PREDICTIVE INDICES OF JUNIOR HIGH SCHOOL TEST SCORES WITH RESPECT TO ACADEMIC PERFORMANCE IN TWELFTH-GRADE SUBJECTS OF THE UNIVERSITY ENTRANCE COURSE

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ABSTRACT

The purpose of this study was to determine how effectively students' academic performance in individual twelfth-grade subjects of the University Entrance Course can be predicted at the ninth-grade level. The nine independent variables selected as predictors were the IQ scores of the Dominion Test, three separate test scores obtained from the School and College Ability Test (SCAT), test scores of ninth-grade language, mathematics, science and history, and the ninth-grade average marks.

A review of relevant literature revealed that various tests of mental ability and academic performance have been used with considerable success to predict academic achievement of students' in senior high school.

The empirical analysis consisted of two major investigations. In the first investigation multiple regression was applied to the data. The coefficient of multiple correlation of the total battery of nine independent variables and the twelfth-grade subjects were computed. The nine independent variables only accounted for forty-five per cent or less of the variance of the individual twelfth-grade subjects. Regression weights of the independent variables selected as the best

predictors were obtained and multiple regression equations were used to predict twelfth-grade subject scores. The predicted twelfth-grade scores were subject to a large error of estimate. A cross-validation analysis of the initial multiple regression investigation also indicated that the differences between the predicted scores and the actual twelfth-grade scores were very large.

The multiple regression investigation demonstrated that the nine selected independent variables, which primarily were measurements of intellectual ability and performance, did not account for a sufficient amount of the variance of individual twelfth-grade subjects to make accurate prediction by multiple regression equations possible. The results of this investigation indicate a need for further research in order to identify independent variables which account for an additional portion of the variance of the individual twelfth-grade subjects so that prediction by multiple regression equations will be subject to less error of estimate.

In the second part of the study expectancy tables were constructed to predict the probability of a student obtaining a score as great as or greater than a designated twelfth-grade subject score. The expectancy tables based on the bivariate distribution of ninth-grade average marks and the scores of the individual twelfth-

grade subject examinations showed the most meaningful and discriminative relationship between the independent and dependent variables. This study established the utility of expectancy tables, based on ninth-grade average marks, to predict students' academic performance in individual twelfth-grade subjects of the University Entrance Course.

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CHAPTER I

THE OBJECTIVES AND SIGNIFICANCE OF THE STUDY

I. INTRODUCTION

At the completion of the ninth grade of junior high school and prior to entering senior high school, students in Manitoba schools must elect to enroll in one of four course patterns. These course patterns are the University Entrance Course, the General Course, the Commercial Course and the Industrial Course. Since each of these courses acts as a pre-requisite for attainment of particular academic or vocational goals, the decisions which are made with regard to course and subject selection at the ninth-grade level are often crucial for the student's future academic or vocational achievements. Therefore, sound guidance based on the most dependable evidence and information must be provided so that each student will make the wisest possible choices.

One useful guide in course selection in senior high school could be the prediction of academic performance in twelfth-grade subjects of the University Entrance Course on the basis of marks obtained in tests of mental ability, school achievement and general intelligence in junior high school. Several studies have been done in this area

of prediction, but none have been performed with these particular variables in the local setting of this study. This study seeks to provide information to assist students in the ninth-grade of the junior high school in the selection of the most appropriate course and subjects in senior high school.

II. THE OBJECTIVES OF THE STUDY

Statement of Objectives

This study has a two-fold purpose: it seeks to determine the effectiveness of selected junior high school tests of mental ability, school achievement and general intelligence as predictors of academic performance in individual subjects of the twelfth-grade University Entrance Course; the second objective of this study is to compare two techniques of prediction to assess by which method the selected variables could be used more effectively to predict academic performance in the twelfth grade. The two techniques being compared in this study are the application of multiple regression together with the construction of multiple regression equations, and the construction of expectancy tables.

Delineation of the Study

The study was limited by being performed with

population samples which consisted only of those twelfth-grade students enrolled in one secondary school in the city of Winnipeg in the province of Manitoba. The study is further limited by considering only those junior high school students who enrolled in the University Entrance Course and completed the twelfth-grade June examinations set by the Manitoba High School Examination Board. No consideration was given in this study to those junior high school students who subsequently enrolled in senior high school courses other than the University Entrance Course.

This study did not consider sex differences of the population samples of students who served as the source of the data of the study.

The study is restricted to a consideration of those independent variables as predictors of academic performance which are themselves measurements of mental aptitudes and academic performance. These independent variables consisted of data which was annually accumulated in the local school setting in which this study was performed. It was hoped that the findings of this study would assist the guidance personnel to assess the relative usefulness of data, readily available in the school, with respect to counseling of students in regards to

course and subject selection in senior high school.

Data Sources

To carry out this study the following data were required:

1. The Verbal, Quantitative and Total scores on the School and College Ability Tests (SCAT) of all the students included in the individual investigations.

2. The final, June ninth-grade subject scores in language, mathematics, science and history of all students included in this investigation. Also the students' average marks, which were the unweighted means of the four ninth-grade subject scores of all students which were included in the individual investigations.

3. The IQ scores obtained from the Dominion Tests of Learning Capacity for all the students included in the individual investigations.

4. The twelfth-grade University Entrance Course subject scores obtained in English, history, mathematics, chemistry, physics, biology and French by students included in the individual investigations.

III. SIGNIFICANCE OF THE STUDY

Curriculum Provisions and Course Selection

The curriculum of the Manitoba high schools is

no longer primarily designed for those students preparing to enroll in a university. With the introduction of other courses besides the University Entrance Course, provision is made for more youth of high school age to prepare for vocational goals that are suited to their abilities. With the introduction of additional senior high school courses, the academic alternatives presented to a student, as he selects a senior high school course at the end of the ninth grade, have also been increased.

In the secondary school from which the data of this study were collected approximately 250 students were annually enrolled in the ninth grade. Of these students a total of 138 students completed the twelfth-grade English examination in the University Entrance Course in 1967 but only 97 students attained a pass standing. The remaining 41 students failed to gain a pass standing in this course subject. It is frustrating and often detrimental to a student to be placed in an educational program in which he will not be successful. Droedge (1960) stated that in recent years there has been increasing recognition of the importance of educational-vocational guidance during the ninth-grade in junior high school with respect to course and subject selection.

Student Ability to Make Academic Decisions

Thompson (1966) supported Super's view (1960)

that students at the ninth-grade level are ready to consider problems of pre-vocational and vocational choices. Thompson found that ninth-grade students were not only interested in exploring the nature of various vocational occupations but indicated personal preferences. He found that there was practically no difference in the preference given to various occupations by individual students during the ninth grade and later during senior high school grades. A student, for example, who was interested in science related vocations such as pharmacy or the chemical research industries while in the ninth-grade would most frequently indicate similar vocational interests during the final year of senior high school.

While evidence based on research indicates that students possess a maturity or stability of vocational and pre-vocational interests and preferences, other research evidences indicate that students frequently have great difficulty in accurately assessing their own ability and their personal potential to achieve in academic subjects. Spaight (1965) made a study to examine the relationship between the actual and the perceived level of academic achievement of junior high school students. He concluded that many junior high students are unable to rate their actual or potential achievement realistically or accurately. He noted that

bright junior high school students tended to underestimate their actual academic achievement and their capacity to achieve. Due to this tendency on the part of some students to underrate themselves, they hesitate to enroll in a certain course which they consider desirable and in which they would probably be successful if they enrolled. Other students, due to lack of adequate self-understanding, choose academic programs which are too demanding in relationship to their ability and consequently fail to achieve success.

Need for Valid Evidence

In seeking to assist a student to assess the probability that he would be successful if he were to enroll in a particular course subject, the counsellor must select independent variables which he considers to be the best predictors of academic performance in that subject. Shaycoft (1967) made a comprehensive study to assess the effectiveness of various independent variables as predictors of academic performance in the twelfth grade of senior high school. She concluded that a student's achievement rating in the individual ninth-grade subject is an excellent predictor of that student's attainment in twelfth-grade subjects requiring the same cognitive skills. Shaycoft's findings justify the inclusion of ninth-grade subject scores as independent

variables of this study.

