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Predictive Value of the Washington Pre-College Differential Grade Predictions Tests Used at Central Washington College of Education

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PREDICTIVE VALUE OF THE WASHINGTON PRE-COLLEGE DIFFERENTIAL GRADE PREDICTIONS TESTS USED AT CENTRAL WASHINGTON COLLEGE OF EDUCATION

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I. INTRODUCTION

The primary goal of all scientific investigation is prediction. Scientific investigations are carried out in the laboratory or studies are conducted in the field so that more accurate predictions can be made concerning the future state of the organisms or material being studied.

Predictions about the human organism itself are beginning to come more to the fore as education and psychology are becoming more concerned with the human organism's capacity to learn and adjust in its environment. As further studies are made, man's ability to predict human behavior is becoming greater and thus, under controlled conditions, is helping people make decisions about possible future courses of action. Individuals, naturally, have a greater probability of being successful in some choices than in others (14:1038-1039).

In education numerous decisions must be made. The role of the Central Washington College of Education adviser is not to make decisions for the student but to assist the student to obtain a better understanding of his aims and motives, as well as his potentialities, so

he can make more satisfying decisions. Some of the questions that confront students are (1) in which major field am I most apt to achieve success? (2) in which major field is there most apt to be possibility of failure? (3) how can I manipulate class schedules so that when failure or lower grades are indicated, my class load is lightened and additional time may be spent on indicated trouble areas? and (4) should I take heavier class loads in areas where high probability of success is indicated?

Central Washington College of Education, at Ellensburg, Washington, has, for the past two years, 1958 and 1959, required that all entering freshmen students take the Washington Pre-College Differential Grade Prediction battery of tests. This group of tests used by the University of Washington consists of:

1. Cooperative English Test
2. American Council on Education Psychological Examination for College Freshmen
3. Guilford-Zimmerman Aptitude Survey
4. Employee Aptitude Survey, Test 2
5. Employee Aptitude Survey, Test 5
6. Cooperative General Achievement Test

The scores from these tests have not been used for the purposes of selective admission; they have been used

only for guidance purposes. These results, together with the student's high school grades, are used to compute the student's predicted all-college grade point average and also to predict grades in thirty-two college course areas.

The student's cumulative grade point average, an average of all grades received so far in college, is far more indicative of his scholastic achievement than grades in a single subject matter area. The cumulative grade point average is not presented in this study as a measure of success in college, but as the most objective measure of scholarship available. At Central Washington College of Education an A receives four grade points (4.0) for each hour of credit; a B, three grade points (3.0); a C, two grade points (2.0), a D, one grade point (1.0); and an E, no grade point (0.0). The total number of points is divided by the number of quarter hours earned. With this system course grades in the same or combined areas may be averaged, and the resulting average is then called the grade point average, or GPA. Thus, if a student receives a cumulative grade point average in college of 2.50, his position on a four point scale of grade point averages would appear as:

0 1 2 3 4

2.5

After taking this battery of tests, the students and the college of the student's choice are sent sheets predicting the all-college grade average and predicted grades in the 32 separate course areas. Then the student and the college adviser are able to analyze those areas which may be difficult or easy. This prediction sheet is used by the adviser to help the student select an appropriate schedule.

If the Washington Pre-College Differential Grade Prediction battery does predict accurately the student's academic aptitude for the curricular offerings of Central Washington College of Education, then the advisers of this college will feel a greater degree of confidence in the use of these results to guide the student.

Test batteries such as these have stilled the criticisms made in the past when a single intelligence test or any other single analytic technique has been used as the sole basis for a judgment about an individual.

II. STATEMENT OF THE PROBLEM

The problem was: How well does the Washington Pre-College Differential Grade Predictions Battery actually predict the grade point average of the students at Central Washington College of Education?

The purpose of this study was to determine to what extent this grade predictive battery does predict grades at Central Washington College of Education. The guidance program pre-supposes the existence of a positive correlation between the scores from these tests and subsequent success in college courses. The logical assumption is that low scores from this battery of tests would predict a tendency toward failure in college, and conversely, that high scores would predict the probability of a high degree of success. Research carried on at the University of Washington indicated the degree of accuracy with which this battery of tests predict grades at the University, but no research has been made to determine the value of the tests to the students of Central Washington College of Education. This relationship has been investigated methodically and extensively at the University of Washington, and the results of such research may be applicable to this college. Since, however, Central Washington College of Education may differ in many respects from the University of Washington, there is a need for research to be conducted locally. There is a need for objective evidence as to whether these tests do actually predict or are valid at Central Washington College of Education. It is imperative that local prediction studies be made in order to establish

an empirical bases for specific educational planning.

Some of the variables that could make the Washington Pre-College Differential Grade Prediction Battery invalid for use with the students of Central Washington College are:

1. Generally, a different selection of students attends Central Washington College than the University of Washington.
2. Grading practices of the instructors of Central Washington College of Education may differ from those at the University of Washington.
   Taylor and Constance report that when an instructor appraises student achievement, it is seldom or never true that he uses exactly the same standards as other instructors, when evaluating the same sample of student performance, agree as to its merit (23:6).
3. Students' social life could be either more or less active or time consuming.
4. Fewer or more students could be working their way through college.
5. Validity of tests may vary a great deal in different settings.

Thus it can be seen that the unreliability of college

marks, differences in departmental standards and procedures, and the varying levels of ability of students who are attracted by different departments might all contribute to the success or failure of this battery of tests to accurately predict the grade point average of the students attending Central Washington College of Education.

This battery of tests predicts quite accurately the grades of students who attend the University of Washington, but it cannot be assumed equally valid in predicting grades at Central Washington College of Education. Freehill (11:64-75), in a study of the relationship between success in college and scores on students taking the American Council on Education Psychological Examination at Western Washington College of Education, reports a correlation of +.37, while an r of +.53 is reported by Votaw (26:215-218) who carried out a similar study at Southwest Texas State College.

