# A STUDY OF THE RELATIONSHIP BETWEEN UNDERGRADUATE AND GRADUATE MARKS IN SELECTED TEXAS SCHOOLS

A Dissertation Fresented to the Faculty of the College of Education The University of Houston

In Partial Fulfillment of the Requirements for the Degree Doctor of Education

> by Kenneth A. Miller August, 1953

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The purpose of this investigation was to make a study of the relationships existing between undergraduate marks and graduate marks as a possible means of predicting graduate school success in nine Texas colleges and universities. These relationships were established through computing correlations between the grades gathered on 3,000 graduate students who had been awarded the master's degree from 1947-48 through 1951-52. Such factors as sex differences, veteran or nonveteran status, transfers and non-transfers, areas of academic study, and the time-lag factor between the awarding of the baccalaureate and graduate degrees were studied to determine their effect on the relationships.

An adjustment factor consisting of an arbitrarily devised system of penalties was applied to each graduate grade-point average in order to provide a spread of graduate marks at least equal to that possible for undergraduate work. This adjustment factor served another purpose in that it afforded a quantitative value to qualitative factors usually deemed worthy smong graduate students. However, it was seldom found that this factor materially changed the magnitude of the coefficients of correlation.

The relationships between the grade-point averages for undergraduate and regular graduate, as well as the adjusted graduate, courses were determined at three stages of the undergraduate study: (1) the freshman-sophomore level; (2) the junior-senior level; and (3) the total undergraduate level. These correlations for the various levels of data were carried through all the enumerated factors.

There was a "marked" relationship between undergraduate and graduate marks in the schools studied, and it was found that junior-senior work provided the best index for prediction of graduate success. When the males and females were divided, no significant differences were revealed except at the freshmansophomore level where the relationship between undergraduate and graduate marks was unusually high for the females. The females consistently made higher averages on this as well as other factors than did the males. The non-veterans not only proved to be better students scholastically than were those studying under the G. I. Bill of Rights but their correlations between undergraduate and graduate averages were also higher.

No sppreciable difference was observed between the transfers and non-transfers except that students taking undergraduate work in colleges where a Phi Beta Kappa chapter was established tended to be successful in non-Phi-Beta-Kappa graduate schools regardless of their undergraduate marks. This was not true for students who took undergraduate work in one non-Phi-Beta-Kappa school and transferred to another such school for graduate study. Little value could be placed on the use of undergraduate marks as a criterion for predicting graduate school success in the vocational or business areas of study, whereas in the field of natural sciences, they could be used with considerable reliability. It was also found that probable graduate success is not contingent upon a time-lag factor until at least ten years had passed.

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Kenneth A. Miller

Humble, Texas June, 1953

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#### CHAPTER I

# THE PROBLEM OF PREDICTING GRADUATE SUCCESS FROM UNDERGRADUATE MARKS

### 1. Introduction

Throughout the United States the problem of predicting college success at the graduate level is of major importance not only to the graduate schools but also to the individual, students who might apply for such study. The students are desirous of knowing their chances or prospects of successfully completing the required courses of study, and the graduate schools are interested in serving their students, and the public, and themselves in the best possible manner. This service to the public and the students embraces methods of admission to graduate study as well as the subject matter taught, the manner of teaching, and the final outcome of the graduate career.

Oraduate schools are not in general agreement as to which is the best method of selecting their students. Some base this selection upon a battery of achievement tests, others use a general intelligence test, and still others use various grade-point averages achieved by the individual student on his undergraduate program. Although combinations of these criteria exist and are used by the various institutions, together with local supplementations, probably the one basic prerequisite essential for admission to graduate study is the successful completion of the baccalaureate degree from a school of recognized standing. This "successful completion" precludes a certain grade-point average in all colleges or universities.

If the admission agencies in the various graduate schools of the nation could standardize their selection criteria, it probably would be of material benefit to all concerned. While the various tests frequently used are standardized, the college marks are not. Although a mark of "B" would seem to indicate the same degree of scholarship in any two courses taken in college, this is not necessarily so. Not all fields of study within a college are of equal difficulty; nor is it possible to eliminate all variations in marks subjectively given. The problem of standardization of marks given in different institutions can be very well handled on paper, but in effect, it is common knowledge that the variation is quite wide.

This lack of standardization of undergraduate marks is a major problem in using such marks for the prediction of graduate success. However, since it is generally conceded that the basis for the marks both on the undergraduate and graduate levels is primarily the same, the relationship between such marks should be considerable.

## 2. Statement of the Problem

This study was initiated to determine quantitatively the relationship between undergraduate marks and graduate marks

in selected graduate schools in Texas. When the relationship was established, various factors were studied to find their part in the trend as a whole. These factors were: (1) sex differences in the total population; (2) veterans as compared with non-veterans in the male population; (3) whether both degrees came from one institution or whether the student took the baccalaureate degree from one Texas institution and then transferred to another for graduate work; (4) the problem of determining whether the possession of a Phi Beta Kappa chapter in schools being transferred from had any effect on the graduate merks; (5) different areas of academic study; and (6) a time-lag factor between the two degrees. From a study of the part these various factors play in the over-all results, one could within certain limitations predict probable graduate success from undergraduate marks.

### 3. Basis of the Study

The proper officials in all of the white graduate schools in the state were approached with the specifications of the study and their cooperation in opening their files to the investigator was requested. Although a few of the schools had a definite policy in maintaining a strict confidential nature of their students' marks, most of them were willing to cooperate fully when they realized that the work of individual students and the identity of individual schools would

not be compromised. Some nine coeducational schools were selected to participate on the basis of their geographical location; their affiliation with various denominational groups, or the lack of it; their size, as determined by their student enrollment; and the number of master's degrees granted during the school years 1947-48 through 1951-52. In this way, the study included state-supported schools, some of which were 'the so-called "teacher's colleges" whereas others were not; church-supported schools; and independent schools.

A total population of 3,000 students was selected for this study to insure adequate numbers in all of the divisions that would be made, and the cases were prorated in accordance with the number of master's degrees conferred during the five years under consideration.

In order that the range of graduate marks would be as large as that for the undergraduate marks, an adjustment factor was applied to the work of those students who did not do highly acceptable work. This application of a quantitative value to a qualitative factor was made in order to make the study more meaningful. Further discussion of this will be found in Chapter III.

When the grade-point averages were computed, various correlations were run to determine the existing relationships. These included the freshman-sophomore grade-point average, the junior-senior grade-point average, and the total undergraduate grade-point average as correlated with the graduate

grade-point average and the adjusted graduate grade-point average for each of the various factors studied.

## 4. Limitations of the Study

The scope of the study was limited to a population of 3,000 graduate students who were awarded master's degrees within the past five years. One-half of these took both degrees from the same institution whereas the other 1,500 transferred from one school to another Texas school after the first degree had been conferred. This sampling should be ample to make some definite conclusions from the findings, but a larger sample was available for investigation.

The study included only Texas students in Texas schools. Any work on either the bachelor's or the master's degree in an out-of-the-state school disqualified the student from the sampling. A similar study in other states would make the investigation a much more inclusive one and therefore of more value to graduate schools in their selection of candidates.

Although no attention was paid to sex or racial extraction of the successful graduate candidates when their selection for this study was made, there were no records of Negroes available for investigation. Hence, any conclusions drawn in this study would not be applicable to Negro schools offering graduate degrees.

Only nine of the graduate schools of the state were selected to participate in the study. The writer believes

that this group was a representative sampling, both of colleges and the students selected to participate, but the number could have been larger and the results more conclusive if all graduate schools had participated.

The study was kept on an impersonal basis at all times. Not only were numbers used for the individual students but the colleges and universities were also coded. Protecting the identity of the schools at times detracted from the value of certain phases of the study.

This study did not include all the college marks of a few students. Some students earned far more than 120-128 hours of credit before taking work toward the master's degree. These were usually the students who had taken a baccalaureate degree in the 1920's or early 1930's, then returned during succeeding summers to take post-graduate work, but did not start on any graduate program until a number of years later. In some instances, the total undergraduate work thus taken amounted to more than 150 semester hours. While this work showed on the records, and would have been available for study, it was felt that only the work earned toward a degree, whether of a baccalaureate or graduate level, should be studied in this investigation.

The study included little more than the marks earned by the various students. There was no study of extracurricular activities, nor were special activities of the students in their professional fields given attention.

Other interesting causative factors, such as religious manifestations, ages of the various students, amount of outside work carried, socio-economic factors of all kinds, and family backgrounds, were all omitted. Jonos<sup>1</sup> found that economic factors, including the amount of remunerative work carried on by students, along with social and physical factors, can contribute toward prevention of the highest effort expended toward scholastic achievement.

The lack of standardization of teachers: marks throughout the study, whether between instructors within one department of a college, between departments, or between institutions, must be recognized and treated as a known limitation.

The value of the study would have been greatly enhanced if there had been a sufficient mumber of students who had worked on or had completed the requirements for a doctor's degree as well as a master's degree. However, only twenty-five out of the 3,000 cases had done any graduate work above a master's degree, and none had finished the requirements for a doctorate. Of these twenty-five, only six had done as much as fifteen semester hours of work, and it was felt that no definite conclusions could be drawn from such insufficient data.

The values of this study should be considered in the full light of such weaknesses and limitations as those pointed out above.

<sup>1</sup> Edward S. Jones, "The Grade-Test Correlation as an Index of Motivation," <u>School and Society</u>, Vol. 36 (October 8, 1932), pp. 479-480.

#### CHAPTER II

### SURVEY OF RELATED INVESTIGATIONS

In making a survey of the literature on the subject of relating one group of marks to another, the writer found that considerable interest had been displayed in this field during recent years. Most of these studies, however, were of little significance to the present investigation.

Segel<sup>1</sup> compiled some 135 selected references in the field of prediction of college success. Each of these references was discussed in varying lengths in his study in order to bring the attention of educators upon the work done in the science of testing for the ultimate prediction of college success. Various methods, statistical and experimental, were discussed in order to make his work more valuable, not as a predictive tool itself, but as a handbook for administrators and investigators concerned with the problems of college admission or guidance of college students.

The Graduate Record Examination, under the direction of the Educational Testing Service of New York City, is perhaps the most outstanding test that has been constructed for predicting the success of graduate students. Its purpose is to test knowledge and to correlate this factor with grade-point

<sup>1</sup> David Segel, <u>Prediction of Success in College</u>, United States Department of the Interior, Office of Education, Bulletin 1934, No. 15.

averages earned by successful graduate students. Heston had the following to say about the Graduate Record Examination:

In 1937 the Graduate Schools of Harvard, Yale, Princeton. and Columbia Universities sponsored a new testing program for graduate students. This project, designated as the Graduate Record Examination. was organized in collaboration with the Carnegie Foundation for the Advancement of Teaching. Since its inception the program has steadily broadened its scope, so that by 1946 a total of 120 graduate and professional schools had taken official action either requiring or recommending the Examination. Over 600 centers have now been established at colleges where accredited Examiners are prepared to make the Examination available to candidates. During the fiscal year ending July 1, 1946, nearly 53,000 students were tested in the various projects carried on by the Graduate Record Office.

Charles R. Langmuir is one among several who has found that the Graduate Record Examination is not as satisfactory as grade-point averages in certain cases. He says:

At one University the data from the Graduate Record Examination proved less satisfactory than the undergraduate record in predicting success of a student prepared at that same University.