Prediction studies must be undertaken with tests even though the title of the test may imply which cognitive skill or skills are measured by it. Only if independent variables are proven empirically to be reliable measures of future performance in a specific subject can,they be used by the school to counsel a student with respect to the probability of success in that particular subject if he chooses to enroll in it. Lavin (1965) warned that many predictors with a label related to an area of academic performance frequently do not measure the same cognitive skills and consequently do not correlate significantly with the criterion carrying the same label. On the other hand, tests that have a particular label such as Numerical Ability may effectively predict achievement in an academic subject designated by an unrelated label such as Physics since the same cognitive skills are required for performance in both tests.

Milholland (1962), in a review of educational testing, drew attention to the fact that the greater number of studies of prediction of academic performance in senior high school, as well as other levels of education, were restricted to an assessment of the effectiveness of a variety of independent variables as predictors of a single criterion, namely over-all

academic performance. However, as Horst (1957) pointed out, performance of most students differs qualitatively from one subject to another. Therefore individual senior high school subjects must be selected as the criterion of academic performance rather than considering composite high-school average marks as an adequate criterion in such prediction studies. This study used subject scores rather than over-all average marks as the criterion.

This study is also of value since it consists of empirical analyses of data obtained in a local setting and therefore provides additional information regarding how effectively these selected independent variables predict academic performance of students in a particular school. Lavin (1965) emphasized the importance of replicating studies, using locally obtained data, in order to determine whether prediction of academic performance based on specific independent variable is warranted in that particular local situation.

IV. SUMMARY

This study seeks to assess the effectiveness of various independent variables as predictors of academic performance in individual twelfth-grade subjects of the University Entrance Course. Another objective of

the study is to compare two techniques of prediction to determine by which method of analysis of the data the most useful information is provided with respect to counseling of students in the selection of senior high courses. The approach of this study consists of the application of multiple regression equations and the construction of expectancy tables.

This study is important for several reasons. Students, at the end of the ninth grade, are faced with the selection of one of four senior high school courses as well as the selection of individual course subjects. Unfortunately, in numerous instances, students who select the University Entrance Course do not attain their twelfth-grade standing. Other students, who would possibly be successful if they enrolled, avoid the University Entrance Course because of their inability to assess their chances of academic success in this course. In order that guidance and counsel may be provided by the school with respect to the probability of success or failure in a given course subject, empirically validated information and evidence must be available.

Chapter II contains a review of some of the research literature that is relevant to this study. A description of the variables, the population samples

and a detailed description of the techniques used in the investigation is given in Chapter III. In Chapter IV the findings of the two main investigations are presented and compared. Chapter V consists of a summary of the study and the implications of the findings.

CHAPTER II

THE REVIEW OF THE LITERATURE

The review of the literature will be restricted to a number of studies related to the prediction of academic performance with the scores of tests of mental abilities, school achievement and general intelligence since these studies were most relevant to this study. A number of research techniques employed in prediction of academic performance will be reviewed. Also literature specifically related to the School and College Ability Tests (SCAT) will be summarized.

I. SCHOOL TEST SCORES AS PREDICTORS OF ACADEMIC PERFORMANCE

Differential Tests of Mental Ability

Shaycoft (1967) demonstrated that growth in cognitive skills is not only substantial between the ninth and twelfth grade, but that the rank-order correlation between ninth and twelfth-grade scores on the same test tended to be highly significant. She concluded that studies of prediction of performance in specific cognitive skills were rationally justifiable. However, she noted significant differences in the rate of mental growth between the individual cognitive skill areas. The largest gain in terms of raw scores on tests was in Vocabulary.

Shaycoft recommended individual subject scores rather than over-all grade average as the criterion of academic performance in prediction studies so that differentiation in rate of mental growth in the individual cognitive skills may be taken into consideration.

Meyer and Bendig (1961) made a study to determine whether scores obtained on differential ability tests in junior high school were effective predictors of academic performance in senior high school. The Primary Mental Abilities Tests were administered to a group of students during the eighth and eleventh grade. The eighth grade sub-test scores of the Primary Mental Abilities Tests correlated with eleventh grade achievement test scores resulted in a correlation coefficients that were highly significant. The study showed that differential tests of mental abilities administered at the junior high level were at least as useful predictors of eleventh grade performance as the same tests administered at the beginning of the Grade XI.

Ingersoll and Peters (1966) studied the predictive value of the sub-tests of the General Aptitude Test Battery (GATB) with respect to ninth-and tenth-grade performance. Verbal Aptitude and Numerical Aptitude with regression weights of .27 and .22 respectively contributed most significantly to the variance of multiple

regression. Frost (1965) in his review of findings of prediction studies based on multiple regression, agreed with Droedge (1966) by stating that numerous studies of mental ability tests indicated that verbal, numerical and spatial factors were major components of the variance of regression between independent variables and the dependent variable.Flanagan (1965) and Jacobs (1959), in separate studies, found that tests of arithmetic computation were the best single predictors of over-all high school performance.

Mitchell (1955) contended that subject achievement tests scores rather than grade average should be the criterion when predicting academic performance by means of differential ability test scores. He recommended four-factor ability tests as predictors.

School Achievement Tests

Boney (1966) made a comparative study of 23 independent variables as predictors of over-all twelfth-grade achievement. Scores obtained by a total sample of 222 students on sub-tests of the Differential Aptitude Tests, the Sequential Tests of Educational Progress, the California Tests of Mental Maturity, junior high-school achievement tests and junior high-school grade-point average served as the independent variables. The criterion of academic performance was over-all

twelfth-grade academic performance. By means of multiple regression Boney demonstrated that junior high-school grade-point average contributed more to the variance of the criterion than the sub-tests of well-known standardized tests of mental ability and achievement.

Scannell (1960) made a study to determine the usefulness of achievement test scores obtained at the junior high school grade level as predictors of success. He demonstrated that the scores of the sub-tests of the Iowa Test of Basic Skills predicted over-all college success equally well in the eighth grade as in the eleventh or twelfth grade. Klugh and Bierley (1959) found that the high school average mark was a better predictor of first semester college grades than the Co-operative School and College Ability Test (SCAT). Marks and Murray (1965) stated that high school average has long been considered as that variable which singly provides the most information about future academic performance at the college level as measured by grade-point average.

Travers (1955) concludes his review of research findings with respect to prediction of academic success by stating:

> There is evidence that a student's grade in a particular subject-matter field can be best predicted from his previous grade in the same or related fields. Relative performance in the same subject is quite stable from year to year, so that

> the tenth-grade scores are in general as good as the eleventh grade scores for predicting twelfth-grade scores in the same subject area.

General Intelligence Tests

The literature of educational research pertaining to the usefulness of general intelligence tests as predictors of academic performance reflects a diversity of views amongst educators. Cronbach (1949) asserted that multifactor tests of abilities add little to the prediction of performance in particular academic courses beyond what the general intelligence will predict. He reported a study at the high school level in which correlation between intelligence and grades was .55. Travers (1949) found that correlations between intelligence and school grades were between .50 and .75 on the eighth- to tenth-grade levels. Gough (1953) obtained correlations of from .62 to .80 with three samples of high school seniors, and Carter (1959) found correlations of about .60 between intelligence tests and academic performance in senior high school of three student samples.

Wellman (1957) made a comparative study of single score intelligence tests and multifactor tests of mental maturity as predictors of high school achievement at the ninth- and tenth-grade level. The Gamma IQ test of the Otis Quick-Scoring Mental Ability Test was used to obtain single scores and the Primary Mental Abilities Test

consisting of a battery of tests was used to obtain multiple scores. He found that a greater portion of the variance of the criterion was accounted for by the Otis IQ scores than by the scores of any of the PMA sub-tests or by the PMA Total scores.