College marks have become increasingly important as a basis for administrative and educational procedures. On the basis of marks, students are dismissed, awarded scholarships, ruled ineligible for athletic competition, accorded privileges such as working for honors, and so on. Taylor and Constance state that while our social organization is based upon individual differences in general

capacity and special aptitude, our school marks provide almost the only organized attempt to give individuals the information about themselves in comparison with others which is indispensable if ambitions are to be brought in line with actualities. In college, the students are guided by marks into fields of study where their interests and ambitions harmonize (23:5).

CHAPTER II

RELATED LITERATURE

As the diversity of pupils within schools increases and as the complexity of society grows, there is a greater need for effective counseling.

The general purpose of counseling is to assist individuals to lead more productive lives. A specific objective is to assist individuals to reach certain relatively specific goals that the individual and his immediate society deem desirable.

If plans are to be made wisely and if young people are to make appropriate educational, vocational, and personal decisions, they need as much relevant information about themselves and the world around them as the counselors and teachers can make available.

What goal should the student select, and in what field will he progress with greater or lesser success?

These questions pose problems of "prediction." If relative degrees of success in varying curricula and occupations can be predicted, one of the first hurdles between students and effective guidance is surmounted (3:1-2).

Rivlin states that any sound guidance program is

conditioned by the ability to forecast the future, that guidance is one of the most acute problems of the modern school.

In education, he further states, the prediction of success means that a student is measured in a trait which can be measured, and that from the score or rating in this trait is predicted the most probable degree to which he possesses another trait not readily measurable. Thus a scholastic aptitude test may be administered to high school seniors and their scores on this test used as a means of predicting their ability to succeed in college (19:599).

According to Super, no prediction of human behavior can take into account all relevant factors. The term prediction should be used cautiously and with a full awareness of its definition (22:657).

Nunnally states that there is a need for differential prediction because different abilities are required for different jobs. Generally, a battery of tests instead of a single test is used to predict a group of assessments (16:124-125).

Cronbach says that anyone who works with people has to make decisions and all decisions involve prediction. A test determines some difference among people's performance. That fact would not be worth knowing if the

prediction could not be made that these people would not differ in some other performance or in the same performance at some other time (9:17).

Psychological tests are one of the chief means of predicting human behavior. Advisers must learn to make wise use of tests. The palmist, the phrenologist, the astrologer all attempt to forecast the future, but their predictions are not valid because of inadequate scientific basis.

It is apparent then that no prediction will ever be perfectly accurate but will only approximate that goal. Any improvement in accuracy over the results of sheer guessing is a worth-while improvement, and predictive tests must be evaluated upon the basis of how well they improve predictions. The process of prediction is fruitless unless use is made of the prediction. Effective individual counseling must be done with students for whom predictions are made (3:3).

Anastasi reports that the general public still identifies psychological tests primarily with intelligence tests. The term IQ test is misleading. The IQ refers not to a type of test but to a particular way of interpreting scores on certain psychological tests.

A psychological test, she believes, is essentially

an objective and standardized measure of a sample of behavior. The diagnostic or predictive value of a psychological test depends upon the degree to which it serves as an indicator of a relatively broad and significant area of behavior. Differential aptitude batteries were designed to provide a measure of an individual's standing in each of a number of traits. Instead of a total score or IQ, a separate score is obtained for such traits as verbal comprehension, numerical aptitude, spatial visualization, arithmetic reasoning, perceptual speed, and others. These batteries provide instruments for making intra-individual analysis or differential diagnosis, which clinicians have tried to obtain from intelligence tests with crude and often improper results (1:121-122).

The Encyclopedia of Educational Research observes that it would be very convenient (when one wishes to predict a certain type of behavior) to locate an appropriate test, administer it, and make decisions accordingly. Most behavior, however, is too complex to forecast adequately with a single predictor. Also, different schools may demand quite different types of performance in courses with similar labels, making a "cookbook" approach undesirable. Experimental verification of the relationship between potential predictors and the actual performance of people representative of the population for which it is desired to make

predictions is the only valid basis for prediction (14:1039).

The editor also points out that similar aptitudes or skills are required for many jobs but their importance may vary. One solution to the problem of differential prediction has been to use a single battery of predictors but to combine them differently for each classification. Not all variables will necessarily be used in making one prediction. A variable ordinarily should contribute substantially to two multiple-regression equations to be kept in the battery. Horst has developed a technique to select from a battery of potential predictors the sub-tests with the highest predictive efficiency for the criterion variables to be predicted.

Guidance programs will find batteries constructed in this manner valuable, for the probable success of an individual can be indicated in several kinds of endeavor. A method has been developed by Horst for selecting a group of tests from a battery to yield the greatest average variance of the predicted difference score for all possible pairs of criteria (14:1045).

Some studies have indicated that tests given before the senior year of high school are valid for predicting college achievement. Byrns and Henmon, in 1935 reported they could predict first-semester college marks from a combination of the tenth-grade average and an intelligence-

quotient measure obtained as early as the fourth grade (5:877-880).

A similar study by Samenfeld found the best zero-order predictor of college grades was the high-school percentile rank. He also found that the ACE (American Council on Education Psychological Test) was equally good for predicting college achievement whether it is given in the ninth or twelfth grade, and Samenfeld thought that this knowledge would be of great value for the purpose of providing high school advisers with basic data for selecting and encouraging capable students to enroll in college (20:432-433).