In 1942, Weber, Brink, and Gilliland reported:

Up to the present few studies have been reported concerning the prediction of success on the graduate level. Mention should be made, however, of the work of a committee of the Carnegie Foundation for the Advancement of Teaching, of which Mr. Learned is chairman. This committee has constructed a six-hour

<sup>&</sup>lt;sup>2</sup> Joseph C. Heston, "The Graduate Record Examination vs. Other Measures of Aptitude and Achievement," <u>Journal of Edu-</u> <u>cational Research</u>, Vol. 41 (January, 1948), p. 339.

<sup>&</sup>lt;sup>3</sup> Cherles R. Langmuir, "The Graduate Record Examination," <u>The Carnegie Foundation for the Advancement of Teaching</u>, <u>Thirty-Seventh Annual Report</u>, 1941-42, p. 03.

Graduate Record Examination that covers seven fields of study: mathematics, physical sciences, biological sciences, literature, fine arts, foreign languages, and verbal aptitude. . . These tests have predictive value, but for the most part their correlations with success in the professional schools have not been determined accurately. With the rapid growth of graduate enrollments, the selection of students at the higher levels becomes increasingly important, and this fact is being realized by leading graduate schools.<sup>4</sup>

The problem of their investigation was the determination of the value of several different factors for predicting success in the graduate school.

Stated in another way, What is the relationship between these factors and marks in the graduate school? The factors considered are: average undergraduate scholarship marks, intelligencetest scores, average undergraduate scholarship marks in the field selected for graduate specialization, amount of undergraduate work taken in the field for graduate specialization.

The researchers claimed that the study was concerned with 319 students who previously had graduated from the College of Liberal Arts, Northwestern University, and who had completed at least nine hours of graduate work. However, when these students were broken down into fields of study, 116 for humanities, ninety-two in physical sciences, and 108 in social sciences, the figures did not agree. Incomplete records limited the group to 181 when the scholastic average in the major field in which the student continued in graduate work was studied.

<sup>4</sup> Janet Weber, W. G. Brink, and A. R. Gilliland, "Success in the Graduate School," <u>The Journal of Higher Fducation</u>, Vol. 13 (1942), p. 19.

<sup>&</sup>lt;sup>5</sup> <u>Ibid.</u>, p. 19.

They were also worried about the reliability of the marking system used, although the study was limited to students in one institution.

The reliability of the marking system is a factor which has been questioned by several investigators who have used marks as a criterion of success. The reliability of the scholastic average can be computed only by assuming that the underlying abilities remain substantially the same from term to term and that essentially the same abilities are required for success in one term as in another.

But the reliability for the time of the study, as predicted by the Spearman-Brown formula, was .94, high enough to warrant the belief that the grade averages represented reliable indices of the students' work.

In terms of comparison with the results of the present study, their findings were of considerable interest:

When the undergraduate marks of the 319 persons included in this study were compared with their mark averages in the Graduate School, a positive correlation of .61 was obtained. Since this group of students is a selected one, this correlation shows a fairly strong relationship. Mark averages in the major field correlated .62 with graduate averages, which is only slightly higher than that between the undergraduate and graduate averages as a whole. Moreover, the relationship between marks in the field in undergraduate and graduate work was no closer than between general scholarship averages, also being .62.

And when the students were divided into various fields of study, they found that

<sup>6</sup> <u>Ibid.</u>, p. 20. 7 <u>Ibid.</u>, p. 21. Undergraduate marks in the humanities were more closely related to graduate marks than in either of the other two fields, or than for the group as a whole (r = .66). . . For the social-science group the correlation between undergraduate and graduate marks was .52, which is considerably lower than the corresponding correlation for the entire group. . . The correlation between undergraduate and graduate marks for the physical-science group was .63.

Also of importance to the present study was their final conclusion. It was:

The finding of multiple correlations between the various factors, it will be noticed, did not give correlations which permit more accurate prediction than the best single measure, namely, undergraduate marks.<sup>9</sup>

From 1942 through 1946 Seagoe used the National Teachers<sup>4</sup> Examination at the University of California at Los Angeles for predictive purposes when she dealt with doctoral students in education. She was not pleased with her criterion and made the statement:

In the first place, the examination is designed to measure the informational aspects of teacher preparation, not aptitude for advanced graduate work. Although there is good reason for believing the two purposes have much in common, they are not identical.<sup>10</sup>

She concluded:

The National Teachers' Examination has greatest predictive value on the Qualifying Examination in psychology, and significant value for philosophy and history. It has little predictive value for administration on the basis of the data given. 11

10 May V. Seagoe, "Prediction of Success in a Graduate School of Education," <u>School and Society</u>, Vol. 69 (February 5, 1949), p. 89.

11 <u>Ibid.</u>, p. 91.

<sup>8</sup> Ibid., p. 22.

<sup>9</sup> Ibid., p. 24.

Cook<sup>12</sup> had previously worked with 788 students at the College of Education, University of Minnesota, in 1940-41, where he used three criteria of success in graduate work: (1) honor-point ratio based on letter grades in all graduate courses taken by the student; (2) numerical scores of students in various graduate courses, the scores being those upon which the final letter grades in these courses were based; and (3) numerical scores on graduate comprehensive examinations administered. However, Cook later made the statement:

The first criterion, honor-point ratio, was not used because previous studies had shown the distribution to be skewed, and the variability inadequate to provide a good criterion measure.

He did find that the grade-points earned by undergraduates were lower than those earned by graduate students and the honor-point ratio based on letter grades was not sufficient for his use at the University of Minnesota.

Since it dealt with one of the graduate schools in Texas, a study by Wentz<sup>14</sup> was of particular interest to this investigation. He used 200 of the available 752 cases who had completed both their undergraduate work and graduate work within that institution from 1937 through 1949. Wentz used four

<sup>, 12</sup> Walter W. Cook, "Predicting Success of Graduate Students in a College of Education," <u>School and Society</u>, Vol. 56 (September 5, 1942), pp. 192-195.

<sup>13</sup> Ibid., p. 194.

<sup>14</sup> George W. Wentz, Jr., The Use of Undergraduate Grade-Point Average As a Criterion for Predicting Success in Graduate School, Unpublished Master's Thesis, Southwest Texas State Teachers College, San Marcos, Texas, 1950.

basic correlations between grade-point averages to develop his study: (1) between the freshman-sophomore group and the graduate group: (2) between the junior-senior group and the graduate group; (3) between the major-subject and the graduate group; and (h) between the total undergraduate group and the graduate group. Another investigation was made using a subgroup of fifty-five from the original 200 who had taken the American Council on Education Psychological Examination and the Cooperative English Test as freshmen. Correlations were computed for this sub-group between the T-scores made on the American Council Psychological Examination and the graduate grade-point averages and between the T-scores made on the Cooperative English Test and graduate grade-point averages. and then another was computed to find the relationship between the total of those two T-scores with the graduate grade-point average.

A third investigation was made with respect to 95,953 grade marks earned by undergraduate students and the gradepoint average of the master's degree graduates and a comparison of the 95,953 grade marks earned by undergraduate students and the undergraduate major-subject of the master's degree graduates.

Wentz obtained the following Pearson product-moment correlations in the four basic sets of variables: (1) .46 between grade-point averages for freshman-sophomore work and graduate work; (2) .42 between grade-point averages for junior-senior work and graduate work; (3) .46 for grade-point averages for major-subject work and graduate work; and (4) .46 for grade-point averages for total undergraduate work and graduate work with a probable error in each case of .04.<sup>15</sup> Regression equations for predictive purposes were then worked out to estimate the probable grade-point average that might be earned in the graduate school from a consideration of the major-subject grade-point average. Deciles of their averages were also calculated, and the median of the grade-point averages of the major subject was found to be 2.80.

This figure indicates that of those students who have been successful in obtaining their M. A. degree from this institution half have had a grade-point average of less than 2.80 in their undergraduate academic major subject. It would also indicate that only one out of five had a major-subject grade-point average of less than 2.31. Or one might interpret it to mean that only 10%, or one out of ten students, have ever received an M. A. degree from this institution with a grade-point average in their major subject of less than 2.08 (better than a 'C' grade). This scale is extremely important to this study, and it is significant that the percentile points fall at such a high level. It can be said that only thirty out of a hundred have ever been awarded an M. A. degree with a grade-point average of less than 2.47 in their under-graduate academic major subject. 16

Regression equations were also constructed to estimate the probable grade-point average that might be earned in graduate school from a consideration of the grade-point averages of the total undergraduate work. About this he said:

15 <u>Ibid.</u>, p. 29.

16 Ibid., pp. 37-38.

. . those students earning in excess of 3.80 in undergraduate work (3.60 for undergraduate major subject) did not achieve so high an average in graduate work. In other words, it would appear that the superior student does not do as well as the poor student when comparing the rate of difference between grades in undergraduate work with graduate work; the superior student goes down while the mediocre or poor student goes up. There seems to be no known explanation of this phenomenon outside of speculation; while this study does not take into consideration the many factors mentioned under the limitations of the study, it was of interest to attempt to explain some of the factors which might affect one phase of the phenomenon.<sup>17</sup>

One of the factors contributing to the sudden jump in grades from undergraduate school to graduate school was particularly interesting:

. . . an arbitrary marking system of only three passing marks--A, B, and C--is provided in the graduate school in contrast with a marking system of four passing marks--A, B, C, and D--in the undergraduate school. Although the original intention of this three-mark grading system was to insure higher accomplishment of graduate students, the actual result may have been, in part at least, to cause instructors to revise their plans of assigning marks to graduate students.<sup>10</sup>

Wentz found that the coefficients of correlation between the various test scores and graduate work fell considerably below those showing the relationship between undergraduate and graduate work. These coefficients were found: (1) between the American Council Psychological Examination and graduate work, .30 with a probable error of .09; (2) between the Cooperative English Test and graduate work, .20 with a

<sup>17</sup> Ibid., p. 41.

<sup>18</sup> Ibid., p. 42.

probable error of .08; and (3) between total test scores of the above and graduate work, .33 with a probable error of .08.<sup>19</sup> Because the correlations were so low, it was felt that the angle of inclination would be inaccurate for making predictive regression lines.

The other investigation undertaken in the study would prove of little value to the present research, but some of the conclusions drawn are shown below:

(1) The total grade-point average earned by undergraduate students affords dependable indicia from which criteria could be established for predicting probable success of students in the Graduate School. It is probable that if a student makes a total undergraduate grade-point average of at least 2.53, he would succeed in graduate school, provided further that there existed no erratic grades.

(2) The academic major subject affords a better tool than does the total undergraduate grads-point average for the purposes of predicting probable success. If a student has a grade-point average in his major academic subject of more than 2.82 the chances are about one to one that he would make a good graduate student; whereas, if his major subject average is 2.39, the chances would be about one out of four against him.

(5) The requirements of an average of B and a minimum credit mark of C in the graduate school appear to have resulted in a double standard of marking.<sup>20</sup>

The figures given in the above study are comparable to those of the present study inasmuch as the grade-point averages were obtained in the same mathematical manner.