Tyler (1965) stated that correlations reported between group intelligence tests and standardized measurements of school achievements often are as high as .80. She stated that long-term predictions from intelligence test scores lend support to the conclusion that intelligence tests measure basic educational aptitude. She concluded that if school attendance laws were such as to permit students to drop out after their fourteenth birthdays, intelligence tests given in a grade school would predict with a fair degree of success how far up the educational ladder students will go.

Strong opposition to the use of group tests of general intelligence as measures of mental ability has been expressed due to the belief that these tests are biased against the culturally deprived. This view was in large part responsible for the decision to ban group intelligence tests in the schools of the city of New York as reported by the Board of Education of the City of New York (1964).

Bloom (1963),in attempting to determine the

relative usefulness of various tests of mental abilities as predictors of academic performance, discovered that the correlation between a general index of intelligence and over-all performance on a battery of achievement tests approaches unity at the elementary level and drops to about .50 at the college level. He concluded that tests of general intelligence have less predictive capacity in the secondary school than differential aptitude tests. Frost (1965), in a review of findings of educational research related to the prediction of scholastic achievement in senior high school, also concluded that rarely can more than 50 per cent of the variance of the criterion of academic performance be accounted for by intelligence test scores alone. However, he concurred with Wellman (1957) who argued that intelligence tests contribute significantly to the amount of variance of the subject criterion in senior high school that is accounted for by a battery of independent variables by means of multiple regression.

II. METHODS OF PREDICTION OF ACADEMIC PERFORMANCE

A brief review of a number of studies using various methods to predict academic performance is included in this section. Studies employing multiple regression, canonical correlation and expectancy tables

will be discussed.

Multiple and Canonical Regression

Multiple regression. Wellman (1957) performed a multiple regression study with data obtained from a sample of 136 students in one high school in the state of Iowa. The purpose of the study was to determine the effectiveness of a single score test and a multiple factor test of mental ability as a battery for differential prediction of ninth-and tenth-grade achievement. Scores obtained on the Otis Quick-Scoring Mental Ability Test and the Primary Mental Ability Tests served as the predictor variables. He found that when the Otis Test scores, the PMA Verbal Meaning scores and the PMA Reasoning scores were correlated with individual criteria, coefficients of multiple correlation of .81 with English, .81 with Science and .82 with over-all tenth grade achievement were obtained.

Swinnen (1961) made a study of prediction of academic performance in secondary schools in Belgium. The population sample consisted of 1259 boys, ages 12 and 13, in the last year of preparatory school. The purpose of the study was to predict academic success at various points during the six years of secondary school. Multiple correlations as well as regression weights of the individual independent variables were obtained. Five

tests served as the predictor variables and the average school achievement of the students during secondary school was the criterion. The five predictor variables were tests of verbal ability, abstract relations, arithmetic computations, a Latin prognosis test and the final examination in preparatory school. Multiple correlation coefficients ranging from .68 to .88 were obtained at various stages during the six-year secondary school period. Also multiple regression equations were constructed with the regression weights of selected predictor variables. These were found useful in the prediction of academic performance in secondary school. The verbal ability test, the arithmetic computation test and the Latin prognosis test most frequently accounted for the greatest portion of the variance of the criterion. The author concluded his report of the research study by stating that it is not too optimistic to say that the selection of suitable candidates for secondary schools can "nowadays be done competently with a minimum of mistakes" by predictions based on multiple regression studies.

Ingersoll and Peters (1966) performed a prediction study to investigate the use of the General Aptitude Test Battery for identification and counseling of students in vocational and academic classes in Ohio secondary schools. A multiple regression analysis was performed

using the General Aptitude Test Battery aptitude scores of 4,000 ninth-and tenth-grade boys and girls as the independent variables and subject grades and grade-point average at the end of one year separately as the dependent variables. They concluded that the General Aptitude Test Battery was useful in the predictive role for ninth-and tenth-grade achievement in most subject areas. However, they recognized that regardless of the significance of the aptitudes evaluated and the measures of attainment used as the criterion, about one-half or less of the variance of the criterion was associated with the independent variables.

Impellitteri (1967) argues against the inclusion of the total score of a battery of mental ability tests as a predictor variable when seeking to determine the multiple correlation with a criterion. A total score, he contends, is not an independent measure and consequently contributes no unique dimension to the multiple regression equation even though it may appear to have a favorable weight in such an equation.

Canonical correlation. Impellitteri (1967) points out that canonical correlation adds to the effectiveness of the multiple regression technique of prediction since it maximizes the common variance by empirically extracting the factors that account for the variance from

the dependent variables as well as the independent variables. Impellitteri used canonical regression in a study to determine the regression weights of the dependent variables as well as the independent variables. Canonical regression is used most advantageously when the dependent variable is a composite variable such as an over-all average academic rating. In such a situation the grades obtained in the individual school subjects are the factors of the composite dependent variable.

Expectancy Tables

Bloom and Peters (1961) advocated that school counsellors construct various forms of expectancy tables in order to estimate students' academic performance in a specific course or subject. They stressed that expectancy tables provide the necessary evidence whereby academic achievement can be predicted as effectively as is possibly being done by the school with the most informed staff. Andersen and Stiles (1968) constructed expectancy tables to estimate the probability of success in the twelfth grade based on ninth-grade subject scores and Scholastic Ability Test (SAT) percentiles. They considered the information obtained in this manner highly practical and useful for guidance and counselling of students with regards to academic course selections.

Blai (1966) constructed expectancy tables which he used to estimate academic performance in the college freshman year. These tables provided valuable information which enabled the college to predict the probability of success of an individual candidate should his application for enrollment in a specific course be accepted by the college.

III. THE SCHOOL AND COLLEGE ABILITY TESTS (SCAT)

It is not possible to refer to extensive research based on the school achievement tests used in this study since different tests are constructed annually. However, since the School and College Ability Tests (SCAT) are both known and used internationally, it is valuable to make brief reference to studies and reviews related to them.

Anastasi (1961), in an evaluation and comparison of tests, stated that on the whole the SCAT test is excellently constructed, standardized on the basis of a large and carefully chosen sample, and possesses promising evidence of predictive validity.

Green (1965) stated that the SCAT test is primarily suited for prediction of general over-all levels of academic performance. He found that research evidence justifies the use of the SCAT as a predictor of academic

performance over at least a two-year period. His review referred to the findings of numerous prediction studies of the SCAT which indicated that the Verbal SCAT test scores added very little to the predictive capacity of the Total scores and the Quantitative scores. Even senior high-school English was predicted more effectively with Total SCAT test scores than by Verbal SCAT test scores. Green remarks that the SCAT is primarily a group intelligence test that avoids the IQ labels and serves as a means of assessment of the likelihood of academic success of a student in a specific school situation.

Kaytal (1967) in a study based on data collected in selected Alberta secondary schools determined by means of biserial correlation that SCAT tests administered to ninth-grade students could be used to discriminate in a number of subjects between those students who would be successful and those who would not be successful in the twelfth grade. He determined the critical scores that a student must attain on the Verbal SCAT and Quantitative SCAT tests in order that a high probability of attaining twelfth-grade standing in the University Matriculation Course subjects existed. He obtained such critical SCAT scores for twelfth-grade English, social studies, chemistry, mathematics, and physics but concluded that success in biology could not be predicted from SCAT scores.

IV. SUMMARY

The research studies performed indicate that the use of tests of mental ability, school achievement, and general intelligence for predicting academic performance in senior high school is considered practical by numerous educators. The SCAT tests have been found to be useful predictors of academic performance in the secondary school setting. Although these studies do not prove the validity of the tests used in this study as predictors of academic performance in senior high school, they do justify the consideration given to these independent variables selected for this prediction study.

Likewise both the use of expectancy tables and multiple regression have been found effective techniques of prediction of academic performance in senior high school on the basis of studies described in this review of some of the relevant literature.