In regard to measuring future accomplishments, Bingham reports that the most accurate predictions have been based upon a carefully weighed combination of preparatory-school marks, rank in class, rating of the school attended in terms of proportion of its graduates who have performed well in college, entrance-examination marks, and aptitude test scores. The scholastic aptitude tests ascertain what the applicant does in the testing place. His future performance is then estimated by comparing his achievement and scores with those of students who have already made good or failed (4:23).

A study by Stone states that research on prognosis

of academic success has focused on three general phases: (a) prediction of general scholarship; (b) prediction of scholarship in specific subjects; and (c) differential prediction in major areas. The most effective predictor variables were high school grade-point average (HSGPA), some measure of scholastic aptitude, and an objective measure of high school achievement. Multiple correlations proved to be more efficient than zero-order correlations.

This study provides multiple regression equations which can be used in the differential prediction of academic success in four college curricula at Brigham Young University. These are (a) commerce; (b) elementary education; (c) physical sciences; and (d) social sciences.

The most efficient single predictor of curriculum success was the high school grade point average (21:108-109). The summary of the results is as follows:

1. The utilization of entrance test data and high school grade-point average provides the counselor at Brigham Young University with the basis for making differential predictions of academic success in four curricula.

2. For commerce and elementary education, the most efficient battery included the HSGPA and ACE Total scores. The respective R's were .633 and .731.

3. The physical sciences criterion was best predicted by a battery including the HSGPA, ACE Total, and CGCT Literature and General Science. R for this battery was .733.

4. The social science predictor battery included the HSGPA, ACE Total and CGCT General Science. R was .507.

5. The best single predictor was the HSGPA.

6. The reliability coefficients of the criterion measure (CGPA) clustered around .80 except for the social science curriculum with an r of .68 (21:110).

Angell reports that growing pains have caused many colleges to look more searchingly at policies and procedures related to the broad area of selection and placement of college students.

Marked college enrollment increases are expected, and the following questions related to college academic counseling are being asked:

1. Do many students fail who might otherwise succeed because they select academic programs in which their chances of succeeding academically are remote and do not select programs for which their chances are much better?

2. Do many students fail because adequate prognostic data are not available to them directly or to counselors and advisers directly?

3. Are we failing to identify adequately the superior college students and to determine what their specific outstanding aptitudes are --and to provide enriched academic programs which meet their needs?

4. How can college best answer the question of providing good academic counseling for the rapidly increasing number of students (2:418)?

Angell points out that there are obviously no easy

plans to provide absolute, unequivocal answers. Certain possibilities, though, do present themselves for consideration. The one which

> . . . seems potentially to hold the greatest promise of answering the question, is the approach which utilizes multiple regression equations developed by means of the interative predictor selection techniques employed by Horst at the University of Washington and reported by Mills and others. By means of the techniques developed by Horst, that combination of variables is selected out of a large number of experimental predictor variables which does the best job of differentially predicting the academic success of college students and of doing the best job, in general, of predicting each of the relevant subject criteria (2:418-419).

This information, Angell thinks, constitutes a rude definition of what Horst describes as multiple differential prediction and multiple absolute prediction. A large amount of the extremely tedious, detailed, and often prohibitive labor involved in the traditional methods of computing partial and multiple correlations is avoided by the use of simplified matrix algebra techniques in which simultaneous solutions of the multiple correlation coefficients and multiple regression equations are obtained and in which one total group matrix can be used for a number of criterion variables.

Angell points out that most of the approaches colleges use to improve college counseling procedures have obvious limitations. It seems unlikely that most faculty advisers are qualified to combine the entrance test datum with other

related data for purposes of interpretation. On the basis of this, they are not, then, qualified to objectively translate the material in terms of probability of college success in specific subject areas. Another limitation is that subjectively derived preidictions of success for specific subject areas may be based on assumptions of relationships between the entrance data and specific college subjects which do not, in reality, exist.

Angell suggests that the most comprehensive and effective single approach to good academic counseling of students would be based on the use of multiple absolute and multiple differential prediction data.

The University of Washington presently provides the outstanding prototype of the application of multiple differential prediction techniques in academic counseling. A similar program presupposes the careful orientation of counselors and faculty advisers in the use of predictive data, for this would be necessary in order to insure proper and effective utilization of these data in counseling students. These data would be counseling tools, and counselors and advisers would not be "enslaved" by them.

Obviously, this suggested program is not perfect, inasmuch as none of the multiple correlational estimates would be perfect, and there are well known limiting factors

involved in attempting to predict college academic success.

The University of Washington's multiple differential prediction program has now been made available and is being used by a high percentage of the high schools and by 22 of the colleges in the state of Washington (2:419-423).

In Horst's study to determine the relationship between preadmission and college success variables, three general types of admissions variables were studied. These were (a) high school grades, (b) number of high school units, and (c) test scores. Over 7,500 students were included in the study. He found:

1. The best preadmission predictors vary greatly from one college course area to another.
2. The best group of predictors are the high school grade point averages.
3. The next best group of predictors are test scores.
4. Number of high school units are, in general, poor or very poor predictors of college success as measured by grade point averages.
5. The single best preadmission variable is the all academic high school grade point average.
6. The grade predictions based on a number of different high school grade averages and test scores are better predictors of college success than all academic high school grade point average (3:ii).

One of the measures of success in college was the over-all grade point average. In addition, grade point

averages in forty-seven different course areas were used for more specific measures of success, and each course area was analyzed in terms of courses considered as introductory or advanced.

The college success variables were GPA in specific course areas rather than in majors. A GPA of 2.9 in English, for example, refers to the average grade for all the English courses a student took, not that the student is an English major with a GPA of 2.9 for all courses, in whatever field.

Table I, taken from this study, shows the correlations of predicted grades at the University of Washington with the students' achieved grades (3:3-4).