19 <u>Ibid.</u>, p. 46. 20 <u>Ibid.</u>, pp. 63-64. Garlington<sup>21</sup> pointed out in 1942 that grade-point averages earned by high school students were not a suitable criterion for adjudicating the probable success of college freshmen in that same institution. She further pointed out that there was a gap between high school and college and again between college and college graduate work, indicating perhaps that college gradepoint averages might not be a completely valid tool in building criteria for predicting success of graduate students.

In 1949 Jenson at the University of Pittsburgh stated:

The problem of determining which applicants for graduate study have the best chances of qualifying for advanced degrees has troubled graduate school administrators for many years. A few institutions conducting research along these lines have isolated some of the variables which have helped considerably in predicting graduate scholastic schievement. But the improvement in accuracy of predicting scholastic success at this level of training has been slow and at best it is far from perfect. Even if it were perfect the real relationships between grade-earning power and later success is not clear-cut. It is generally recognized that academic achievements leading to the acquisition of advanced degrees do not invariably signify postdegree world-shaking accomplishments. Perhaps a lack of uniformity in standards of selection and training among graduate schools accounts for much of this apparent discrepancy. At present. however, acholarship constitutes the most widely used and most generally understood criterion of future attainment. Hence, acceptable course marks become our immediate criterion of graduate student promise and a hopeful sign of subsequent scientific and professional attainments.<sup>22</sup>

21 Gladys Ryan Garlington, <u>Persistence of the 1935-36</u> <u>Preshman of the Southwest Texas State Teachers College</u>, Unpublished Master's Thesis, Southwest Texas State Teachers College, San Marcos, Texas, 1942, p. 14.

22 Ralph E. Jenson, <u>Predicting Scholastic Achievement</u> of First-Year Graduate Students, Unpublished Doctoral Dissertation, University of Pittsburgh, Pittsburgh, Pennsylvania, 1949, p. 3.

His study was an attempt to predict the scholastic achievement of several groups of first-year graduate students at the University of Pittsburgh. The major problems under investigation in his study were: (1) investigating the differences in performance on tests of graduate ability and over-all undergraduate quality-point average of graduate groups in Education, English, Chemistry and Psychology; (2) ascertaining the magnitude of differences in quality-point averages of the groups named above; (3) determining which predictive variables, singly and in various combinations, give maximum accuracy in forecasting first-year graduate scholastic achievement of each group; (4) comparing undergraduate quality-point averages with the tests of graduate ability for accuracy in predicting first-year graduate averages of the groups; and (5) developing devices whereby the results may be applied to "actual graduate selection problems faced continually by admission officers."23

Finally, rather than devote a portion of the study to the prediction of scholastic achievement for 'general' graduate students, the plan of the study is aimed at departmental studies. It seems more realistic to look for separate prediction formulae for various fields of graduate work since the evidence reported points to different patterns of ability and educational backgrounds for each.<sup>24</sup>

The departmental samples selected for study constituted those having approximately fifty or more students with complete and usable undergraduate records and test scores. All

<sup>23</sup> Ibid., p. 6.

<sup>24</sup> Ibid., p. 21.

their graduate work was taken in one field of study at the University of Pittsburgh, and they were tested on the Pittsburgh Examination during the fall of 1947 or the spring and summer of 1948. Two predictive variables were used: (1) the over-all undergraduate quality-point average; and (2) the University of Pittsburgh Examination for Graduate Students, which was a battery of three published standardized tests, namely, (a) Miller Analogies Test; (b) Iowa Mathematical Aptitude Test; and (c) The Cooperative Reading Comprehension Test.

Jenson arrived at the following "general conclusions":

(1) Given a set of predictive measures from which it is desired to predict success in graduate scholastic achievement of different graduate groups, equal powers of prediction should not be arbitrarily assigned to each or any combinations of these variables. Empirical tests should be made first to ascertain differences in group performance on the predictive and criterion variables and beta weights derived for each member of a predictive team.

(2) Undergraduate quality point averages should not be consistently relied upon as the best single predictor of first-year graduate scholastic achievement. Even though it occurred most frequently in multiple prediction, it should be assigned a weight in relation to its true power of prediction when the influence of other members of the predictive team of which it was a participant is excluded. When used singly it should be employed with knowledge of its real predictive power.

(3) In general, the GQPA [Graduate Quality Point Average] of first-year graduate students in Education, English and Psychology can be predicted accurately two times out of three within an error of about three-tenths of a quality point in either direction of the best prediction GQPA. This error runs about four-tenths for the Chemistry group. (4) The Pittsburgh Examination will predict graduate success of the groups studied as well or better than the much longer tests of the Graduate Record Examination will predict it for the same classes of students at Harvard or Iowa.<sup>25</sup>

· Wentz pointed out that

Most colleges and universities use the regular methods of statistical techniques of making studies within their institution for correlating grade-point averages of undergraduates with grade-point averages of graduate students. The information gleaned from such study is considered only of local interest and it is not ordinarily made known. Then, too, the information is usually of a very informal nature, and in that form, while perfectly suitable for the needs, it is not in the nature of documented data.<sup>20</sup>

It is therefore difficult to obtain from graduate schools reliable information in documented form that would be acceptable to include in a study of this type. This difficulty does not lessen the need for such information, however, for often one institution desires to compare the success of its students with that achieved elsewhere. And, as pointed out before, the problem of selecting worthy applicants for graduate study is not new to the colleges of this nation.

25 Ibid., pp. 109-110.

26 George W. Wentz, Jr., 02. cit., pp. 17-18.

#### CHAPTER III

#### TECHNIQUE USED IN COLLECTING AND TREATING DATA

## 1. Sources of the Data

The data for this study were taken from several sources. First of all, it was necessary for the writer to determine how many master's degrees had been granted during the past five years by the nine schools being considered. When this was done, an approximate pro rata share of cases was decided upon for each institution, with the exception of number five. Here, although the number of degrees granted was less than three per cent of the total, 150 cases were selected as a minimum, since one-half this number would reduce the smallest population with which to work to seventy-five students. Table I shows the number of master's degrees granted by the various institutions during the school years 1947-48 through 1951-52, the number of cases selected for study, and the approximate percentage these cases represent of the total population of the investigation.

-22-

School number	Number master's de- grees conferred	Cases used	Approximate percentage of total cases
1	1,622	400	13.333
2	2,135	550	18.333
3	2,686	650	21.667
4	818	250	8.333
5	294	150	5.000
6	713	250	8.333
7	839	250	8.333
8	728	250	8.333
9	700	250	8.333
Totals	10,535	3,000	99.998

TOTAL MASTER'S DEGREES GRANTED, 1947-48 THROUGH 1951-52, NUMBER OF CASES USED, AND APPROXIMATE PERCENTAGE OF TOTAL CASES REPRESENTED BY EACH SCHOOL

TABLE I

Only the schools' arbitrarily assigned numbers were used throughout the study to protect the identity of these schools. At no place on the information cards was the name of the school or the name of the individual student used; code numbers took their places.

In each school the complete list of successful master's degree candidates for the years being studied was compiled. From this list it was determined which graduates were to be

considered merely by taking every third or fourth student. depending upon the number of cases to choose from and the number of cases needed from that institution. After these names were assembled, the permanent records of the various registrars were opened and the following selection criteria were then applied: (1) the student must have majored in the same field on both degrees, or if he had majored in more than one subject on his baccalaureate degree, the graduate major must also have been one of those fields; (2) all undergraduate work must have been completed without transfer work; (3) rejection of any student whose baccalaureate degree was from an out-of-the-state institution; and (h) one-half of the cases selected must have been those who had transferred to another college after the first degree and one-half must have been those who took both degrees from the same school. This last criterion prevented the sampling from being as random as desired, for as the students were finally selected for inclusion in the study, frequently more transfers were found than those who had taken both degrees from the same school, or vice versa. Consequently, some of the students, who otherwise would have fitted in, had to be rejected in order not to exceed or fall short of the fifty per cent ratio of transfers.

Next, it was necessary for the writer to obtain the raw letter marks from the permanent record cards of the 3,000 students who had taken their master's degrees from the nine

Texas institutions considered. For 1,500 of these graduates who had taken the baccalaureate degree in one Texas school and then transferred to another school in Texas for the master's degree, it was necessary to obtain raw letter or number marks from their transcripts.

A "key" to the names of schools and a separate "key" to the list of students within each school were kept in order to avoid duplication and to enable the writer to find a particular record later if it were accidentally left incomplete.

The information recorded for each student was (1) college number, (2) student number, (3) sex, (4) birthday, (5) whether he had attended any part of his schooling as a veteran as defined by the G. I. Bill of Rights, (6) academic major, (7) which undergraduate degree, (8) when taken, (9) where granted, (10) which master's degree, (11) when taken, (12) which doctor's degree, (13) when taken, and (14) a tabulation of the number of "Ats," "Bis," "Cis," "Dis," and "Fis" attained. There was also a line for "totals" and another for "averages," The tabulation was divided into the following classifications: (1) "freshman-sophomore," wherein the first sixty to seventy hours of credit earned chronologically were placed; (2) "junior-senior," wherein the remainder of the undergraduate work up to the granting of the first degree fell; (3) "total undergraduate," which was merely a total of items one and two above; (4) "major," which included only those marks earned

in the student's academic major field as determined by both degrees; (5) "master's," wherein all graduate work leading to the master's degree was recorded; and (6) "doctor's," which was used only for the twenty-five cases who had completed some work toward their doctorate. After each of these classification columns, there appeared a "Total" column, which was later used to show the total number of quality-points allowed for each mark in the various classifications.

Each student's college marks were transmuted into qualitypoints by letting an "A" represent four quality- or gradepoints; "B" three; "C" two; "D" one; and "F" zero. All grades of "P" or "Pass" or "Credit" were arbitrarily assigned the mark of "B" and were so considered in further calculations. From the number of symbols earned, the proper quality-point value was multiplied to achieve the number listed in the "Total" columns under the various classifications. All quarter or term hours were also converted into semester hours and the information recorded on the basis of three semester hours counting as one course.

When the conversion of marks into quality-points was completed, the number of courses and the number of qualitypoints earned were added, and the former was divided into the latter to find the grade-point averages for the five or six different classifications (the number depending on whether the student had finished any doctoral work).

Two other quantities were then ascertained for each student and entered on the information cards. These were the number of years between the granting of the two degrees, derived simply by subtracting one date from the other, and the "adjusted graduate grade-point average." This adjusted graduate grade-point average was assigned to each card in order to make the study more meaningful inasmuch as it was an attempt to give a quantitative value to a qualitative factor. It was derived by applying a penalty to the regularly calculated grade-point average if the student's graduate record indicated that he did not achieve the marks normally expected of graduate students. This penalty was made up of several parts: (1) if the student made no "A's" on his graduate record, his average was penalized two-tenths of a grade-point; (2) if he made two times as many or more "B's" as "A's," he received the same penalty, but he could not be penalized for both "(1)" and "(2)"; (3) for a first "C" the penalty was one-tenth of a grade-point; (4) two-tenths of a grade-point were deducted for each additional "C"; (5) for each "D" in the record two-tenths of a grade-point were deducted; and (6) two-tenths of a grade-point were deducted for each "F" recorded. Other than the exception mentioned above, each offense constituted a separate penalty, which brought the averages of a number of the students who barely maintained a required "B" average for graduate work down to rather low averages.