CHAPTER III

THE DESIGN OF THE STUDY

The purpose of this chapter is to set out and describe the variables, the population samples and the techniques used in this prediction study. Identical dependent and independent variables were used for each of the investigations of this study. The variables will be described only once in this chapter and then will be referred to by name in the individual investigations. The population samples consisted of twelfth-grade students selected from one secondary school of the city of Winnipeg in the province of Manitoba. Since different population samples were selected for each of the investigations of this study, the individual population sample will be identified in conjunction with the description of the technique used in each investigation.

The procedure of the analysis of the data consisted of two main parts. The first part of the empirical analysis consisted of the application of multiple regression to selected variables. In association with this investigation a cross-validation investigation of the initial multiple regression analysis was undertaken. The second part of the study consisted of an investigation based on the construction of expectancy tables.

The procedure of the analysis of the data took into consideration the two main aspects of the study of the problem. Each of the two main investigations was designed to determine which variables of a group of nine independent variables most effectively predicted academic performance in the individual twelfth-grade University Entrance Course subjects. Also the design of the study provided for a comparison of the two methods of prediction, namely the application of multiple regression and the construction of expectancy tables, in order to determine which method of prediction provided the most useful information in a ninth-grade school counselling situation with respects to academic placement of students in the senior high school program.

In order to be able to make valid comparisons of the separate investigations, the population samples which served as the source of the data of the individual investigations were compared to determine whether they could be considered as random samples of the same population and not significantly different from one another.

I. THE VARIABLES OF THE INVESTIGATIONS

Sixteen variables were selected for this prediction study. Seven dependent and nine independent variables

were used in each investigation. Scores on tests of mental ability, school achievement and general intelligence served as the variables of this study. The data associated with each variable was obtained from the cumulative student record files of the secondary school from which the population samples of this study were chosen.

Dependent Variables

The dependent variables selected for this study were the student scores obtained in seven twelfth-grade subjects of the University Entrance Course. The seven subjects were English, history, mathematics, chemistry, physics, biology and French. The final June examinations set and scored under the direction of the Manitoba High School Examination Board were selected as the measurements of students' academic performance in each of the subjects. Twelfth-grade students enrolled in the University Entrance Course attain their standing on the basis of achievement on these examinations. A student must obtain a subject mark of 50 per cent or more in order to attain a pass standing in the individual subject.

A detailed description of the content of each course subject upon which the individual June examinations are based is provided in the "Program of Studies of the University Entrance Course". This booklet is published by the Manitoba Department of Education.

For purposes of identification the subjects of the twelfth-grade University Entrance Course are labelled with the number 300 in the program of studies outline issued by the Manitoba Department of Education. Hereafter the individual dependent variables which consist of twelfth-grade subject scores, will be identified by the subject name and the number 300, for example English 300. These variables are labelled in order to assist in identifying them in later sections and chapters of this study. The individual dependent variables are English 300, History 300, Mathematics 300, Chemistry 300, Physics 300, Biology 300, and French 300. These dependent variables are listed in Table I.

Independent Variables

Nine independent variables were selected for use in this study. These variables were test scores of

TABLE I

SUMMARY OF VARIABLES

Dependent Variables[a]
English 300
History 300
Mathematics 300
Chemistry 300
Physics 300
Biology 300
French 300
Independent Variables
Mental ability scores[b]
Verbal SCAT
Quantitative SCAT
Total SCAT
Class achievement scores[c]
Language IX
Mathematics IX
Science IX
History IX
Grade IX Average
General intelligence scores[d]
Dominion IQ

[a] Twelfth-grade subject scores of University Entrance Course.

[b] Test scores of School and College Ability Tests (SCAT).

[c] Ninth-grade subject achievement scores.

[d] Single-score IQ measurements of Dominion Test of Learning Capacity.

mental ability, school achievement and general intelligence administered at the junior high level.

Mental ability test. Three independent variables were derived from the Cooperative School and College Ability Test (SCAT), Form 2A. The SCAT test was administered during the sixth month of the ninth grade. Each test booklet consists of four parts. As reported in the Manual for Interpreting Scores (1957) which has been issued by the publishers of this test, the SCAT test was designed to aid in estimating the capacity of a student to undertake the academic work of the next higher grade level of schooling. The test measures two kinds of school-related abilities which are important in a large number of academic endeavors: verbal and quantitative abilities.

Three converted SCAT scores were obtained for each student. The Verbal SCAT score is a measure of verbal abilities. The Quantitative SCAT score is a measure of numerical or quantitative abilities. The Total SCAT score provides a single measure of a student's ability to do academic work. These three SCAT scores served as independent variables. They are named Verbal SCAT, Quantitative SCAT and Total SCAT to assist in identification and will be referred to in this manner in subsequent sections of this study.

The Verbal SCAT, Quantitative SCAT, and Total SCAT percentile ranks which were used in the expectancy tables studies were derived from the SCAT Test scores on the basis of norms established for the Winnipeg School Division.

School achievement tests. Four independent variables were students' scores in four selected ninth-grade subjects of junior high school. The final June subject scores in language, mathematics, science and history served as four independent variables. The average mark of these four ninth-grade scores served as a fifth independent variable. The five school achievement variables are named Language IX, Mathematics IX, Science IX, History IX and Grade IX Average.

Instruction in each subject was given by qualified teachers in accordance with the program of studies outlined by the Manitoba Department of Education. Identical subject text-books were provided for all students included in the population sample. Instruction was co-ordinated under the direction of subject committee convenors. Each subject score was a uniformly compiled composite mark based on term examinations and class assignments. The same ninth-grade subject examinations were written by all the students included in the population sample.

Consultation amongst subject teachers prior to the marking of the examinations assured relatively uniform marking standards.

General intelligence test. The ninth independent variable consisted of the IQ scores derived from the Dominion Test of Learning Capacity, Intermediate Level, Form A. This test was administered during the second month of the seventh grade. This is a test of general intelligence and a single IQ score is obtained. In order to more readily identify this independent variable, it is named Dominion IQ.

The nine independent variables are listed by name and identified in Table I, page 30 and will be referred to in later sections and chapters by their designated names and by reference to this table.

II. THE MULTIPLE REGRESSION INVESTIGATION

This section is a description of the first of the two main investigations of this study. The technique associated with the investigation is briefly interpreted. The population sample and the variables are identified. The procedures related to the selection of the independent variables as the best predictors of the dependent variables are explained. The methods followed in the cross-

validation analysis of the initial multiple regression study are presented.

Interpretation of Multiple Regression and Associated Statistical Techniques

Multiple regression and multiple correlation are techniques used to determine the relationships between two or more independent variables and a dependent variable. Multiple regression equations are used to predict a students' dependent variable score from two or more independent variable scores obtained by that student.

Multiple correlation. Multiple correlation, R, is a term used to describe the correlation between one dependent variable and two or more independent variables simultaneously. The coefficient of multiple correlation indicates the strength of the relationship that exists between the dependent variable and the independent variables. The coefficient of multiple determination, which is the square of the multiple correlation coefficient and is identified as R^2, expresses the amount of variance of the dependent variable that is accounted for or associated with a number of independent variables collectively. Theoretically a greater portion of the variance in the criterion could be accounted for by increasing the number

of independent variables being correlated with the criterion. A new test may add to the validity of the battery of independent variables by being related to or "taking out" some of the as yet unmeasured part of the dependent variable. An independent variable may also add validity as a "suppressor" if it takes out non-valid variance applied by another independent variable.

Guilford (1956) refers to two main principles that serve as a basis for the selection of independent variables from a battery of test variables which account for or are related to the variance of a particular dependent variable. These principles are (1) a multiple correlation increases as the size of correlation between the dependent and independent variables increases and (2) a multiple correlation increases as the size of inter-correlation of independent variables decreases. Guilford (1956) and Garrett (1958) state that the determination of the variance of the dependent variable is frequently only slightly enhanced by the inclusion of more than three or four independent variables from a battery of academic tests in a multiple correlation and multiple regression analysis. This limit to the numbers of useful independent variables is due to the fact that usually only a limited number of human abilities and other traits involved in the

dependent variable are represented in these tests which primarily measure academic performance or general intelligence.

