27	17	40
5	2.07	126	68	38	30	16	58
6	2.37	107	45	28	17	16	40
7	2.19	89	54	30	24	20	51
8	2.94	134	74	45	29	26	55
9	1.76	76	48	26	22	15	37
10	1.46	78	28	11	17	12	13
11	2.43	93	57	29	28	15	34
12	2.66	133	85	40	45	30	51
13	2.95	138	75	37	38	15	53
14	2.37	96	44	28	16	16	33
15	3.00	76	47	20	27	15	25
16	2.95	140	71	33	38	24	42
17	1.94	120	40	28	12	16	42
18	3.10	55	49	32	17	21	37
19	1.83	111	70	45	25	18	47
20	2.40	143	81	54	27	24	60
21	2.31	122	54	32	22	15	40
22	2.32	111	59	40	19	16	58
23	2.44	126	58	27	31	14	32
24	2.02	120	58	22	36	18	47
25	2.17	112	86	49	37	25	59
26	2.57	102	70	31	39	16	47
27	2.23	101	49	26	23	14	36
28	2.28	126	53	32	21	12	40
29	2.79	99	54	35	19	22	47
30	1.66	54	38	19	19	15	22

## APPENDIX C (Continued)

Case Number	Grade- point Average $X_d$	Test Scores					
		$X_1$	$X_2$	$X_3$	$X_4$	$X_5$	$X_6$
		EU	ST	SV	SQ	SM	SR
31	2.60	113	52	40	13	17	59
32	1.83	120	40	23	17	13	33
33	3.18	164	97	54	43	29	53
34	2.32	76	39	31	8	18	32
35	2.78	117	69	33	36	24	51
36	1.59	80	35	23	12	14	26
37	2.98	126	78	39	39	22	57
38	2.54	155	86	44	42	24	58
39	2.24	23	38	19	19	15	31
40	1.93	96	36	26	10	21	47
41	3.21	122	91	56	35	25	60
42	2.66	129	62	34	28	16	48
43	2.36	141	89	51	38	25	56
44	1.93	132	71	46	25	27	58
45	3.46	123	74	37	37	13	50
46	2.56	139	70	41	29	29	51
47	2.21	102	44	26	18	20	45
48	3.26	158	82	56	26	22	64
49	3.11	147	78	45	33	20	57
50	3.11	120	67	32	35	22	49

## APPENDIX D

RAW DATA FOR THE SECOND SEMESTER SENIOR CLASS  
1958-59

Case Number	Grade- point Average $X_1$	Test Scores					
		$X_1$	$X_2$	$X_3$	$X_4$	$X_5$	$X_6$
		EU	ST	SV	SQ	SM	SR
1	2.89	68	53	35	18	21	36
2	2.74	141	84	54	30	18	57
3	2.46	125	39	24	15	17	30
4	3.26	159	96	55	41	30	64
5	3.52	129	86	40	46	20	49
6	1.84	137	57	21	36	24	45
7	3.36	124	88	41	47	30	56
8	2.43	132	62	32	30	21	45
9	2.95	135	60	30	30	26	46
10	2.63	161	93	48	45	30	59
11	3.20	167	94	52	42	27	60
12	2.91	82	64	30	34	21	51
13	2.65	155	66	45	21	20	59
14	2.67	114	51	31	20	12	47
15	3.36	143	94	53	41	24	37
16	3.04	126	54	32	22	27	41
17	1.76	146	76	37	39	22	52
18	2.88	103	52	34	18	16	53
19	2.55	108	64	30	34	25	47
20	3.60	155	77	44	33	14	53
21	2.35	145	55	26	29	21	43
22	2.00	110	55	34	21	21	33
23	2.50	132	92	55	37	27	56
24	2.46	131	46	33	13	19	51
25	2.04	102	60	28	32	22	45
26	3.53	143	90	55	45	25	65
27	3.01	152	82	44	38	24	53
28	2.30	141	59	22	37	21	49
29	2.55	102	57	35	22	13	53
30	3.03	139	70	41	29	26	58

APPENDIX D (Continued)

Case Number	Grade- point Average $X_f$	Test Scores					
		$X_1$	$X_2$	$X_3$	$X_4$	$X_5$	$X_6$
		EU	ST	SV	SQ	SM	SR
31	2.49	136	77	34	43	27	45
32	2.91	119	85	42	43	28	60
33	3.00	121	80	35	45	32	42
34	2.35	119	55	26	29	22	53
35	3.21	148	73	34	39	26	59
36	3.01	138	61	32	29	22	47
37	2.51	56	53	32	21	26	36
38	2.05	100	76	37	39	24	46
39	3.15	123	64	30	34	13	38
40	1.88	101	44	34	10	23	47
41	3.42	131	83	41	42	29	57
42	2.52	89	63	32	31	16	50
43	2.57	111	71	43	28	9	49
44	3.03	118	73	33	40	24	49
45	1.79	93	60	22	38	19	28
46	2.46	119	84	44	40	36	61
47	2.18	120	65	34	31	23	28
48	2.06	103	31	25	6	12	43