This adjustment factor gave a greater range to the graduate grade-point averages than existed for the undergraduate marks and therefore tended to correct any degree of skewness that might otherwise have been evidenced on the graduate scale. Ehereas the graduate grade-point averages ranged from 2.44 to 4.00 quality-points before the factor was applied, they ranged from 0.54 to 4.00 quality-points after being adjusted. In every case, through all the divisions, the correlations are shown between the various levels of the undergraduate grade-point averages and both the regular and the adjusted graduate grade-point averages.

### 2. Procedure

With these data at hand, the actual study of their relationship to each other was begun. This called for the computation of a series of 234 coefficients of correlation through the use of scattergrams in order to determine whether any two of the sets of data under consideration were related, and to what extent the relationship existed.

The formula used in the computation of all Pearson productmoment correlations given in this investigation was the one given by Holzinger<sup>1</sup> as most convenient for grouped data:

<sup>1</sup> Karl J. Holzinger, <u>Statistical Methods</u> for <u>Students</u> in <u>Fducation</u>, p. 151.
$$\underline{\mathbf{r}} = \frac{\sum_{\mathbf{x}, \mathbf{y}, \mathbf{d}, \mathbf{y}, \mathbf{d}, \mathbf{y}} - \frac{(\sum_{\mathbf{x}, \mathbf{d}, \mathbf{x}}) (\sum_{\mathbf{y}, \mathbf{d}, \mathbf{y}})}{N}}{\sqrt{\sum_{\mathbf{x}, \mathbf{x}, \mathbf{d}, \mathbf{x}}^{2} - \frac{(\sum_{\mathbf{x}, \mathbf{d}, \mathbf{x}})^{2}}{N}} \sqrt{\sum_{\mathbf{y}, \mathbf{d}, \mathbf{y}}^{2} - \frac{(\sum_{\mathbf{y}, \mathbf{d}, \mathbf{y}})^{2}}{N}}}$$

When it was found that a relationship did exist between undergraduate and graduate grade-point averages, the possible causal relationship of various factors affecting the over-all correlation was determined. That is, it was determined how well one can predict from undergraduate work--at the freshmansophomore level, at the junior-senior level, and then at the total undergraduate level--the success graduate students might enjoy.

Then various factors were studied to see what effect they had on this relationship at these three levels. First, the matter of sex difference of the scholastics was investigated. Then, among the males only, the factor of being a veteran or not being a veteran was studied on the three levels and with regular and adjusted graduate grade-point averages to see if this caused a shift in the correlations. The female veterans were omitted from this part of the study since there were only twenty-eight of them; to have included the females would merely mean that the records of the males were again pitted against those of the females, thereby rendering the veteran factor invalid.

Next, the factor of transferring came in for investigation. The same correlations--between the undergraduate grade-point

averages at the three levels of work and the regular and adjusted graduate grade-point averages--were determined for those students who had transferred after receiving their first degrees. These transferees were then divided into two groups: (1) those who had attended a school for their first degree where a Phi Beta Kappa chapter was established and then transferred to a non-Phi-Beta-Kappa school; and (2) those who had attended a school where no such chapter was established for their first degree and then transferred to another school where there was no such chapter. The authority to establish and the ability to maintain such a Phi Beta Kappa chapter on the campus was arbitrarily selected to denote a widely recognized superior quality among the schools of the nation. Only three such chapters exist in Texas at the present time. The students who had taken both degrees from the same institution, or the so-called "non-transfers," were studied as a group of 1,500, and then they were divided into the various nine schools and the same correlations were determined for each school studied. The population for these particular correlations was one-half the total number of cases selected from each school. The population for these individual school correlations therefore ranged from seventy-five to 325.

1

The 3,000 cases were then divided into six general areas of study with no reference being made to any other factor. This division provided 179 cases for the vocational majors,

167 cases for natural sciences, 145 in business, 309 in humanities, 257 in social sciences, and 1,943 in education and health & physical education. The same levels of undergraduate grade-point averages and the two types of graduate grade-point levels were then correlated as in the study of other factors.

Finally, an investigation was made to determine if the length of time between the awarding of the baccalaureate degree and the master's degree was of consequence to the over-all relationship. All of the cases were divided into the following five groups to consider the relationship between undergraduate and graduate grade-point averages: (1) no lag through two years; (2) three through five years lag; (3) six through ten years lag; (4) eleven through twenty years lag; and (5) over twenty years lag. Then these groups were divided according to sex to see what effect, if any, this factor had on the time-lag variable.

Three well-known abbreviations were used in the reporting of the results of the investigation: (1) <u>N</u> for the number of cases used; (2) <u>r</u> for coefficient of correlation; and (3) <u>P. F.</u> for probable error.

### CHAPTER IV

## RESULTS AND INTERPRETATIONS

Since all of the results of this study will be given as a coefficient of correlation with its calculated probable error, it is best first to have some understanding of the possible meaning of this coefficient and an interpretation of its possible magnitudes. Garrett states:

The product-moment coefficient of correlation may be thought of essentially as that <u>ratio</u> which expresses the extent to which changes in one variable are accompanied by--or are dependent upon--changes in a second variable.1

Crawford and Burnham, in the first volume of a proposed exhaustive study of the subject, say:

r from .00 to .19 denotes indifferent or negligible relationship. r from .20 to .39 denotes low correlation; present but slight. r from .40 to .49 denotes a reasonable, and probably significant correlation. r from .50 to .69 denotes substantial or marked relationship. r from .70 to 1.00 denotes high relationship, seldom found, because of complicating factors and uncertain measures.<sup>2</sup>

Rugg gives us a little different interpretation on the evaluation of coefficients of correlation when he says:

This definition of limits depends largely on the personal experience of the person making the interpretation. For example, it has been common for certain educational investigators to arbitrarily

1 Henry R. Garrett, <u>Statistics in Psychology and Fducation</u>, 3rd ed., p. 272.

<sup>2</sup> Albert Beecher Crawford and Paul S. Burnham, <u>Forecasting</u> <u>College Achievement</u>, p. 52. interpret a coefficient of .25 as an indication of 'high' positive correlation, and one of .40 as 'very high.' Others would interpret .25 as very low, and .50 as 'marked' or 'somewhat high.' Certainly, our educational conclusions must be colored by our arbitrary definition of such a coefficient. The experience of the present writer in examining many correlation tables has led him to regard correlation as 'negligible' or 'indifferent' when r is less than .15 to .20; as being 'present but low' when r ranges from .15 to .20 to .35 or .40; as being 'markedly present' or 'marked,' when r ranges from .35 to .40 to .50 or .60; as being 'high' when it is above .60 or .70. With the present limitations on educational testing few correlations in testing will run above .70, and it is safe to regard this as a very high correlation.3

Table II gives the coefficients of correlation and their probable errors for the total population of 3,000 cases.

#### TABLE II

RELATIONSHIPS BETWEFN UNDERGRADUATE AND GRADUATE GRADE-POINT AVERAGES FOR 3,000 TEXAS CASES

Relationships	r	P. F.	
(1) Grade-point averages for freshman- sophomore work and graduate work	.443	.010	
(2) Grade-point averages for junior- senior work and graduate work	•484	.009	
(3) Grade-point averages for total under- graduate work and graduate work	.417	.010	
(4) Grade-point averages for freshman- sophomore work and adjusted graduate work	•436	.010	
(5) Grade-point averages for junior- senior work and adjusted graduate work	.455	.010	
(6) Grade-point averages for total under- graduate work and adjusted graduate work	.435	.010	

<sup>3</sup> Barold C. Rugg, <u>Statistical Methods Applied to Education</u>, p. 256.

It is evident that the grade-point averages for the three different levels of undergraduate study are of approximately the same value for prediction purposes. Using Rugg's "experience" as a criterion for generalization, one would say that all of the above coefficients show that the relationship between undergraduate and graduate grade-point averages, and between undergraduate and adjusted graduate grade-point averages, were "markedly present." The above results were extremely close to those obtained by Wentz<sup>4</sup> in his study of 200 cases at only one Texas college, but were lower than those obtained by Weber, Brink, and Gilliland,<sup>5</sup> who studied 319 students at Northwestern University. It is interesting to note that the coefficients of correlation did not follow the results of Strang, who said:

As certain students become more and more engrossed in their major interest, they tend to devote an increasing amount of effort to it with a resulting neglect of other courses. This specialization of interest may be the most important factor in lowering the coefficient of correlation in the later years of college.

The relationship between junior-senior grade-point averages and graduate work was higher than that for the freshman-sophomore work before and after the adjustment factor was applied, although the application heightened the difference.

4 George W. Wentz, Jr., <u>op</u>. <u>cit.</u>, p. 29. 5 Janet Weber, W. G. Brink, and A. R. Gilliland, <u>op</u>. <u>cit.</u>, p. 21.

Ruth Strang, <u>Personal Development and Guidance in</u> <u>College and Secondary Schools</u>, p. 72.

It is interesting to note that the junior-senior work was the best of the three indices to use in both cases and the total undergraduate averages were the poorest, although when the graduate averages were adjusted, there was no practical difference between the use of the freshman-sophomore averages and the total undergraduate averages.

In any event, for predictive purposes it would seem that all the grade-point averages taken could profitably be used as worthy indices. The coefficients fell at both the freshmansophomore and the junior-senior level of the study when the adjustment factor was applied to the graduate grade-point averages, but rose slightly at the total undergraduate work level.

In later discussions concerning the magnitude of the coefficients of correlation obtained for the various factors under consideration, little will be said unless those coefficients are considerably above or below the ones found in the over-all relationships between the three levels of undergraduate marks and the graduate grade-point averages.

The junior-senior grade-point averages were more than three-tenths of a grade-point higher than the freshman-sophomore averages, having means of 2.989 and 2.623 respectively, while the mean total undergraduate grade-point average was 2.810. The adjustment factor brought the graduate grade-point average down from 3.467 to 3.394.

# A. Grade-Point Averages for Undergraduate Work and Graduate Work According to Sex

When the selection of the 3,000 cases was finished, the writer was surprised to find that they were so nearly equally divided between males and females. There were 1,543 males and 1,457 females, representing 51.43 and 48.57 per cent of the cases, respectively. Table III below shows the same sets of data as those given in Table II, but divided into the two sexes.

#### TABLE III

RELATIONSHIPS BETWEEN UNDERGRADUATE AND GRADUATE GRADE-POINT AVERAGES FOR 1,543 MALES AND 1,457 FEMALES

Belettershtre	Ms	les	Females		
Relationships	r	P.E.	r	P. E.	
(7-8) Grade-point averages for freshman-sophomore work and graduate work	.427	•014	•658	.010	
(9-10) Grade-point averages for junior-senior work and graduate work	•505	•013	•453	•014	
(11-12) Grade-point everages for total undergraduate work and graduate work	•447	•01)t	.418	.015	
(13-14) Grade-point averages for freshman-sophomore work and adjusted graduate work	•396	•01f	.627	.011	
(15-16) Grade-point averages for junior-senior work and ad- justed graduate work	.462	•014	.420	.015	
(17-15) Grade-point averages for total undergraduate work and adjusted graduate work	•439	•01/4	.386	.015	

The coefficients of correlation for the males followed the same general pattern as those for the total population with the exception that with the males the grade-point averages for the total undergraduate work proved to be a better criterion for prediction than the freshman-sophomore grade-point averages. Here, the adjusted graduate work averages consistently showed a lower relationship than did the graduate work averages before they were adjusted.