Regression weights of independent variables. In association with multiple correlation, a regression weight for each independent variable may be computed. Regression weights are calculated to determine the relative weight which each independent variable contributes to the variance of the dependent variable, independently of other factors. Thus the regression weight of a particular independent variable functions as a ratio that expresses how many units the dependent variable will increase or decrease for every variation of one unit in this particular independent variable.

Multiple regression equations. A multiple regression equation is used to predict a student's score on a dependent variable from the scores he has obtained on two or more independent variables. A multiple regression equation consists of an algebraically determined constant value called a regression constant, the regression weight of each of the selected independent variables which function as predictors and the student's obtained score on the selected independent variables. The function of the regression constant of the equation, graphically related to the point of intersection of the regression line on the Y-axis and therefore referred to as the Y-intercept,

is to assure that the mean of the predicted scores will equal the mean of the original dependent variable also referred to as the criterion.

Population Sample and Variables

The students selected as the population sample of the multiple regression analysis were those 144 students who completed the twelfth-grade University Entrance Course examinations in June of 1967 in one secondary school in Winnipeg. The population sample of each of the seven subject analyses consisted of those students who completed the examination of the particular twelfth-grade subject to which multiple regression was being applied in association with the nine independent variables. The size of the population sample for each of the seven dependent variable analyses is listed in Table II, page 38.

Seven dependent variable and nine independent variables were selected for this analysis. The variables of this investigation were the total group of variables listed in Table I, page 30.

TABLE II

SIZE OF STUDENT SAMPLES ASSOCIATED WITH EACH DEPENDENT VARIABLE ANALYSIS OF THE SEPARATE INVESTIGATIONS

Dependent Variables	Size of Student Samples		
	Multiple Regression Investigation	Cross-Validation Analysis	Expectancy Tables Investigation
English 300	138	95	233
History 300	36	31	67
Mathematics 300	136	83	219
Chemistry 300	114	78	192
Physics 300	71	33	104
Biology 300	48	35	83
French 300	124	86	210
Total Population Sample	144	97	241

Procedure of Multiple Regression

The values for all the variables were punched onto I.B.M. cards and programmes were used to enable the multiple regression technique to be applied to the data by the 360 I.B.M. computer system. An empirical analysis of the data was made by the application of multiple regression to each of the seven dependent variables in association with the battery of nine independent variables. The mean, standard deviation and simple inter-correlations of the nine independent variables and each dependent variable were obtained. Also, the regression weights of the independent variables, the multiple correlation coefficient, the regression constant and the standard error of estimate were determined.

In this description of the analysis, the procedures of the study with respect to the dependent variable English 300 and the nine independent variables will be presented in detail. Identical procedures were followed with respect to the application of multiple regression to the other six selected dependent variables.

Selection of best independent variables as predictors. After the initial multiple correlation and multiple regression of the battery of nine independent

variables and the criterion, namely the dependent variable English 300, was completed, a sub-group of independent variables was selected to serve as predictors in the regression equation. This battery of independent variables was chosen on the following basis:

1. The sub-group of independent variables which was selected as the predictors must account for a minimum of 80 per cent of the variance of the dependent variable that is associated with the battery of all nine independent variables.

2. The number of independent variables included in the battery was restricted to a maximum of four predictors. If no more than two per cent of the variance of the dependent variable was accounted for by including four independent variables instead of three, then only three independent variables were chosen for the regression equation. Guilford (1956) and Garrett (1958) recognized that the inclusion of more than three or four independent variables in a prediction equation frequently only slightly enhances the determination of the variance of the dependent variable (see page 35).

3. The coefficient of multiple correlation of the battery of independent variables included as predictors of the multiple regression equation of prediction of the dependent variable must not be less than .50.

4. If no variance determinant was obtainable for

the battery of the nine independent variables then the sub-group of independent variables which as a battery met the first three stipulations was chosen.

Multiple regression was applied to the dependent variable English 300 and batteries of two, three and four selected independent variables to determine which battery of independent variables served as the best predictor of English 300. Independent variables which had low inter-correlation and high correlation with the dependent variable were given preference as selected independent variables. These variables were assembled into batteries of variables which were correlated with the dependent variable English 300. The battery of independent variables which accounted for the largest portion of the variance of English 300, according to the guidelines which have been set out, was selected for the construction of multiple regression equations. In addition the multiple correlation coefficient, the regression constant, the regression weights of the selected variables, and the standard error of estimate of prediction for the selected battery of independent variables and English 300, was recorded.

Construction of multiple regression equations. Three students were selected by the lottery method from the population sample that served as the source of the data of the English 300 investigation. Multiple regression equations

were constructed to predict these students' score in English 300. The multiple regression equation of prediction for each student was constructed with the regression constant, the regression weight of each selected variable of the sub-group of independent variables which had been obtained earlier by the application of multiple regression and the score on each of these independent variables obtained by that student whose score is being predicted. Each students predicted score was recorded and compared with his actual English 300 score.

Cross-Validation of the Multiple Regression Investigation

The cross-validation investigation was designed to determine how effectively academic performance of a student of a twelfth-grade class in a following year could be predicted by means of the multiple regression equation constructed from data obtained by the initial multiple regression investigation. The population sample and variables are identified and the procedures of cross-validation are described in this section.

Population sample and variables of cross-validation analysis. The students selected as the population sample of the cross-validation analysis were those 97 students who completed the twelfth-grade University Entrance

Course examinations in June of 1968. This population sample was selected from the same secondary school from which the population sample of the initial multiple regression investigation was chosen. The size of the population samples associated with each of the seven dependent variables to which multiple regression equations were applied are listed in Table II, page 38.

The same seven dependent variables and the nine independent variables as those used in the initial multiple regression investigation were used in the cross-validation analysis. The variables used in this investigation are the variables listed in Table I, page 30.

Comparison of the population samples. Prior to making the cross-validation study of the original initial multiple regression study, a comparison of the population samples which served as the source of the data of these two investigations was made. This comparison was made to determine whether it may be assumed that the two population samples were randomly selected from the same population. The null hypothesis which stated that there was no significant difference of the means of the students' scores obtained on tests written by members of the two population samples served as the basis of the comparison.

The t-test of significance was used to measure the difference between the means. As indicated in Table III, page 45, the means of the Total SCAT scores, the Grade IX Average scores and the Dominion Test scores of the cross-validation population samples were compared with the means of the corresponding test scores of the initial multiple regression investigation.

The hypothesis that there was no significant difference between the means of the test scores obtained from the two population samples was either rejected at the five per cent level of significance or otherwise the difference was considered non-significant and could easily have arisen from sampling fluctuations. Table III, page 45, shows the t-distribution of comparison of the means of the three selected variables for each of the seven pairs of population samples of twelfth-grade University Entrance Course subjects. These results of the comparison of the population samples are reported in this section, rather than in Chapter IV, since the cross-validation analysis was justified only if the population sample were known not to be significantly different. The seven column headings on Table III, page 45, are the names of dependent variables which were associated with the

TABLE III

THE t-TEST OF ANALYSIS OF THE DIFFERENCE OF THE MEANS OF THREE SELECTED PAIRS OF INDEPENDENT VARIABLES OF THE MULTIPLE REGRESSION INVESTIGATION AND THE CROSS-VALIDATION ANALYSIS

Compared Pairs of Independent Variables	t-distribution of the Difference of the Means of Student Samples Related to Dependent Variables						
	English	History	Mathematics	Chemistry	Physics	Biology	French
	300	300	300	300	300	300	300
degrees of freedom	231	65	217	190	102	81	208
Total SCAT	.96	.99	.67	.77	1.69	1.29	1.72
Grade IX Average	1.41	1.04	1.02	1.82	.98	1.39	1.47
Dominion IQ	.63	.03	.55	.09	.91	1.18	.27
5% significance level	1.97	2.00	1.97	1.97	1.98	1.99	1.97

There was no significant difference of the means at the 5% level.

individual multiple regression and cross-validation analyses. The names of these dependent variables are used to identify the seven pairs of population samples being compared. The size of these population samples of the separate analyses are listed in Table II, page 38. The degrees of freedom of the t-distribution of the difference of the means of each pair of compared means consisted of the total number of observations obtained from the pooled population samples less two degrees of freedom.