The University of Washington publishes a manual for the high school counselor to use in advising the student with regard to the probability prediction of his academic success in college. An additional folder entitled "Washington Differential Grade Predictions (Instructions to the Student)" is given to the student, and this, together with the Pre-College Differential Guidance Data sheet which includes the student's predicted grades, enables the student to interpret and understand the data received.

The counselor's manual includes tables and charts to make the predicted grades more meaningful for guidance.

TABLE I

CORRELATIONS OF PREDICTED GRADES WITH ACHIEVED GRADES

College Success Variables	1953-54 Group Correlation	1953-54 Group No. Cases	1955 Group--Two Years Correlation	1955 Group--Two Years No. Cases
1. All University	.63	5063	.64	2723
2. Accounting	.47	870	.41	376
3. Air Science	.62	1016	.60	527
4. Anthropology	.52	1934	.51	1019
5. Architecture	.27	115	.33	57
6. Art	.29	950	.28	504
7. Astronomy *	.60	71	.46	28
8. Biology	.71	250	.60	71
9. Botany	.67	320	.58	171
10. Business Admin.	.54	2068	.55	899
11. Chemistry	.58	2220	.57	1207
12. Classical Languages *	.48	369	.53	197
13. Drama	.54	571	.45	224
14. Economics	.47	2206	.46	945
15. Education	.47	446	.16	112
16. Engineering	.36	1199	.43	577
17. English Comp. *	.66	4112	.67	2265
18. English Lit.	.51	1592	.58	859
19. Far Eastern	.47	576	.36	162
20. Fisheries *	.33	86	.19	37
21. Forestry	.40	141	.46	85
22. Geography	.51	1491	.49	618
23. Geology	.46	1097	.36	450
24. Germanic Languages	.58	399	.43	174
25. History	.43	1017	.54	354
26. Home Economics	.42	723	.44	330
27. Journalism	.42	494	.42	233
28. Mathematics	.56	2017	.53	1012
29. Meteor. & Climat. *	.43	229	.34	99
30. Microbiology *	.51	259	.58	77
32. Music	.31	814	.23	349
33. Naval Science	.62	183	.56	91
34. Nursing	.45	215	.44	104
35. Nutrition	.59	216	.50	97
36. Oceanography *	.45	430	.40	208
37. Pharmacy	.48	111	.24	56
38. Philosophy	.51	532	.56	214
39. Physical Education	.39	234	.23	117
40. Physics	.40	1173	.35	584
41. Political Science	.53	850	.52	314
42. Psychology	.59	2107	.56	940
43. Public Health *	.42	315	.89	8
44. Radio and T.V. *	.50	230	.20	74
45. Romance Languages	.55	684	.54	370
46. Sociology	.63	2744	.61	1338
47. Speech	.53	1647	.47	762
48. Zoology	.48	772	.49	365

*Total Course values presented since number of introductory or advanced courses too few to be included (15:116). No. 31 was left out of original copy.

These tables are:

A. Course and Grade Requirements for Majors at Various Colleges. Certain colleges wished to have their grade and course requirements for various majors included in this manual. They are given in Part IV. These tables are very useful in helping a student plan a major for which his predicted grades are satisfactory.

B. Comparative Predictions of Success in College Majors. This chart on Page 26 is to be used in connection with the tables in Part IV to plan a suitable major at a particular college.

C. Additional Charts for Interpreting Predicted Grades. In addition to the Form and Form I charts in the student's folder, two other charts are available which provide further interpretation of the predicted grades. These charts, however, should not be used until Form C and Form I have been completed and understood. The additional charts with instructions are given on pages 12-14. They are:

(1) GRADE PREDICTION CHART--FORM B--(UNIVERSITY OF WASHINGTON. The chances of making B (3.0) or better give a somewhat different picture from that when C (2.0) or better is used as a base on Form C. If the student wants to know his chances of making B or better in the various course areas he should use this form. The instructions for marking and interpreting the Form B chart are the same as Form C.

(2) GRADE PREDICTION CHART--FORM II--(FOR ALL COLLEGES). This chart is an extension of Form I which, it will be remembered, gives the chances of making grades in the top 50 per cent (above average) for students taking courses in each of the course areas. Form II is used when the student is also interested in the chances that he will rank in the top 22 per cent, the lower 35 per cent, or some other group. His predicted grades, when marked on the Form II chart, indicate

these chances, in terms of percentages, not only for the top 65 per cent of achieved grades but also for seven other percentage ranks. Instructions for marking this form are the same as those for Form I. Instructions for interpreting the predictions are provided.

D. Predictor Data Percentile Chart. Counselors with long experience in the use of test scores and grades may wish to use these in addition to the students predicted grades for guidance purposes. The chart on page 11 can be used by these counselors to convert the high school grades and test scores to percentile ranks. In general, however, the actual predicted grades should prove more useful than the high school grades and the test scores (6:1-2).

The manual further states that although these predicted grade averages have proved highly accurate for many college course areas, a number of considerations, in addition to the predicted grades, should be considered when selecting a program of study. A college degree cannot be earned merely by taking courses in the areas where the student's predicted grades are the highest. In other course areas required for a major, the student's predicted grades should be adequate, as well as in the major and minor course areas. Since colleges vary somewhat in their major requirements, the student should obtain information about course requirements for the various majors and minors at the college or university of his choice.

The student should also check on the minimum requirements for a degree and become aware of possible difficulties in different majors because of predicted grades below minimum requirements.

In course areas for which predicted grades are not available, the student should check on different required hours of course work, and thus arrive at some indication of the degree of probable success in such majors.

A low predicted grade does not necessarily mean that a C or better will not be earned. It means instead that extra work and extra time are indicated, and frequently the student may find it advisable to sustain a reduced load while carrying a low-predicted-grade course. While a light load may increase the chance of success in college, the problem of staying in school longer than the usual four years is presented. Students deferred from military service are expected to graduate in four years. However, a light load one quarter may be compensated for by an extra heavy load another quarter or by attending school in the summer.