An unusual phenomenon appeared in Table III. The relationship between the grade-point averages for freshman-sophomore work and graduate work, both regular and adjusted, for the females was quite high. Before the graduate work was adjusted, the coefficient was the second highest in the entire study, and it was significantly higher than that for the same sets of data for the males. It was, according to Rugg's standards, "high" rather than "marked."7 and was the second highest the writer was able to find in his survey of the field. The relationship between the other two levels of study and the graduate marks were not markedly different from those found for the males, and the situation was made all the more unusual when one discovered that otherwise the coefficients for the females trailed those for the males in every case. Here. for the first and one of the few times, the situation decidedly followed that referred to by Strang,<sup>8</sup> and showed that among

<sup>7</sup> Harold O. Rugg, loc. cit.

<sup>&</sup>lt;sup>8</sup> Ruth Strang, <u>loc. cit.</u>

the females the freshman-sophomore grade-point average was a much better criterion for the prediction of graduate school marks than was the junior-senior or the total undergraduate work. This could have been caused by the reasons given in the above reference or possibly the fact that females were more interested during the latter two years of their undergraduate career in extra-curricular duties and pleasures than they were in achieving good marks. The opposite was possibly true during their first two years of college study. This indicated that the objectives of undergraduate female students in Texas changed after the first two years of academic life.

The other coefficients of correlation for the females showed no perticular deviation from those found for the population as a whole. That between the total undergraduate work and the adjusted graduate work dipped below .40 for the only time in this part of the investigation, but was not significantly lower than the others.

A comparison of the mean scores throughout the data for the males and females revealed no significant differences for either group. The mean freshman-sophomore grade-point average for the males was 2.562, while that for the females was 2.679; on the junior-senior level, the means were 2.948 and 3.033 respectively; and on the total undergraduate scores they were 2.754 and 2.865. The mean graduate grade-point averages for the females were consistently slightly higher than those for the men, being 3.526 as compared with 3.473 before the adjustment and 3.439 and 3.349 afterwards.

# B. Grade-Point Averages for Undergraduate Work and Graduate Work for Male Veterans and Mon-Veterans

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When the males of this study were further divided into the categories of veterans and non-veterans, it was found that 922 or 59.75 per cent were veterans, as classified by the G. I. Bill of Rights, and 621, or 40.25 per cent, were not. The same statistical procedures were applied to these two groups, and the results are shown in Table IV.

#### TABLE IV

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RELATIONSHIPS BETVEEN UNDERGRADUATE AND GRADUATE GRADE-POINT AVEFAGES FOR 922 MALE VETERANS AND 621 MALE NON-VETERANS

Palationshine	Vet	erans	Non-veterans		
Vergerauthe	r	P. E.	P	P. E.	
(19-20) Grade-point averages for freshman-sophomore work and graduate work	.418	.018	•439	•022	
(21-22) Grade-point averages for junior-senior work and graduate work	.472	.017	•566	.013	
(23-24) Grade-point averages for total undergraduate work and graduate work	.413	.019	.513	•020	
(25-26) Grade-point averages for freshman-sophomore work and adjusted graduate work	• 389	•019	.423	.022	
(27-28) Grade-point averages for junior-senior work and ad- justed graduate work	•440	.018	•529	.019	
(29-30) Grade-point averages for total undergraduate work and adjusted graduate work	.406	.019	.501	.020	

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Although one may have heard much about the seriousness and maturity with which veterans attacked their school work when they returned to civilian life -- how they knew what they wanted and went after it rather than "playing around" as the non-veterans had a tendency to do -- the above figures did not in any instance bear out this "superiority." In fact, the reverse trend was indicated by every coefficient and when the mean grade-point averages were considered, the picture was even stronger in favor of the non-veterans because all averages for veterans were lower than the corresponding averages for non-veterans. The means presented below give the veterans first and then those for the nonveterans: freshman-sophomore grade-point averages, 2.546 and 2.587; junior-senior grade-point averages, 2.936 and 2.951; total undergraduate grade-point averages, 2.749 and 2.762; graduate grade-point averages, 3.465 and 3.483; and adjusted grade-point averages, 3.343 and 3.366.

Approximately the same predictive value could be attached to the freshman-sophomore work for both groups, but the difference in the second half of their college work was quite definite. When the adjusted graduate work was considered, the values were not materially changed.

The lower relationships for the veterans may be due to one or a number of causes, among which are the following: (1) veterans had varied their interests while in service and hence did not want to be tied down to the single goal

of graduate study; (2) a cursory examination of the marital status indicated that a larger percentage of veterans were married than were the non-veterans; (3) the average age of the veteran student was between three and four years higher than that of the non-veteran, during which time the learning processes had slowed;<sup>9</sup> (4) some veterans went back to school simply because the government would pay part or all of their expenses and they had little or nothing else to do; (5) some veterans congregated in special sections of courses with "extra" and possibly inferior instructors assigned to them; and (6) many veterans who were not fitted for college training or who normally would never have had the financial opportunity to attend started a college career with veterans' allowances.

# C. Grade-Point Averages for Undergraduate Work and Graduate Work for Transfers and Non-Transfers

When the records for this study were gathered, one of the selection criteria was that one-half of the cases would be transfers, as previously defined, and the other one-half would be non-transfers. Table V gives the results of the correlations computed for these two large groups.

<sup>9</sup> John A. McGeoch, The Psychology of Human Learning, pp. 59-62.

### TABLE V

RFLATIONSHIPS BETWEEN UNDERGRADUATE AND GRADUATE GRADE-POINT AVERAGES FOR 1,500 TRANSFERS AND 1,500 NON-TRANSFERS

Dal of tanah tan	Trar	sfers	Non-tr	Non-transfers			
Relationships	r	P.E.	· <b>*</b>	P. E.			
(31-32) Grade-point averages for freshman-sophomore work and graduate work	.427	.014	.448	.014			
(33-34) Grade-point averages for junior-senior work and graduate work	.466	•014	.480	.013			
(35-36) Grade-point averages for total undergraduate work and graduate work	•516	.013	•498	.013			
(37-33) Grade-point averages for freshman-sophomore work and adjusted graduate work	• 393	.015	•435	•014			
(39-40) Grade-point averages for junior-senior work and ad- justed graduate work	.415	*01f	.453	•014			
(41-42) Orade-point everages for total undergraduate work and adjusted graduate work	.423	.014	•494	.013			

The similarity of the two groups was somewhat surprising and indicated that it made little or no appreciable difference whether one transferred to a second school after taking the bachelor's degree or stayed in the same school for the two degrees. The non-transfers had slightly higher correlations on both the freshman-sophomore and the junior-senior work but fell below the transfers on the total undergraduate correlation; however, the non-transfers were higher on all three levels when the graduate work grade-points were adjusted.

The means of the grade-point averages for the two groups vary less than one-tenth of a quality-point at all but one level--that of the junior-senior work where the mean for the transfers was 3.087 and 2.960 for the nontransfers.

When the transfers were divided into two groups, the similarity of coefficients of correlation stopped, indicating that the transfer group was made up of two dissimilar groups. A total of 262, or 17.47 per cent of the transfers, had taken their first degree from a school where a Phi Beta Kappa chapter had been established but then had transferred to a non-Fhi-Beta-Kappa school for the master's degree. The other 1,238 graduates, representing 82.53 per cent of the transfers, had taken the first degree in one non-Phi-Beta-Kappa school and then had transferred to another such school for the graduate schooling. The usual correlations for these two divisions are shown in Table VI.

## TABLE VI

## RELATIONSHIPS BETWEEN UNDERGRADUATE AND GRADUATE GRADE-POINT AVERAGES FOR TWO DIFFERENT GROUPS OF TRANSFERS

Relationships	r	P. E.
From Phi-Beta-Kappa Schools to Non-Phi-Beta-Kap	opa Schoo	ls Crou
(43) Grade-point averages for freshman- sophomore work and graduate work	.254	.039
(44) Grade-point averages for junior- senior work and graduate work	• 308	.038
(45) Grade-point averages for total under- graduate work and graduate work	• 324	•037
(46) Grade-point averages for freshman- sophomore work and adjusted graduate work	.204	•040
(47) Grade-point averages for junior-senior work and adjusted graduate work	.270	.039
(48) Grade-point averages for total under- graduate work and adjusted graduate work	-285	.038
From One Non-Phi-Beta-Kappa School to Another Kappa School	• Non-Phi	-Beta-
(49) Grade-point averages for freshman- sophomore work and graduate work	•464	.015
(50) Grade-point averages for junior- senior work and graduate work	•496	.014
(51) Grade-point averages for total under- graduate work and graduate work	•560	.013
(52) Grade-point averages for freshman- sophomore work and adjusted graduate work	•433	.016
(53) Grade-point averages for junior-senior work and adjusted graduate work	.446	.015
(54) Grade-point averages for total under- graduate work and adjusted graduate work	.452	.015

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Rugg<sup>10</sup> would call all the coefficients in the first part of the above table "present but low," whereas those in the latter part of the table were about the same as other parts of this study have produced---"markedly present." There definitely was a significant difference in the two groups and in each case the grade-point averages of the junior-senior work were a better criterion than were those for the freshman-sophomore work; in like manner, the total undergraduate work was a better index of prediction than was the junior-senior work.

The figures presented in Table VI were a very strong endorsement of the three schools in Texas which had Phi Beta Kappa chapters. The relationships indicated that in so far as graduate study was concerned, it made little or no difference what type of undergraduate marks the students from these schools made because they correlated so low with graduate success when the graduate work was done in schools not having a Phi Beta Kappa chapter. In fact, students from Phi Beta Kappa undergraduate schools made a higher over-all graduate average when they transferred to the non-Phi-Beta-Kappa schools than those who originally came from the lattertype institutions. The same type of statement could be made when the graduate marks were adjusted, although both groups naturally showed a decrease in averages.

10 Harold O. Rugg, loc. eit.

One could better predict the graduate performance from every level of the undergraduate work of those students who avoided the Phi-Beta-Kappa institutions. In other words, if a student made good grades in a school which did not have the honorary society established, he would tend to make good marks in another such school, but even those who made poor marks in Phi-Beta-Kappa schools were successful on the graduate level in other schools. However, if all of the cases studied had not been successful graduate students, the converse might just as well have been true.

The means revealed that freshman-sophomore marks in member schools were slightly higher than those in nonmember schools, being 2.644 and 2.591, respectively, while the reverse was true at the other two levels. Those mean averages given in the same order were 3.000 and 3.105 at the junior-senior level and 2.824 and 2.848 for the total undergraduate work.

The non-transfers were studied separately by institutions in order to see whether one could better predict in one school or another the graduate marks from the undergraduate grade-point averages. The relationships derived by schools are given in Table VII.