There was no significant difference at the five per cent level of confidence between the means of the three pairs of independent variables with reference to all seven population sample comparisons. Therefore the null hypothesis was not rejected and it was assumed that no true difference existed between the means of each of the seven dependent variable-related population samples of the 1967 twelfth-grade multiple regression investigation and the corresponding population samples of the 1968 cross-validation investigation.

Procedure of cross-validation. Three students were selected by the lottery method from the population sample that served as the source of the data of this investigation. Each student's English 300 score was predicted by a

multiple regression equation. The regression constant and the regression weights used in the initial multiple regression investigation were substituted into this multiple regression equation. Also the score obtained by the individual student on each of those independent variables selected as the best predictors in the initial investigation was introduced into this prediction equation. The predicted English 300 scores of the three students were compared with their actual scores. The differences between the predicted and actual scores in English 300 based on the cross-validation analysis were compared with the difference between predicted and actual scores in English 300 based on the initial multiple regression investigation.

The results and findings based on the multiple regression investigation and the associated cross-validation related to the dependent variable English 300 are reported in Chapter IV. The results and findings based on identical investigations associated with each of the other six dependent variables are also reported in Chapter IV.

III. THE EXPECTANCY TABLE INVESTIGATION

In this investigation an analysis is made to determine the relationship between dependent and independent variables by means of expectancy tables. The population sample and the variables will be identified. The construction of expectancy tables will be described and the reading of the tables will be illustrated.

Population Samples and Variables

The students selected as the population sample of the analysis of the data by expectancy tables were those 241 students of the selected secondary school who completed the twelfth-grade University Entrance Course in June of 1967 and 1968. The size of the population sample of the analysis associated with each of seven dependent variables is listed in Table II, page 38.

Seven dependent variables and nine independent variables were selected for this investigation. The variables of this investigation are the total group of variables listed in Table I, page 30.

Construction of Expectancy Tables

An expectancy table is constructed from a grid containing rows and columns of cells on which the frequency distribution of pairs of scores of two variables

are plotted. In this manner the relationship of a student's standing on an independent variable, on the one hand, and a dependent variable, on the other hand, may be shown. When a student's score on an independent variable is given, it is possible by means of an expectancy table to predict the chances of his obtaining a score as great as or greater than a designated score on the dependent variable.

Expectancy tables were constructed to show the relationship between each dependent and independent variable. For example, separate tables were constructed to show the relationship of English 300 and each of the nine independent variables. Likewise nine expectancy tables were constructed in association with each of the other six dependent variables. In this description of the construction and reading of expectancy tables, the discussion will be restricted to the expectancy table of English 300 based on the Verbal SCAT scores.

As shown in Table IV, the scale of measures of the dependent variable English 300 was indicated across the top of the table and the scale of measures of the independent variable Verbal SCAT was indicated on the left-hand side of the table. The tallied frequencies of

TABLE IV

ENGLISH 300 EXPECTANCY TABLE BASED ON VERBAL SCAT TEST

Verbal SCAT Percentile	N	Grade XII Subject Scores							Median Score
		50	55	60	65	70	75	80	
91-99	39	98	70	60	47	22	14	2	64
81-90	33	81	56	33	18	12	12	3	56
71-80	42	75	47	25	10	7	5	5	54
61-70	33	62	39	26	13				52
51-60	36	76	44	24	14	3			54
41-50	15	67	52	28	20	7	7		55
31-40	11	54	36	9	9				51
21-30	24	50	13	4	4				50
11-20	15	45	33						less than 50
1-10	4	75	25						
Total N-	233								

the distribution of scores within each row were accumulated by entering a particular row on the right-hand side of the table and totalling or accumulating the frequencies in each cell of that row while progressing to the left-hand side of the row. The total of the number of frequencies within each row were tabulated in the column under the heading N. Finally the cumulative frequency of each cell in each of the rows was expressed as a per cent of the total frequency of scores in that row. The column of figures on the extreme left-hand side of the scale of measures of the dependent variable, English 300, are the listed percentages of the students within each of the percentile intervals of the independent variable, Verbal SCAT, who obtained an English 300 mark of 50 per cent or better. The column of marks on the extreme right-hand side of the table are the medians of the dependent variable scores in each row of the expectancy table.

Reading the expectancy table. Upon entering that row in Table IV which includes all the students who obtained a Verbal SCAT score in the 81-90 percentile interval, it is observed that 81 per cent of the students received a "pass" mark of 50 per cent or better in English 300. The remaining 19 per cent of the students in the row

received a "failure" mark of 50 per cent. A mark of 50 per cent in English 300 is a critical score since in Manitoba only marks of 50 per cent or better are presently considered to be "pass" marks.

Use of expectancy tables. The use of the expectancy tables may be illustrated by making reference to Table IV, page 50, as follows: The counselor , together with a ninth-grade student may seek to assess the probability of the student achieving a particular score or a score higher than that score if the student were to enroll in the University Entrance Course and eventually write English 300. The counsellor, by checking the school records, may establish that the student has a percentile rank standing of 61 on the Verbal SCAT Test. By entering into the row of the expectancy table designated as the independent variable score interval of 61-70, the counselor may predict the student's academic achievement by stating that this student has 62 chances in 100 of obtaining a mark of 50 per cent or better in English 300, and he has 26 chances in 100 of obtaining a mark of 60 per cent or better in the same subject.

The expectancy tables which show the relationship between each of the remaining independent and dependent

variables are shown in Table IX to Table LXX of the Appendix.

IV. COMPARISON OF THE TWO TECHNIQUES OF PREDICTION

The procedures of prediction of academic performance of twelfth-grade students by the use of two techniques have been described in earlier sections of this chapter. In this section the procedures related to a comparison of the relative effectiveness of these two methods of prediction namely by means of multiple regression equations and expectancy tables, will be outlined.

Comparison of population samples. In order to compare the findings based on the two methods of prediction, the population samples used in the two investigations were compared to determine whether they may be considered to be drawn from a common population. The population sample of the expectancy table investigation consisted of those students who completed the twelfth-grade University Entrance Course examinations in June of 1967 and June of 1968. This population sample consisted of the combined population samples of the multiple regression investigation and the cross-validation analysis. As indicated in Table III, page 45, these two population samples which served as the source of data of the multiple regression investigation

and the cross-validation analysis were accepted as not being significantly different from one another at the five per cent level of significance. Therefore it is also assumed that the population sample of the expectancy table investigation is not significantly different from the population sample of the multiple regression investigation. Consequently data obtained from these two population samples may be compared.

Procedure of Comparison. The comparison of the findings based on these two methods of prediction did not consist of statistical analysis but was a general descriptive comparison. This comparison of the findings will be reported in Chapter IV.

V. SUMMARY

In this chapter seven dependent and nine independent variables have been presented. The empirical analysis of the data has also been described. This description of the analysis was divided into two main parts. The first part of the investigation was achieved by the application of multiple regression, the selection of a battery of the best predictors for each dependent variable and the construction of multiple regression

equations. Students were selected by the lottery method and their dependent variable scores were predicted by means of the multiple regression equations. The predicted scores were compared with the actual scores to assess how effectively the individual dependent variable could be predicted. In association with the multiple regression investigation, a cross-validation analysis was undertaken. The multiple regression equation constructed for each of the seven dependent variables in the initial analysis were used to predict student's scores in the following year.

In the second part of the study a series of expectancy tables were constructed and analyzed. These expectancy tables were used to predict, on the basis of a student's score on an individual independent variable, the probability of a student obtaining a designated score or a score better than that score on a dependent variable.