If his predicted grades are low, a student will not be able to work his way through college because he will not be able to spend much time on outside work and

still maintain high enough grades to stay in college unless the class schedule is reduced. Higher predicted grades of B's (3.0) or better indicate a student may be able to spend considerable time on a job and still earn C grades. There is, however, a limit to how hard and to what degree a person can work. There is the possibility, too, that social life may interfere seriously with the student's academic progress.

The predicted grades do not specifically take interest and motivation into consideration. Some students may take subjects for which predicted grades are lower and, because of high interest and motivation, achieve satisfactory grades.

Because job opportunities vary for people with different majors, it is recommended that students consult with department advisers and guidance and job placement personnel before deciding definitely on a major, for no one goes to college merely to earn grades. Most students use college as a preparation for earning a livelihood.

Certain courses such as art and music require very special skills. High predicted grades do not ordinarily mean a student should consider a major in these course areas unless he has already demonstrated special talent. Electives could be chosen, if they are of suf-

ficient interest, for such courses may contribute to a capacity for enjoying life and to a well-rounded education.

Simply because high grades are predicted in a course area is not sufficient reason to plan a major in a field not previously considered. Serious consideration must be given to all phases of this problem. A student may find, after learning all he can about a high-prediction subject, that it would be of great interest to him and would lead to opportunities for jobs in which he would be happy and successful.

If a student changes objectives because of low predicted grades or other reasons and wishes further help in what to do after high school, he should consult his counselor. The predicted grades were designed only to provide guidance in planning a college career (6:2-5).

CHAPTER III

PROCEDURES

The purpose of this study was to determine how well the Washington Pre-College Differential Grade Prediction Battery actually predicts the grades of students at Central Washington College of Education.

The sample on which this study was based included all the students from the 1958 entering freshman class of 584 students who were still enrolled at Central Washington College of Education at the end of Winter Quarter, 1960. Only those students enrolled in the Teacher Education Program were included in the sample.

One hundred eleven sophomores composed the sample group for whom all the criterion and predictive data were available. Of the one hundred forty-four of the original sample, thirty-three students had no grade prediction sheets in their records and therefore were not included in the sample.

This sample is not random in the strictest sense, but is based upon the total population of the sophomore class who had completed five quarters of work. Edwards points out:

> In the behavioral sciences we may recognize and acknowledge that we never have perfect random

> samples of a large population. But, if we are willing to make the necessary assumptions, we find that in many, many instances the assumptions are justified in terms of practical considerations. Much has been said against the samples used in behavioral research--and that many studies have violated even simple precautions to insure representativeness is not to be denied--but generalizations based upon samples in which care has been taken to eliminate bias and which are then treated as if they were random samples from larger populations have been found to be sound and useful. The fact is that no one has ever studied the correlation between college grades and tests of academic aptitude in a strictly random sample of college students from the population of all college students. Yet generalizations have held up that have been made on the basis of available correlation coefficients derived from samples and tests of significance have been applied to these coefficients as though they were derived from random samples (10:285-286).

For the purpose of this study the sample was considered to be a random one of those students who completed at least five quarters of college in the Teacher Education Program.

Cumulative grade point averages for each individual included in the sample were obtained from transcripts on file in the Office of the Registrar, Central Washington College of Education. Grades received in the six areas selected for comparison with predicted grades were also obtained from these transcripts.

All college predicted grade point averages and predicted grades in the six comparison courses were taken from the grade prediction sheets in the student's folders

on file in the Dean of Student's office.

The six classes selected for comparison of actual grades with the predicted all college grade point average were Biological Science 100, Sociology 100, History 100, Geography 100, Psychology 100, and the first English course listed on the student's transcript. Some students, because of high scores on the entrance English test, were excused from English 101. Students with scores below the 4th percentile took English 100. In any event, the grade for the first class in English was taken as the criterion.

The next step was the arrangement of the data into logical order. This data was too cumbersome for either full comprehension or adequate comparison in its original form. Because of the large number of ungrouped data, the coefficient of correlation was computed from the data on college records. Scores were available for every person in the sample on the two sets of events--the predicted all college grade point average and the five quarter grade point average. The Pearson product-moment correlation coefficient (r) was used. For convenience the three expressions: Pearson correlation coefficient, product-moment correlation coefficient, and r are used interchangeably in this report. The

basic formula was taken from Underwood (25:144).

A tabulation of all the data used in computing the Pearson correlation coefficient for the all-college grade point average and the predicted grade point average is contained in Appendix A of this study. Tables II and III show the actual grade point average of students after five quarters of work and the predicted all-college grade point average of all students in the sample.

Tabulation of the data (Table II) of the frequency distribution of grade point averages of 111 Fifth Quarter Sophomores at Central Washington College of Education reveals a range in grade point averages from 3.74 downward to 1.75. A class interval of .25 was used and the data grouped. The mean and standard deviation of the grade point averages was computed. The mean grade point average for the group, 2.56, shows that for these lower division students after five quarters of work, the average all-college GPA was higher than C (2.0). The standard error of the mean is .025. The standard deviation of the distribution is .261.