## TABLE VII

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RELATIONSHIPS BETTEEN UNDERCRADUATE AND GRADUATE GRADE-POINT AVERAGES FOR NON-TRANSFERS IN MIRE DIFFERENT SCHOOLS

Relationships	r	P. E.
School Number 1 Where N = 200		
(55) Grade-point averages for freshman- sophomore work and graduate work	•513	.035
(56) Grade-point averages for junior- senior work and graduate work	•528	•034
(57) Grade-point averages for total under- graduate work and graduate work	•546	.033
(58) Grade-point averages for freshman- sophomore work and adjusted graduate work	•469	.037
(59) Grade-point averages for junior-senior work and adjusted graduate work	.516	.035
(60) Grade-point averages for total under- graduate work and adjusted graduate work	•536	.034
School Number 2 Where N = 275		
(61) Grade-point averages for freshman- sophomore work and graduate work	.420	•034
(62) Grade-point averages for junior- senior work and graduate work	•588	.027
(63) Grade-point averages for total under- graduate work and graduate work	•524	.029
(64) Grade-point averages for freshman- sophomore work and adjusted graduate work	•437	.033
(65) Grade-point averages for junior-senior work and adjusted graduate work	•528	.029
(66) Grade-point averages for total under- graduate work and adjusted graduate work	.503	.030

Relationships	r	P. R.
School Number 3 Where N = 325		. ,
(67) Grade-point averages for freshman- sophomore work and graduate work	•330	.033
(68) Grade-point averages for junior- senior work and graduate work	• 358	.032
(69) Grads-point averages for total under- graduate work and graduate work	•376	.032
(70) Grade-point averages for freshman- sophomore work and adjusted graduate work	.286	•034
(71) Grade-point avorages for junior-senior work and adjusted graduate work	• 348	.033
(72) Grade-point averages for total under- graduate work and adjusted graduate work	.409	•032
School Number 4 Where N = 125		
(73) Grade-point averages for freshman- sophomore work and graduate work	.421	.050
(74) Grade-point averages for junior- senior work and graduate work	.416	.050
(75) Grade-point averages for total under- graduate work and graduate work	.472	.047
(76) Grade-point averages for freshman- sophomore work and adjusted graduate work	•448	•048
(77) Grade-point averages for junior-senior work and adjusted graduate work	.408	.050
(78) Grade-point averages for total under- graduate work and adjusted graduate work	.482	.046

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TABLE VII (Continued)

# TABLE VII (Continued)

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Relationships	r	P. E.
School Number 5 Where N = 75		
(79) Grade-point averages for freshman- sophomore work and graduate work	.624	*0148
(80) Grade-point averages for junior- senior work and graduate work	•539	•055
(81) Grade-point averages for total under- graduate work and graduate work	.665	•043
(82) Grade-point averages for freshman- sophomore work and adjusted graduate work	•596	.050
(83) Grade-point averages for junior-senior work and adjusted graduate work	•497	•058
(84) Grade-point averages for total under- graduate work and adjusted graduate work	.604	•049
School Number 6 Where N = 125		
(85) Grade-point averages for freshman- sophomore work and graduate work	•500	.045
(86) Grade-point averages for junior- senior work and graduate work	•530	•043
(87) Grade-point averages for total under- graduate work and graduate work	.580	•040
(88) Grade-point averages for freshman- sophomore work and adjusted graduate work	.458	•048
(89) Grade-point averages for junior-senior work and adjusted graduate work	.489	•046
(90) Grade-point averages for total under- graduate work and adjusted graduate work	•532	.043

Relationships	r	P. E.
School Number 7 Where H = 125		
(91) Grade-point averages for freshman- sophomore work and graduate work	• 508	.045
(92) Grade-point averages for junior- senior work and graduate work	.435	•049
(93) Grade-point averages for total under- graduate work and graduate work	•515	-044
(94) Grade-point averages for freshman- sophomore work and adjusted graduate work	•502	.045
(95) Grade-point averages for junior-senior work and adjusted graduate work	•351	÷053
(96) Grade-point averages for total under- graduate work and adjusted graduate work	.491	•046
School Number 8 Where N = 125		
(97) Grade-point averages for freshman- sophomore work and graduate work	•535	.043
(98) Crade-point averages for junior- senior work and graduate work	•491	.046
(99) Grade-point averages for total under- graduate work and graduate work	•537	•043
(100) Grade-point averages for freshman- sophomore work and adjusted graduate work	•525	•044
(101) Grade-point averages for junior-senior work and adjusted graduate work	.502	•046
(102) Grade-point averages for total under- graduate work and adjusted graduate work	•529	•043

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TABLE VII (Continued)

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Relationships	r	P. E.
School Number 9 Where N = 125		
(103) Grade-point averages for freshman- sophomore work and graduate work	•14314	.050
(104) Grade-point averages for junior- senior work and graduate work	•494	.046
(105) Grada-point averages for total under- graduate work and graduate work	.476	-047
(106) Grade-point averages for freshman- sophomore work and adjusted graduate work	•477	.047
(107) Grade-point averages for junior-senior work and adjusted graduate work	.490	•046
(108) Grade-point averages for total under- graduate work and adjusted graduate work	•505	•045

TABLE VII (Continued)

From the above table it may be seen that in all but two schools, numbers two and nine, the grade-point averages for total undergraduate work were the best indicators of graduate work. In the two exceptions, the junior-senior gradepoint averages were the best indicators, whereas in no one school did the freshman-sophomore work show up as the best index.

When the relationships for each school were compared with those for the total non-transfers, only two of the schools deviated from that which one would have normally 51

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expected. These were schools numbered three and five, the largest and the smallest, respectively, for the purposes of this investigation. The size of the school, however, was not where the dissimilarity stopped. School number five had the highest group of coefficients of correlation of the entire study. Furthermore, the correlation between grade-point averages for total undergraduate work and graduate work  $(.665\pm.043)$  was the highest single coefficient derived and was what Rugg<sup>11</sup> would call "high." When the total undergraduate work was correlated with the adjusted graduate work, the coefficient was lowered somewhat, but remained a "high" . 604. On the other hand, school number three's group of correlations was by far the lowest of the nine schools, and for the most part could be classified "low." In other words, one would have had a good chance of predicting graduate school success fairly accurately in school number five, but there was little chance of making a good prediction in school number three. These differences could have been the result of one or more of several factors at school number three (or the reverse of these at school number five), among which were: (1) low reliability of marks given by the instructors; (2) the awarding of high marks to students to please them rather than in accordance with merit; (3) poor instructors at either the graduate or

<sup>11</sup> Harold O. Rugg, loc. cit.

undergraduate level; (4) offering of graduate courses independent of prerequisities; (5) existence of a double standard of marking; and (6) failure to recognize and correct the mistake of admitting inferior students into the graduate school.

A look at the scattergrams for school number five revealed that no graduate average or adjusted graduate average of less than 3.10 was recorded, whereas for school number three, graduate averages of 2.44 and an adjusted graduate average as low as 0.54 were found. In like manner, school number three produced a freshman-sophomore grade-point average as low as 1.10, whereas the lowest such average for school number five was considerably higher.

The coefficients of correlation progressed from .330, using the freshman-sophomore work and the graduate marks, to .358 for the junior-senior work and graduate averages, and to .376 for the total undergraduate work and graduate work. These were small differences, and having the total undergraduate work as the best predictive level agreed with the results obtained for school number five. However, school number five did not show this type of progression; instead, the correlation between the grade-point averages for juniorsenior work and graduate work was significantly lower than either of the other two coefficients. In this respect, these students followed the findings of Strang,<sup>12</sup> which

12 Ruth Strang, loc. cit.

was not usually done in this investigation. The same thing was true when the total female population was studied (see pages 37-33 of this Chapter), so the sex of the school number five transfer population was resolved to see if this was the determining factor. However, it was found that forty-two, representing 56.00 per cent, of the seventyfive cases were males, so this was not the cause. The academic majors of these seventy-five persons were also checked to see if any particular field of study would follow this general pattern, but this attempt to explain the cause also failed. School number three, on the other hand, did have more females in the transfer group. Here, the females numbered 174, or 53.54 per cent of the 325, whereas the males numbered 151. Here, also, the academic major of Education claimed a majority of the students, with 223, or 68.62 per cent, majoring in this field. In school number five, the Education majors were less than a majority although thirty-four, or 45.33 per cent, of the transfers did select this major.

The various means for the nine schools and for the total transfers are presented in Table VIII.

### TABLE VIII

MEANS	OF	UNDERG	RAD	VATP	An	DI	GRAD	UATE	ORADE-	POINT	AVE	RAGES	FOR
NO	N-TI	RANSFEF	s I	N NI	NE	DI	FFER:	ent s	SCHOOLS	COMPA	RED	WITH	
				TO	TAL	N	ON-T	RAI'SI	FERS				

	Keans										
number	Freshman- sophomore work	Junior- senior work	Total under- graduate work	Graduate work	Adjusted graduats work						
1	2.680	2.686	2.683	3.483	3.371						
2	2.610	2.975	2.794	3.509	3.383						
3	2.644	2.992	2.818	3.600	3.407						
4	2.573	2.934	2.747	3.391	3.280						
5	2.672	3.206	2.861	3.636	3.590						
6	2.592	2.949	2.781	3.466	3.334						
7	2.481	2.873	2.725	3.480	3.369						
8	2.782	3.121	2.931	3.607	3.523						
9	2.784	3.093	2.925	3.496	3.395						
Total Non- Transfera	2.643	2.960	2.799	3.502	3.396						

School number five once again stood out, as expected, with the highest average of the junior-senior work, the graduate work, and the adjusted graduate work. And here a final significant difference showed up. When the mean adjusted graduate work was subtracted from the mean graduate

work, differences ranging from .046 to .193 of a gradepoint were found. These were seemingly small differences, but one was more than 420 per cent larger than the other. The smallest loss belonged to school number five, while the largest deductions went to school number three, indicating that the average graduate student at school number three was not on an academic par with those at other schools being investigated.

D. Grade-Point Averages for Undergraduate Work and Graduate Work According to General Areas of Study

In order to determine whether one could better predict graduate marks in various general areas of study, all of the students were divided into six groups according to their academic majors. The coefficients of correlation and their respective probable errors for these groups make up Table IX.

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## TABLE IX

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RELATIONSHIPS BETWEFN UNDERGRADUATE AND GRADUATE GRADE-POINT AVERAGES FOR SIX GENERAL AREAS OF STUDY

Relationships	r	P. E.
Vocational Majora Where N = 179		
(109) Grade-point averages for freshman- sophomore work and graduate work	.287	•046
(110) Grade-point averages for junior- senior work and graduate work	•338	.045
(111) Grade-point averages for total under- graduate work and graduate work	•352	<b>.</b> 044
(112) Grade-point averages for freshman- sophomore work and adjusted graduate work	• 355	.044
(113) Grade-point averages for junior-senior work and adjusted graduate work	• 370	• 044
(114) Grade-point averages for total under- graduate work and adjusted graduate work	• 384	.043
Natural Sciences Majors Where N = 1	.67	
(115) Grade-point averages for freshman- sophomore work and graduate work	.518	.038
(116) Grade-point averages for junior- senior work and graduate work	•574	•035
(117) Grade-point averages for total under- graduate work and graduate work	•589	•034
(118) Grade-point averages for freshman- sophomore work and adjusted graduate work	•519	.038
(119) Grade-point averages for junior-senior work and adjusted graduate work	•526	•038
(120) Grade-point averages for total under- graduate work and adjusted graduate work	•558	•036