The population samples which served as the source of the data were also compared. These comparisons were made in order that the relative effectiveness of these two methods of prediction could be evaluated. The seven dependent variables and nine independent variables used

in each of the investigations have been listed in Table I, page 30. The size of the population samples which served as the source of the data of the individual subject analysis of each investigation are listed in Table II, page 38. The details associated with the comparison of the population samples of the multiple regression investigation and the associated cross-validation are presented in Table III, page 45.

The findings of the individual investigations and the comparison of these findings based on two techniques of prediction will be reported in the following chapter, Chapter IV.

CHAPTER IV

THE FINDINGS OF THE PREDICTION STUDY

The findings of the prediction investigations of this study are given in this chapter. The presentation of the findings is organized on the basis of the two main investigations detailed in the previous chapter (Chapter III). A comparison of the findings based on the investigations using two different techniques of prediction will also be presented in this chapter.

The nature and importance of the study has been indicated in Chapter I. The review of relevant literature was presented in Chapter II. The selected variables and the techniques employed in the analysis were described in the previous chapter.

I. FINDINGS OF THE MULTIPLE REGRESSION INVESTIGATION

The findings related to the analysis based on the application of multiple regression and the selection of the independent variables which were the best predictors of the scores on each dependent variable are given in this section. The dependent and independent variable of this investigation are listed in Table I, page 30. Also a comparison of the predicted and actual student scores is presented and the findings of the cross-validation investigation are reported.

Multiple Correlation Coefficients

Matrices of simple inter-correlations of the individual dependent variable and the nine independent variables were obtained. Also coefficients of multiple correlation of each dependent variable and the battery of all nine independent variables were obtained and are listed in Table V. Physics 300 and French 300, each with a multiple correlation coefficient of .67 and Mathematics 300, with a multiple correlation coefficient of .66, were the three dependent variables that correlated most highly with the battery of nine independent variables. Multiple correlation coefficients of .58 for English 300 and .54 for Chemistry 300 were obtained with the nine independent variables.

A matrix of simple inter-correlations between the dependent and nine independent variables was obtained for History 300 and for Biology 300 as for the other five dependent variables. However, instead of obtaining a coefficient of multiple correlation and the related regression coefficients of the independent variables, no correlation was obtained for these two dependent variables as is shown in Table V, page 59. Later multiple regression was successfully applied to History 300 and Biology 300 in association with selected sub-groups of independent variables as is shown in Table VI and VII.

TABLE V

COEFFICIENTS OF MULTIPLE CORRELATION AND PER CENTS OF VARIANCE OF INDIVIDUAL DEPENDENT VARIABLES ASSOCIATED WITH THE BATTERY OF NINE INDEPENDENT VARIABLES [a]

Dependent Variables	N	Coefficient of Multiple Correlation	Per Cent of Variance
English 300	138	.58	33.64
History 300	36	-	-
Mathematics 300	136	.66	43.56
Chemistry 300	114	.54	29.16
Physics 300	71	.67	44.89
Biology 300	48	-	-
French 300	124	.67	44.89

[a] For details of independent variables refer to Table I, Page 30 .

Variance of multiple regression. As indicated in Table V, page 59, the portion of the variance of the individual dependent variable accounted for by the battery of nine independent variables varied considerably. Physics 300 and French 300 had 44.89 per cent of their variance accounted for. Only 29.16 per cent of the variance of Chemistry 300 was accounted for by the nine independent variables.

Selection of Independent Variables as Best Predictors

A sub-group of three or four independent variables was selected as best predictors of each of the seven dependent variables in accordance with the guide lines set out in Chapter III, page 40.

In Table VI, page 62, the multiple correlations of each dependent variable with the total battery of nine independent variables are compared with the multiple correlation of the same dependent variable and the battery of three or four selected independent variables. The comparisons of the coefficients of multiple correlation reported in Table VI, page 62, indicated that the amount of variance of English 300, Mathematics 300, Chemistry 300, Physics 300 and French 300 accounted for by the nine independent variables is accounted for almost equally well by 3 or 4 selected independent variables. For example the French 300 coefficient of multiple regression with the three selected variables was .65 as compared to a

coefficient of .67 with all nine independent variables. The difference of the per cent of variance accounted for by these two batteries of independent variables is less than three per cent.

As indicated in Table VI, page 62, multiple correlation coefficients were obtained for History 300 and Biology 300 when each was correlated with a battery of three selected independent variables. The coefficient of multiple correlation for Biology 300 and the battery of three independent variables is .42. This is less than the coefficient of multiple correlation of .50 which was accepted as the minimum coefficient acceptable for this prediction study.

In Table VII the regression weights of these independent variables selected as the best predictors of scores on each of the seven dependent variables are listed together with the regression constant and the standard error of estimate. In addition the coefficient of multiple correlation of each selected battery of three or four independent variables and the corresponding dependent variable are listed once more. A summary of the findings related to each dependent variable as presented in Table VI and VII are presented under the following sub-titles.

<u>English 300.</u> The independent variable, Total SCAT, had the largest weighting in the prediction equation for

TABLE VI

A COMPARISON OF THE MULTIPLE CORRELATION BETWEEN EACH DEPENDENT VARIABLE AND THE TOTAL BATTERY OF INDEPENDENT VARIABLES[a] AS COMPARED TO THE MULTIPLE CORRELATION OF EACH DEPENDENT VARIABLE AND A SUB-GROUP OF SELECTED INDEPENDENT VARIABLES[b]

Dependent Variables	Coefficient of Multiple Correlation With Nine Independent Variables	Coefficient of Multiple Correlation of Selected Independent Variables	Number of Selected Variables
English 300	.58	.55	3
History 300	-	.55	3
Mathematics 300	.66	.64	4
Chemistry 300	.54	.52	4
Physics 300	.67	.62	4
Biology 300	-	.42*	3
French 300	.67	.65	3

*Rejected because R is less than .50.

[a]For details related to list of independent variables refer to Table I, page 30.

English 300. Grade IX Average also contributed significantly to the English 300 multiple regression equation. Mathematics IX, the third independent variable had a negative regression coefficient and consequently acted as a "suppressor". The regression constant was 10.83. The coefficient of multiple correlation of English 300 and the three selected independent variables was .55 as compared to .57 for English 300 and all nine independent variables.

History 300. History IX, Grade IX Average and Quantitative SCAT were selected as the independent variables of a multiple regression equation of prediction of History 300 scores. The multiple correlation coefficient was .55, the regression constant was 19.39, and the standard error of estimate was 13.60.

Mathematics 300. Quantitative SCAT had the largest regression weight in the Mathematics 300 prediction equation. Science IX, Mathematics IX and Verbal SCAT were also selected for the multiple regression equation. The regression weight of Verbal SCAT had a negative weighting as a predictor of Mathematics 300.

Chemistry 300. History IX contributed the most significant weight in the Chemistry 300 prediction equation. This relationship between these two variables which are associated with two distinct school-subject areas may seem odd. However, Lavin (1965), as reported in Chapter I,

TABLE VII

SUMMARY OF FINDINGS ASSOCIATED WITH THE PREDICTION OF DEPENDENT VARIABLE SCORES BY MULTIPLE REGRESSION WITH BEST INDEPENDENT PREDICTOR VARIABLES

Dependent Variables	Regression Weights of Independent Variables									Coefficient of Multiple Correlation	Regression Constant	Standard Error of Estimate
	Verbal SCAT	Quantitative SCAT	Total SCAT	Language IX	Mathematics IX	Science IX	History IX	Grade IX Average	Dominion IQ			
English 300			0.44		-0.23			0.35		.55	10.83	9.50
History 300		0.54					1.30	-1.01		.55	19.39	13.60
Mathematics 300	-0.37	0.61			0.38	0.42				.64	.94	11.76
Chemistry 300		0.13			0.29	0.20	0.32			.52	- 7.91	12.00
Physics 300			0.18	-0.56				1.38	-0.17	.62	- 3.70	10.59
Biology 300	0.08			0.41			0.18			.42*	21.18	11.80
French 300		0.50		0.55			0.27			.65	-19.91	11.51

* Rejected since the multiple correlation coefficient is less than .50.

page 8 of this study, observed that an independent variable may account for a considerable amount of the variance of a dependent variable with which it is not readily identified by name or implied subject area. Apparently the same cognitive skills are essential for achievement in History IX and Chemistry 300. Mathematics IX, Science IX and Quantitative SCAT also contributed significantly to the Chemistry 300 multiple regression equation.