A review of the criterion variable in Table II indicates there is not a normal distribution. Since an unknown number of students who entered college in the fall of 1958 left college because they failed to meet

TABLE II

FREQUENCY DISTRIBUTION OF GRADE POINT AVERAGES OF 111 FIFTH QUARTER SOPHOMORES AT CENTRAL WASHINGTON COLLEGE OF EDUCATION, WINTER QUARTER, 1960

GRADE POINT AVERAGE	FREQUENCY
3.75-3.99	0
3.50-3.75	2
3.25-3.49	6
3.00-3.24	15
2.75-2.99	12
2.50-2.75	19
2.25-2.49	24
2.00-2.24	26
1.75-1.99	7
1.50-1.74	0
1.25-1.49	0
1.00-1.24	0
.75- .99	0
.50- .74	0
.25- .45	0
N	111

Mean 2.56

Standard error of mean .025

Standard Deviation .261

TABLE III

FREQUENCY DISTRIBUTION OF PREDICTED ALL COLLEGE GRADE POINT AVERAGE OF 111 FRESHMEN AT CENTRAL WASHINGTON COLLEGE OF EDUCATION, AUTUMN QUARTER, 1958

GRADE POINT AVERAGE	FREQUENCY
3.75-3.99	0
3.50-3.74	0
3.25-3.49	1
3.00-3.24	10
2.75-2.99	5
2.50-2.74	20
2.25-2.49	13
2.00-2.24	26
1.75-1.99	13
1.50-1.74	14
1.25-1.49	6
1.00-1.24	3
.75- .99	0
.50- .74	0
.25- .49	0
N	111

Mean 2.13

Standard error of mean .021

Standard Deviation .225

the grade requirements of Central Washington College of Education, as well as for numerous other reasons, a "lopping off" of one tail of the distribution occurred, resulting in a negatively skewed curve. Because there exists some magnitude of positive relationship between low grades and drop-outs in college, the data suggest that coefficient correlations would be lower than might be expected if the students who failed to meet college grade requirements had had their all-college grade prediction average and actual grade point average included in the sample.

Inspection of the frequency distribution (Table III) of predicted all-college grade point averages indicates that the distribution is normal. The range in predicted grade point averages goes from 3.49 downward to 1.24. A class interval of .25 was used to group the data. The mean predicted grade point average is 2.13. The standard error of the mean is .021, the standard deviation .225.

In Horst's study, the following convention of defining a good or poor correlation for the purposes of prediction was used:

CORRELATION	QUALITY
.00- .19	very poor
.20- .29	poor
.30- .39	fair
.40- .49	good
.50- .59	very good
.60-1.00	excellent (15:3).

For the purpose of this study, this definition of the correlation coefficient findings will be used.

CHAPTER IV

RESULTS

The primary purpose of this study was to determine the value of the Washington Pre-College Grade Prediction Battery in actually predicting the student's all-college grade point average. The secondary purpose was to determine if single grades in six separate course areas correlate significantly with the predicted grade point average (even though the predicted grade point average was based on all grades in the major field instead of a single course in that field).

Table IV shows the results of this study. All of the correlations were significant above the 1 per cent level of significance (25:231). The findings of this study are summarized as follows:

1. A positive correlation of +.77 was found to exist between the predicted grade point average and the GPA after five quarters of college work. The correlation was corrected according to Sheppard's correction in σ for coarse grouping (13:330). The corrected r is +.82. Horst's study defines a correlation of .82 as excellent relationship (15.8). The mean of the five quarter all-college grade point average (x) was 2.56. The mean of

TABLE IV

COEFFICIENTS OF CORRELATION OBTAINED BETWEEN PREDICTED GRADES AND FIVE QUARTER GRADE POINT AVERAGES

	GROUP	NUMBER	r	r (Sheppard's Correction)
1.	All-College GPA	111	.77	.82 **
2.	English - First Grade	103	.57	.62 **
3.	Geography 100	79	.57	.62 **
4.	History 100	57	.47	.51 **
5.	Psychology 100	107	.65	.71 **
6.	Biological Science 100	90	.67	.73 **
7.	Sociology 100	50	.60	.67 **

** At the 1 per cent level of significance

the predicted grade point average (y) was 2.19.

2. Between the English grade and the predicted all-college GPA in English, the r was +.57. The corrected r was +.62, defined as excellent relationship. The mean of the English grades (x) was 2.5; the mean of the predicted all-college English grades (y) was 2.15.

3. Between the Geography 100 grades and the predicted all-college GPA in Geography, the r was +.57. The corrected r was +.62, defined as excellent relationship. The mean of the Geography 100 grades (x) was 2.13 and the mean of the predicted all-college Geography grades was 2.12.

4. Between the History 100 grades and the predicted all-college GPA in History, the r was +.47. The corrected r was +.51. This is defined as very good relationship. The mean of the History 100 grades (x) was 2.33, and the mean of the predicted all-college History grades (y) was 2.11.

5. Between the Psychology 100 grades and the predicted all-college GPA in Psychology, the r was +.65. The corrected r was +.71, defined as excellent relationship. The mean of the Psychology 100 grades (x) was 2.57, and the mean of the predicted all-college Psychology grades (y) was 2.08.

6. Between the Biological Science 100 grades and the predicted all-college GPA in Biology, the r was +.67. The corrected r was +.73, defined as excellent relationship. The mean of the Biological Science 100 grades (x) was 2.25, and the mean of the predicted all-college Biology grades (y) was 1.89.

7. Between the Sociology 100 grades and the predicted all-college GPA in Sociology, the r was +.61. The corrected r was +.67, defined as excellent relationship. The mean of the Sociology 100 grades (x) was 2.02, and the mean of the predicted all-college Sociology grades (y) was 2.08.

CHAPTER V

CONCLUSIONS

I. SUMMARY

This study was motivated by the realization that until the extent to which the Washington Pre-College Grade Prediction Battery actually was of value in predicting grades of students at Central Washington College of Education was known, student advisers would be hesitant to use the results for counseling students. The primary purpose was to ascertain if the predicted all-college grade point average actually predicted the grades of Central Washington College of Education students. The secondary purpose was to find if there was any relationship between predicted all-college grade point averages in major fields when compared to a single grade in a course, even though the predicted grade was based on an all-college grade point average.