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Relationships	r	P. E.
Business Majors Where N = 145		,
(121) Grade-point averages for freshman- sophomore work and graduate work	.363	.049
(122) Grade-point averages for junior- senior work and graduate work	.408	•047
(123) Grade-point averages for total under- graduate work and graduate work	•464	•044
(124) Grade-point averages for freshman- sophomore work and adjusted graduate work	•325	.050
(125) Grade-point averages for junior-senior work and adjusted graduate work	• 393	.047
(126) Grade-point averages for total under- graduate work and adjusted graduate work	.419	•046
Humanities Majors Where N = 309		
(127) Grade-point averages for freshman- sophomore work and graduate work	• 392	.032
(128) Grade-point averages for junior- senior work and graduate work	.441	.031
(129) Grade-point averages for total under- graduate work and graduate work	•1770	.031
(130) Grade-point averages for freshman- sophomore work and adjusted graduate work	•362	.033
(131) Grade-point averages for junior-senior work and adjusted graduate work	•390	•032
(132) Grade-point averages for total under- graduate work and adjusted graduate work	•384	.033

# TABLE IX (Continued)

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Relationships	r	P. E.
Education, Realth & Physical Education Majors	Where N =	1,943
(133) Grade-point averages for freshman- sophomore work and graduate work	.430	.012
(134) Grade-point averages for junior- senior work and graduate work	•454	.012
(135) Grade-point averages for total under- graduate work and graduate work	.405	.013
(136) Grade-point averages for freshman- sophomore work and adjusted graduate work	.404	.013
(137) Grade-point averages for junior-senior work and adjusted graduate work	.430	.012
(138) Grade-point averages for total under- graduate work and adjusted graduate work	• 384	.013
Social Science Najors Where N = 2	257	
(139) Grade-point averages for freshman- sophomore work and graduate work	.415	•035
(140) Grade-point averages for junior- senior work and graduate work	•521	.031
(141) Grade-point averages for total under- graduate work and graduate work	.511	•031
(142) Grade-point averages for freshman- sophomore work and adjusted graduate work	.383	•036
(143) Grade-point averages for junior-senior work and adjusted graduate work	•505	.031
(144) Grade-point averages for total under- graduate work and adjusted graduate work	•455	.033

# TABLE IX (Continued)

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Although very few general statements could be made about the information presented in the above table. it was seen that in every case the relationship between juniorsenior work and graduate work was higher than that for the freshman-sophomore averages and graduate averages. In onehalf the cases the coefficients went even higher when one progressed to the total undergraduate work relationship with graduate work (the vocational, natural science, and business groups), but decreased in the other groups. For the most part, the relationships between the various levels and the adjusted graduate work were correspondingly lower than between the same levels and the regular graduate work. but the direct opposite was true for all three pairs of coefficients for the vocational majors, indicating a deviation from the normal expectations with this group. Correlation number 118 was also very slightly lower than its correspondent, number 115.

The vocational majors group, which produced the second lowest set of correlations of the study, was composed of thirty-six male majors in Industrial Arts, seventeen females in Home Economics, and 126 males with majors in Vocational Agriculture or Agriculture Education. This was a total of 179, which represented 5.967 per cent of the total population. It was evident from the correlations that there was little predictive value of undergraduate marks in this field--it

apparently made little difference how well a student did on any part of his undergraduate work. The scattergrams for these correlations showed more spread of tally marks than did any other of the entire study.

Another group that showed considerable spread on the scattergram was the business majors, and this group was next to the worst in producing coefficients from which reliable predictions could be made. As with the vocational majors, the coefficients were larger as one progressed from the freshman-sophomore work to the junior-senior work, and finally to the total undergraduate work. The business majors did not, however, produce larger correlations when the adjusted graduate work was considered. The business majors consisted of 117 males and twenty-eight females (4.833 per cent of the total) with majors in Business, Economics, Accounting, Management, Marketing, or Business Education.

Although the scattergrams for the humanities looked as if they would produce much better relationships between the various sets of data, the coefficients of correlation for this group were but very little higher than those for the business group. In the humanities group were included 133 males and 176 females, together making 10.300 per cent of the cases, with academic majors in English, Spanish, Art, Speech, Religion and Religious Education, Bible, Philosophy, Music and Music Education, Voice, Drama, Radio, Photography, Composition, and Theory.

The Education group, which included those students who had majored in the three main branches of Education (elementary, secondary, and administrative), Guidance, Supervision, Special Education, Recreation, and Health & Physical Education, was by far the most numerous. This group was comprised of 1,130 females and 813 males, a total of 1,943, or 64.77 per cent of the entire student body considered. Since the group was so large, it was expected that the correlations would be practically the same as those for the entire population, and such was the case, even to the deviations for each corresponding coefficient.

The scattergrams for the social science majors, who represented 8.567 per cent of the total population, indicated that the tally marks are pushed somewhat to the right, thus showing that these graduate marks were higher than those for other groups. This shift was even more evident when the adjusted graduate marks were tallied. The coefficients of correlation for this group were the second highest in this part of the investigation. The social science group included academic majors of History, Psychology, Geography, Sociology, Government, Political Science, and Social Studies.

The tally marks for the natural science majors were even farther to the right of the sheet, and this especially showed up for the data concerning the junior-senior years of study. The correlations for this group, consisting of 144 males and twenty-three females (or a total of 5.567 per cent of the

cases) who majored in such academic courses as Mathematics, Biology, Chemistry, Physics, various branches of Engineering, and fields related to Medicine, were consistently the highest of any group in this part of the investigation. These high coefficients tended to corroborate the often-expressed idea that it takes the best students to major in the sciences, and certainly one could predict their graduate marks from their undergraduate work with more reliability than in the other areas of study.

Table X, which is similar to Table VIII, gives the means for the various groups of study.

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MEANS OF UNDERGRADUATE AND GRADUATE GRADE-POINT AVERAGES FOR SIX GENERAL AREAS OF STUDY COMPARED WITH TOTAL POPULATION

Area of study	Neans					
	Freshman- sophomore work	Junior- senior work	Total under- graduate work	Graduate work	Adjusted graduate work	
Vocational	2.397	2.833	2.602	3.382	3.223	
Natural sciences	2.784	3.087	2.945	3.571	3.473	
Business	2.585	2.967	2.773	3.449	3.290	
Humanities	2.942	3.233	3.090	3.629	3.568	
Education, Nealth & Physical education	2.573	2.945	2.758	3.479	3•373	
Social sciences	2.753	3.091	2.906	3.554	3.471	
Total population	2.623	2.989	2.810	3.497	3+394	

The humanities group had the highest average in all five divisions, whereas the natural sciences were second in every instance except one, the junior-senior work. The difference here was very slight but social sciences were in second place.

When the adjusted graduate work averages were subtracted from the regular graduate work averages, the average penalty varied from .061 to .159 of a grade-point. The business and the vocational majors both suffered .159 of a grade-point loss whereas the humanities group took the smallest loss. The sizes of these losses compared somewhat inversely with the sizes of the various coefficients of correlation for a group. Only the area of the humanities suffered a smaller loss than that taken by the total population, but those suffered by the vocational and business groups were more than twice that taken by the total population.

# E. Grade-Foint Averages for Undergraduate Work and Graduate Work According to Time-Lag Factor

The final phase of the study was the division of the 3,000 population into five groups in accordance with the number of years elapsed between the two degrees. These groups were further divided according to sex, and then correlations were run between the usual six sets of data in each time division for the males, females, and then for the total. These coefficients and their respective probable errors comprise Table XI.
# TABLE XI

RELATIONSHIPS BETWEEN UNDERGRADUATE AND GRADUATE GBADE-POINT AVERAGES ACCORDING TO TIME-LAG FACTOR

Relationshipa		Males		Females		Total	
	r	PE	r	PE	r	PE	
0-2 Years Lag Group Where N =	580		158		739		
(145-147) Grade-point aver- ages for freshman-sopho- more work and graduate work	.520	.020	• 355	•047	*477	.019	
(148-150) Grade-point aver- ages for junior-senior work and graduate work	•547	•020	.480	•041	•550	.017	
(151-153) Grade-point aver- ages for total under- graduate work and graduate work	.522	.020	.420	•044	•522	.017	
(154-156) Grade-point aver- ages for freshman-sopho- more work and adjusted graduate work	•457	.022	• 314	•048	.435	.020	
(157-159) Grade-point aver- ages for junior-senior work and adjusted graduate work	•532	.020	.430	•044	•506	.018	
(160-162) Grade-point aver- ages for total under- graduate work and ad- justed graduate work	•500	.021	• 397	•045	• 504	.018	
3-5 Years Lag Group Where N =	250		251		501		
(163-165) Grade-point aver- ages for freshman-sopho- more work and graduate work	•457	.034	.472	.033	.471	.023	
(165-163) Grads-point aver- ages for junior-senior work and graduate work	•529	.031	•499	.032	.531	.022	

Palationabina	Wales		Females .		Total	
no is utonamiya	r	PR	r	PE	r	PB
(169-171) Grade-point aver- ages for total under- graduate work and graduate work	.524	.031	•474	· <b>.</b> 033	•520	.022
(172-174) Grade-point aver- ages for freshman-sopho- more work and adjusted graduate work	•454	.034	.454	•034	.471	.023
(175-177) Grade-point aver- ages for junior-senior work and adjusted graduate work	•530	.031	•494	.032	•518	.022
(178-180) Grade-point aver- ages for total under- graduate work and ed- justed graduate work	•535	•030	•473	•033	•520	•022
6-10 Years Lag Group Where N	= 2	:83	3	53	6	36
(181-183) Grade-point aver- ages for freshman-sopho- more work and graduate work	.502	.030	.480	•028	.488	.020
(184-186) Grade-point aver- ages for junior-senior work and graduate work	•536	•029	•522	•026	•524	.019
(187-189) Grade-point aver- ages for total under- graduate work and graduate work	.512	•030	•511	•027	.441	•022
(190-192) Grade-point aver- ages for freshman-sopho- more work and adjusted graduate work	.488	.031	•456	.028	.445	.021

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TABLE XI (Continued)

Palotionahina	Kales		Females		Total	
Relationships	Σ <b>°</b>	PE	r	PE	r	PE
(193-195) Grade-point aver- ages for junior-senior work and adjusted graduate work	•517	•029	•494	.027	•479	.021
(196-198) Grade-point aver- ages for total under- graduate work and ad- justed graduate work	•530	.029	•524	.026	.516	.020
11-20 Years Lag Group Where N	n = 368		546		914	
(199-201) Grade-point aver- ages for freshman-sopho- more work and graduate work	• 346	.031	.415	.021	.408	.019
(202-204) Grade-point aver- ages for junior-senior work and graduate work	.452	.028	.420	•024	•435	.015
(205-207) Grade-point aver- ages for total under- graduate work and graduate work	.428	.029	.416	.024	.407	.019
(208-210) Grade-point aver- ages for freshman-sopho- more work and adjusted graduate work	• 304	.032	• 377	.025	.381	.019
(211-213) Grade-point aver- ages for junior-senior work and adjusted graduate work	•399	.030	• 393	.024	.391	.019
(214-216) Grade-point aver- ages for total under- graduate work and ad- justed graduate work	•396	.030	• 392	.02lj	•373	.019

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TABLE XI (Continued)

Relationships .		Males		Females		Total	
		PE	r	PE	r	PE	
Over 20 Years Lag Group There	N z	62	149		211		
(217-219) Grade-point aver- ages for freshman-sopho- more work and graduate work	•1440	•069	• 389	.047	•424	.038	
(220-222) Grade-point aver- ages for junior-senior work and graduate work	•522	.062	•443	.044	.458	.037	
(223-225) Grade-point aver- ages for total under- graduate work and graduate work	•526	.062	• 390	•047	.423	.035	
(226-228) Grade-point aver- ages for freshman-sopho- more work and adjusted graduate work	.451	•068	• 362	.048	•398	.039	
(229-231) Grade-point aver- ages for junior-senior work and adjusted graduate work	.502	.064	.428	.045	.440	.037	
(232-234) Grade-point aver- ages for total under- graduate work and ad- justed graduate work	•496	.065	• 393	•047	.420	.038	

TABLE XI (Continued)

The first three groups had very similar trends in their correlations which were approximately the same size for the various sets of data. However, the fourth group, those that had a time-lag factor of 11-20 years and comprised 30.467 per cent of the total, showed an appreciable drop in correlation in every instance. The last group, those 211 cases, representing 7.033 per cent, who had waited more than twenty years to take their second degree, continued the lower trend of correlations. It would therefore seem that the break to lower predictive ability came about the end of the tenth year.