In order to determine this, all-college grade point averages and predicted all-college grade point averages for the sample of one hundred eleven students who entered college Autumn Quarter, 1958, and were still enrolled in college in the Teacher Education Program,

Winter Quarter, 1960 were compiled. Grades and predicted grades in six separate course areas were amassed at the same time. Correlation coefficients were computed between the actual grade point averages and the predicted all-college grade point averages.

The fundamental results of this study, shown on Table IV, may be summarized as follows:

1. The correlation between the predicted all-college grade point average and the grade point average of students after five quarters' work was +.82. Referring to Horst's definition of quality of r, this r shows excellent relationship (15:8).

2. The correlations between the predicted all-college grade point average in major fields and the actual grade in one course are as follows: (1) English, r = + .62; (2) Geography 100, r = + .62; (3) History 100, r = + .51; (4) Psychology 100, r = + .71; (5) Biological Science 100, r = + .73; (6) Sociology 100, 4 = + .67. All correlations were significant above the 1 per cent level of confidence.

In an unpublished research project conducted by Wilkinson in March, 1959, wherein correlations were run between predicted grades and actual grades in four separate subjects for the first quarter's grades of entering freshman, the following results were reported:

(1) Biology, r = + .68; (2) English 101, 4 = + .63; (3) Psychology 100, r = + .67; and (4) Sociology 100, r = + .71. Wilkinson points out that the correlation obtained in English was undoubtedly influenced by the fact that the extremely competent and incompetent students were not included in English 101 (28:1-2).

II. IMPLICATIONS

The results of this study have important implications in the use of these test results for guiding students. Only nine students who received predicted all-college grade point averages of less than 1.5 were still enrolled in school at the end of Winter Quarter, 1960. Four of these nine students received a cumulative grade point lower than 2.0 at the end of Winter Quarter, 1960. Only five of the students who entered college with a predicted all-college grade point average of below 1.5 remained in good scholastic standing at the end of five quarters of college.

Only one student among those with a predicted grade point average of 3.0 or better failed to achieve a cumulative grade point average of 3.0. This student fell from a predicted 3.0 grade point average to a

cumulative grade point average of 2.79.

This would seem to indicate that the Washington Pre-College Differential Grade Prediction Battery does an excellent job of predicting grade point averages at either end of the grade scale for Central Washington College of Education students.

A student's adviser could conclude that when a student's prediction chart indicates a grade point average above 2.0, this student has adequate ability to do satisfactory work in college. However, this gives no guarantee the student will succeed since interest, health and emotional stability, as well as general ability also influences academic success.

One should keep in mind that the criterion of one grade is not considered sufficient evidence of the success of the Washington Pre-College Grade Prediction Battery is predicting grade point averages in major fields; it is recommended that final judgment be withheld until further research is done.

The results of the correlation coefficients in the six separate course areas are to be viewed with caution. The inadvisability of using these findings as an indication of the success or failure of prediction will be understood when it is pointed out that only one

grade in one course was matched against a predicted all-college grade point average in all courses taken in this field. As Horst points out, a predicted 2.9 in English means this is the predicted average for all English courses taken (15:3). These fifth quarter sophomores are just deciding on their major fields. Careful statistical analysis of their grades in major fields and predicted all-college grade point averages in major fields is indicated after these students have completed their college work.

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APPENDICES

APPENDIX A

COMPUTATION OF THE PEARSON (PRODUCT-MOMENT CORRELATION COEFFICIENT BETWEEN ACTUAL GRADE POINT AVERAGES AND PREDICTED ALL-COLLEGE GRADE POINT AVERAGES.

$x = 284.12$

$x^2 = 747.32$

$y = 242.10$

$y^2 = 557.05$

$xy = 638.06$

$Mx = 2.56$

$My = 2.13$

$Mx^2 = 6.55$

$My^2 = 4.75$

$$r = \frac{\frac{\Sigma xy}{N} - MxMy}{\sigma x \quad \sigma y} = \frac{5.75 - (2.56)(2.18)}{(.424) \quad (.529)}$$

$$= \frac{5.75 - 5.58}{.22} = \frac{.17}{.22} = .77$$

$r = .77$

$$\sqrt{\frac{\Sigma x^2}{N} - Mx^2} = \sqrt{\frac{747.32}{111} - 6.55}$$

$$= \sqrt{6.73 - 6.55} = \sqrt{.18} = .424$$

$$\sqrt{\frac{\Sigma y^2}{N} - My^2} = \sqrt{\frac{557.05}{111} - 4.75}$$

$$= \sqrt{5.03 - 4.75} = \sqrt{.28} = .529$$

APPENDIX B

STUDENT	CUM. GPA. X	X^2	PRED. GPA Y	Y^2	XY
1	2.95	8.70	2.7	7.29	7.43
2	2.31	5.34	2.8	7.84	6.47
3	2.6	6.76	1.8	3.24	4.68
4	2.77	7.67	2.1	4.41	5.82
5	3.16	9.99	3.0	9.00	9.48
6	3.13	9.80	2.8	7.84	9.64
7	2.22	4.93	1.9	3.61	4.22
8	2.23	4.97	1.7	2.89	3.79
9	2.18	4.75	1.6	2.56	3.49
10	1.94	3.76	1.5	2.25	2.91
11	3.03	9.18	2.3	5.29	6.97
12	2.15	4.62	1.9	3.61	4.09
13	2.15	4.62	1.6	2.56	3.44
14	2.75	7.56	2.0	4.00	5.50
15	3.09	9.55	3.2	9.12	9.89
16	2.15	4.62	2.2	4.84	4.73
17	2.92	8.53	2.3	5.29	6.72
18	3.21	10.30	2.7	7.29	8.67
19	2.20	4.84	1.9	3.61	4.18
20	2.04	4.16	1.6	2.56	3.26

APPENDIX B (Continued)

STUDENT	CUM. GPA. X	X^2	PRED. GPA Y	Y^2	XY
21	2.41	5.81	2.5	6.25	6.03
22	2.32	5.38	2.3	5.29	5.34
23	2.82	7.95	2.6	6.76	7.33
24	2.73	7.45	2.0	4.00	5.46
25	3.09	9.55	3.1	9.61	9.58
26	2.61	6.81	2.2	4.84	5.74
27	2.76	7.61	1.8	3.24	4.97
28	2.12	4.49	1.5	2.25	3.18
29	2.12	4.49	1.7	2.89	3.60
30	2.42	5.85	2.1	4.41	5.08
31	2.44	5.95	2.6	6.76	6.34
32	2.20	4.84	1.8	3.24	3.96
33	2.17	4.70	2.6	6.76	5.64
34	2.46	6.05	2.0	4.00	4.92
35	2.72	7.39	2.6	6.76	7.07
36	2.77	7.62	2.4	5.76	6.65
37	2.17	4.71	1.4	1.96	3.04
38	3.63	13.18	2.8	7.84	10.16
39	2.57	6.60	1.7	2.89	4.37
40	3.25	10.56	3.3	10.89	10.73
41	2.31	5.33	1.8	3.24	4.16

APPENDIX B (Continued)

STUDENT	CUM. GPA. X	X^2	PRED. GPA Y	Y^2	XY
42	3.02	9.12	3.0	9.00	9.06
43	2.20	4.84	2.0	4.00	4.40
44	3.42	11.69	2.6	6.76	8.89
45	1.92	3.68	2.2	4.84	4.22
46	2.61	6.81	2.0	4.00	5.22
47	3.18	10.11	2.2	4.84	7.00
48	3.45	11.90	3.1	9.61	10.70
49	2.46	6.05	2.3	5.29	5.66
50	2.00	4.00	1.9	3.61	3.80
51	2.01	4.04	1.3	1.69	2.61
52	2.97	8.82	2.4	5.76	7.13
53	2.23	4.97	2.3	5.29	5.13
54	2.55	6.50	2.4	5.76	6.12
55	1.97	3.88	2.0	4.00	3.94
56	2.35	5.52	1.2	1.44	2.82
57	2.69	7.24	2.5	6.25	6.73
58	2.16	4.67	1.8	3.24	3.89
59	2.41	5.81	2.1	4.41	5.06
60	2.65	7.02	2.5	6.25	6.63
61	3.3	10.89	2.7	7.29	8.91
62	2.65	7.02	2.3	5.29	6.10
63	2.3	5.29	2.1	4.41	4.83

APPENDIX B (Continued)

STUDENT	CUM. GPA X	X^2	PRED. GPA Y	Y^2	XY
64	3.29	10.82	1.9	3.61	6.25
65	3.27	10.69	2.5	6.25	8.18
66	1.8	3.24	1.4	1.96	2.52
67	2.65	7.02	2.1	4.41	5.57
68	3.47	12.04	3.2	10.24	11.10
69	2.33	5.43	2.2	4.84	5.13
70	2.88	8.29	2.7	7.29	7.78
71	2.48	6.15	2.7	7.29	6.70
72	2.85	8.12	2.2	4.84	6.27
73	2.34	5.47	1.8	3.24	4.21
74	2.58	6.66	2.2	4.84	5.68
75	2.62	6.86	2.4	5.76	6.29
76	2.13	4.54	1.5	2.25	3.20
77	2.70	7.29	1.0	1.00	2.70
78	1.88	3.53	1.0	1.00	1.88
79	2.32	5.38	2.0	4.00	4.64
80	2.33	5.42	2.1	4.41	4.89
81	3.03	9.18	2.7	7.29	8.18
82	2.73	7.45	2.8	7.84	7.64
83	3.61	13.03	3.0	9.00	10.83
84	2.01	4.04	1.4	1.96	2.81
85	2.38	5.66	2.6	6.76	6.19

APPENDIX B (Continued)

STUDENT	CUM. GPA X	X^2	PRED. GPA Y	Y^2	XY
85	2.38	5.66	2.6	6.76	6.19
86	1.97	3.88	1.4	1.96	2.76
87	2.18	4.75	2.4	5.76	5.23
88	3.03	9.18	3.0	9.00	9.09
89	2.39	5.71	1.9	3.61	4.54
90	1.73	3.17	1.3	1.69	2.31
91	2.96	8.76	2.2	4.84	6.51
92	2.05	4.20	1.6	2.56	3.28
93	2.48	6.15	2.0	4.00	4.96
94	2.39	5.71	2.5	6.25	5.98
95	3.03	9.18	3.0	9.00	9.09
96	2.58	6.66	2.0	4.00	5.16
97	2.22	4.93	1.5	2.25	3.33
98	2.52	6.35	1.5	2.25	3.78
99	2.11	4.45	1.5	2.25	3.17
100	2.03	4.12	1.6	2.56	3.25
101	3.08	9.48	2.8	7.84	8.62
102	2.45	6.00	1.5	2.25	3.68
103	2.09	4.37	2.1	4.41	4.39
104	2.61	6.81	2.3	5.29	6.00
105	2.79	7.73	3.0	9.00	8.37
106	2.53	6.40	2.3	5.29	5.81

APPENDIX B (Continued)

STUDENT	CUM. GPA X	X^2	PRED. GPA Y	Y^2	XY
107	2.21	4.41	2.2	4.84	4.86
108	3.13	9.80	2.5	6.25	7.83
109	2.32	5.38	2.0	4.00	4.64
110	2.68	7.18	2.7	7.29	7.24
111	3.06	9.36	2.6	6.76	7.96