This fourth group was probably made up of five main types of personnel. First, those teachers who had not taken the initiative to acquire a master's degree until it was made profitable by additional raises in pay for experience through the Minimum Foundation Program Act, more popularly called the Gilmer-Aiken Bill. Under this Act no further increments in pay were mandatory for additional experience after the twelfth year with only a bachelor's degree. Second, a great number of teachers who were teaching in the elementary schools but holding a high school certificate were forced to acquire specific or additional training for elementary school work; many of these people not only were now meeting this requirement but were also applying the work toward a graduate degree so as to continue to get pay increases ennually. Thirdly, among the females, there was the group that had taken their first degree and then had married and stayed in the home. With the great increase in cost of living that accompanied the years this study covered, many of these people felt that they had to go back to work, but took additional academic training before returning to employment or after working hours while holding the position. Another group, which would

primarily concern the males. was composed of persons who were veterans whose G. I. Bill of Rights time was about to expire because no advantage had been taken of it. This federal aid was an added incentive to those people who had wished to do graduate work previously but who had felt they could not spare the time nor afford it financially. Finally, the fifth group would be those who would not fit into any of these categories but had miscellaneous reasons for taking a graduate degree. With such a diversified group with which to deal, it should not be hard to see why the coefficients of correlation fell considerably at this point. However, even in this group, the females maintained their position of having a higher correlation than the males on the freshmansophomore level, but as previously noted, the males took the lead on the junior-senior level and maintained it on the total undergraduate work level. In all other groups, the correlation for the male segment at the freshman-sophomore level was either higher or they were very close to the same.

The group with the greatest predictive ability for the men was that which had the least time-lag factor, which indicated that if a person immediately enrolled for graduate courses upon the completion of the baccalaureate degree, one could predict his graduate success to a greater extent than if he waited some time to start graduate work. This was not true for the female population, for whom the highest

correlations were found in the 6-10 years lag group. Strangely enough, the correlations for the males also exceeded those for the females here, but the differences were very slight.

There was no group where the coefficients for the females were consistently superior to those for the men; in fact, the reverse was true for three of the five groups: (1) 0-2 years lag; (2) the 6-10 years lag; and (3) over 20 years lag. This was a marked difference, however, only in the first instance where the males outnumbered the females 580 to 158. These 738 cases in the 0-2 years lag group comprise 19.333 per cent of the total.

When the totals were considered, the junior-senior work proved in all five groups to be a better predictive index than either the freshmen-sophomore work or the total undergraduate work. Peculiarly enough, this same statement could also be made for the females, but it was not true for the men.

Just as a matter of interest, it should be noted that the longest lapse of time between degrees was credited to a male who waited thirty-nine years after taking his baccalaureate degree before receiving the master's degree. The female who had the greatest leg factor waited thirty-seven years. However, in the group that waited twenty years or longer, the females outnumbered the men 149 to sixty-two.

The means for the various groups are presented in Table XII.

# TABLE XII

MEANS OF UNDERGRADUATE AND GRADUATE GRADE-POINT AVIRAGES FOR TIME-LAG FACTOR GROUPS ACCORDING TO SEX COMPARED WITH TOTALS

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Time-lag group	Freshnen- sophomore work	Junior- senior work	Total under- graduate work	Graduate work	Adjusted graduate work
0-2 years:					
Males Fomales Total group	2.643 2.852 2.687	3.015 3.184 3.051	2.795 3.024 2.344	3.451 3.554 3.476	3.316 3.498 3.363
3-5 years:					
Males Females Total group	2.528 2.753 2.641	2.934 3.121 3.028	2.733 2.928 2.831	3.450 3.529 3.489	3.327 3.439 3.381
6-10 years:					
Kales Females Total group	2.525 2.717 2.635	2.901 3.071 3.009	2.711 2.891 2.811	3.520 3.532 3.523	3.416 3.451 3.435
11-20 years:					
Males Females Total group	2•532 2•587 2•539	2.994 2.946 2.925	2.705 2.766 2.745	3.493 3.519 3.509	3.132 3.428 3.411
Over 20 years:					
Males Females Total group	2.511 2.623 2.609	2.898 2.993 2.962	2.698 2.787 2.761	3.474 3.491 3.486	3•379 3•372 3•374
Total population	):				
Males Females Total group	2.562 2.679 2.623	2.948 3.033 2.989	2.754 2.865 2.810	3.473 3.526 3.497	3.349 3.439 3.394

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with one exception. the females exhibited superior averages to the males, and even for that one exception, the adjusted graduate work for the over 20 years lag group, the two sexes had practically the same average. This indicated that throughout the study, no matter how the coefficients of correlation and other data ran, the females maintained higher marks than did the males. This degree of consistency was not expected but was not particularly surprising. When the adjustment penalties were applied to graduate marks, the males suffered the greater mean loss in every category and this was accentuated in the 11-20 year time-lag group. The females also took a big adjustment loss in this same group, but their greatest average loss appeared in the last category, those having over twenty years time lapse between the two degrees. When the total population was considered, the adjustment losses amounted to .124 of a grade-point for the males and .087 for the females. The difference between the two appeared small, but comparatively speaking, the male loss was almost 150 per cent of that for the females.

Due to the failure and lack of persistence of the poorer students, scholastically speaking, the junior-senior averages are consistently above those for the freshman-sophomore years. In like manner, the graduate averages are superior to those for any part or all of the undergraduate work. A possible reason for this has been previously advanced in this study on page 16.

## CHAPTER V

#### SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

#### 1. Summary

The purpose of this investigation was to make a study of the relationships existing between undergraduate marks and graduate marks as a possible means of predicting graduate school success in selected Texas institutions. When those relationships were established, through computing correlations between the data, the factors affecting them were sought and studied to determine what part in the relationships they played. At least five different factors, which were usually further divided, were brought into consideration. These included sex differences, veterans of World War II or nonveterans, transfers and non-transfers, the areas of academic study, and the time-lag factor between the awarding of the baccalaureate and graduate degrees.

The principal data used were the grade marks earned by 3,000 graduate students who had been awarded the master's degree from 1947-48 through 1951-52 by nine graduate schools in the state. Other data, such as sex, academic majors, dates of degrees, transfer records, study under the G. I. Bill of Rights, and time-lag between the two degrees, were available from various sources and were included.

An adjustment factor which consisted of an arbitrarily devised system of penalties was applied to graduate gradepoint averages in order to provide a spread of graduate marks at least equal to that possible for undergraduate work. Another purpose of this adjustment factor was to give a quantitative value to qualitative factors usually deemed worthy among graduate students.

The grade-point averages for undergraduate and regular graduate, as well as adjusted graduate, work were correlated at different stages of the undergraduate study; that is, at the freshman-sophomore level, at the junior-senior level, and at the total undergraduate level. These correlations for the various sets of data were also carried through the abovementioned factors, thereby giving a total of 234 Pearson product-moment coefficients for the investigation.

### 2. Conclusions

On the basis of the findings presented in this study, the following conclusions appear valid:

(1) There exists a "marked" relationship between undergraduate and graduate marks in all the Texas schools included in this study.

(2) Junior-senior grade-point averages provide a better index for prediction of graduate success than do the freshmansophomore or the total undergraduate grade-point averages.

(3) There is but a small difference in the number of males and females in Texas pursuing and achieving graduate degrees. (4) When the females are considered separately, the freshman-sophomore grade-point average provides by far the best predictive index, giving a "high" coefficient of correlation with graduate marks, whereas the males do not deviate materially from the group as a whole.

(5) Non-veteran students prove to be better students scholastically than do those attending under the G. I. Bill of Rights and show a significantly higher degree of correlation between undergraduate and graduate work.

(6) There is no appreciable difference in the marks attained by the transfer and non-transfer groups, as defined by this study, providing all of the transferred work constitutes a bachelor's degree and comes from any other Texas college.

(7) Students taking undergraduate work in colleges where a Phi Beta Kappa chapter is established tend to be successful in non-Phi-Beta-Kappa graduate schools irrespective of their undergraduate marks, but this is not true when students take undergraduate work in one non-Phi-Beta-Kappa school and transfer to another such school for graduate work.

(8) Among the non-transfers where a student received both degrees from the same institution, the smallest school studied showed the highest relationships between undergrauate and graduate marks whereas the largest school included produced the lowest relationships.

(9) When undergraduate marks are the criterion for predicting graduate success, little value can be placed on them in the field of vocational or business subjects. Their most reliable use can be utilized in the natural sciences.

(10) Probable success in graduate work is not contingent upon the time element, so far as the lapse between the two degrees is concerned, until at least ten years have passed.

(11) The study of Education and its related subjects is by far the most popular graduate study in the state. Almost two-thirds of the population of this study were Education majors, and this trend is even more popular in the independent and church-related colleges than in the so-called "teacher's colleges."

(12) Females on the average consistently make better marks both on the undergraduate and graduate levels than do males under the same conditions.

(13) The requirements of an average of "B" and a minimum mark of "C" for accepted credit in the graduate schools appear to have resulted in a separate standard of marking for graduate students throughout the state.

### 3. Recommendations

In order to make the present study more valuable to everyone concerned, the writer presents the following recommendations and suggestions:

(1) The proper authorities in the various graduate schools of the state might do well to examine and evaluate their present policies of student admission in the light of the findings of this investigation.

(2) The personnel in charge of vocational and business departments should be particularly critical of the present procedures used in the selection of their graduate students.

(3) The undergraduate grade-point average achieved by the individual student usually should not be the sole criterion considered in selecting him for admission to graduate study.

(4) A similar study should be made in which the population would consist of Negro graduate students only.

(5) A similar study in the non-coeducational graduate schools would prove of considerable interest and value.

(6) The recipients of doctor's degrees awarded in the state should be studied in a like manner as were the successful master's candidates here.

(7) Further study of the transfer students should be made, but this time those students who took their undergraduate work in non-Phi-Beta-Kappa schools and then transferred to a school with such a chapter for their graduate work should be considered.

(3) The marks of graduate students who write a thesis should be contrasted with those who do a research problem or merely take sufficient hours of credit to receive a master's degree. This study might also investigate the realm of the various master's degrees.

(9) In each school a further investigation of the marks achieved by student veterans as compared with those of nonveterans should prove of considerable local value.

(10) A similar study made in each of the various states of the nation would prove interesting and valuable for comparison purposes.

(11) A study should be made to ferret out and weight those factors which might be responsible for the sudden increase in averages of grade-points for graduate students over those for undergraduate students.

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