Physics 300. Grade IX Average contributed the most significant weight in the Physics 300 prediction equation. Language IX contributed a significant negative weight and was followed by Dominion IQ and Total SCAT.

Biology 300. The Biology 300 coefficient of multiple correlation with the three selected independent variables was only .42. For purposes of comparison of predicted and actual scores, the battery of selected independent variables associated with Biology 300 is reported even though the coefficient of multiple correlation is less than the minimum of .50 stipulated in Chapter III, page 40. Language IX had the largest regression weight; followed by History IX and Verbal SCAT. These three variables are commonly associated with verbal skills. Consequently it would appear that verbal skills contribute significantly to achievement in Biology 300. However, only 18 per cent of the variance of the criterion,

Biology 300, was accounted for by these three variables. Therefore this analysis does not provide conclusive evidence with respect to the major determinants of academic achievement in Biology 300.

French 300. The correlation for French 300 and the sub-group of selected independent variables was the highest of the seven dependent variables. The coefficient of multiple correlation was .65. Language IX had the largest regression weight, followed by Quantitative SCAT and History IX.

Prediction of Dependent Variable Scores

The three predicted and actual students' scores for each dependent variable are reported in the first two columns of Table VIII. The students whose scores were predicted were selected by the lottery method from the initial multiple regression population sample which consisted of students who completed twelfth-grade University Entrance Course examinations in June of 1967. As indicated in Table VIII, a considerable fluctuation in the difference between the predicted and actual score is apparent for each dependent variable. The average difference of the three predicted and three actual scores of each dependent variable ranged from a

minimum of 3.3 marks for English 300 to a maximum of 11.6 for History 300 and for Biology 300. Physics 300, French 300 and Mathematics 300 showed average differences between actual and predicted scores of 4.0 marks, 4.6 marks and 5.3 marks respectively. The average difference of predicted and actual scores for Chemistry 300 was 11.3 marks. The relatively large standard error of estimate of each multiple regression equation, as reported in Table VII, page 64, indicates that large errors in prediction will occur.

Findings of the Cross-Validation Analysis

The population sample of the cross-validation investigation consisted of those students who completed the twelfth-grade University Entrance Course examinations in June of 1968. Three students' scores were predicted for each dependent variable. The three predicted student scores for each dependent variable were compared with the corresponding actual student scores obtained on that same dependent variable. This comparison is presented in column three and four of Table VIII, page 68. A considerable fluctuation in the size of the difference of the predicted scores and actual scores occurred even

TABLE VIII

A COMPARISON OF STUDENTS' ACTUAL SCORES ON DEPENDENT VARIABLES WITH THEIR PREDICTED SCORES OBTAINED BY MEANS OF MULTIPLE REGRESSION EQUATIONS[a]

	Initial Multiple Regression Analysis		Cross-Validation Analysis	
Dependent Variables	Actual Score	Predicted Score	Actual Score	Predicted Score
English 300	41	46	79	57
	70	63	43	47
	56	57	50	53
History 300	77	64	76	67
	81	73	52	56
	46	60	64	56
Mathematics 300	86	86	82	69
	60	64	55	66
	47	59	50	62
Chemistry 300	58	51	68	66
	76	67	54	41
	35	53	62	53
Physics 300	50	50	43	56
	76	74	64	62
	38	48	83	69
Biology 300	54	67	40	65
	74	77	78	78
	62	43	60	60
French 300	53	55	77	55
	74	67	44	42
	46	51	61	53

[a]For details of selected independent variables, their regression weights and additional data related to the multiple regression equation of prediction of each dependent variable, see Table VII, page 64.

as in the comparisons of predicted and actual scores based on the initial multiple regression investigation which are shown in the first two columns of the same table. For example, the first predicted English 300 score of the cross-validation analysis was 22 marks less than the actual score while the third predicted score for the same dependent variable was three marks higher than the actual score. The average difference of the three predicted and three actual scores was the lowest for the cross-validation analysis of History 300. The average difference was 7.0 marks. The largest average difference of actual and predicted scores of 12.0 marks was obtained for Mathematics 300.

II. FINDINGS OF THE EXPECTANCY TABLES INVESTIGATION

Each of the expectancy tables is a table that shows the relationship between one of the nine independent variables based on students' test scores obtained during the junior high-school grades and one of the seven dependent variables consisting of twelfth-grade examination scores in individual subjects of the University Entrance Course. The variables being considered in the expectancy tables are listed in Table I, page 30. In this investigation

the percentile ranks of the SCAT Test scores rather than the SCAT Test Scores served as the data of the three independent variables associated with the SCAT Test. The English 300 expectancy table based on the Verbal SCAT percentile has been presented as Table IV, page 50. The other expectancy tables are reported in Table IX to Table LXX (see Appendix).

The findings based on the expectancy table investigation will be presented in three parts. Since it is impractical to report the findings for each of the sixty-three expectancy tables separately, these comments will be related to the usefulness of scores of the SCAT Test, the school achievement tests and the Dominion Test as predictors of academic performance at the twelfth-grade level. The prediction of academic performance based on the expectancy tables is presented in terms of the probability, expressed as a given number of chances in a hundred, of a student obtaining a score as great or better than a designated dependent variable score.

Prediction Based on SCAT Test Percentiles

In examining Table IV, page 50, and other expectancy tables in which the percentile ranks of students' SCAT scores serve as the independent variables, it is apparent that there was a great range of the percentile ranks of the

scores obtained on the SCAT Tests by students who completed the individual twelfth-grade University Entrance Course examinations. As indicated in Table IV, page 50, students who completed the English 300 examination had Verbal SCAT scores whose percentile ranks ranged from the highest percentile rank interval, namely the 91-99 percentiles, to the lowest percentile rank interval, namely the 1-10 percentiles. Four students who completed the English 300 examination had Verbal SCAT scores which, when ranked, were placed in the 1-10 percentile interval. Of these four students, three students or 75 per cent of the students in the 1-10 percentile interval obtained a "pass" mark of 50 per cent or better in English 300.

The population sample selected as the source of data for the construction of expectancy tables did not include all ninth-grade students of the particular secondary school from which the population sample was selected. Of the total ninth-grade population of approximately 520 students only those 241 students were included in the population sample of the expectancy table investigation who later completed the twelfth-grade University Entrance Course examinations in June of 1967 and June of 1968. When the Verbal SCAT scores of the total ninth-grade student population of the school were examined, it was

observed that the majority of the students with Verbal SCAT scores in the 1-10 percentile range did not complete the twelfth-grade University Entrance Course examination in English 300. The majority enrolled in secondary school courses other than the University Entrance Course.

Some students with Verbal SCAT scores in the 1-10 percentiles did enroll in the University Entrance Course but due to their inadequate academic performance in earlier grades were not eligible to write the English 300. On the basis of the evidence provided in Table XV, (see Appendix), it is apparent that only those students with a Verbal SCAT score in the 1-10 percentile range who achieved a Grade IX Average of 51 per cent or better wrote the twelfth-grade University Entrance Course examination in English. Verbal SCAT Test student percentile ranks that fall at the lower end of the percentile rank scale of this expectancy table are not useful for predicting probability of achievement of an English 300 score as great or better than a designated score.

Prediction Based on School Achievement Tests

Findings related to the expectancy tables associated with the independent variables Language IX, Mathematics IX, Science IX, History IX, and Grade IX Average are included in this

sub-section of the report. However particular attention will be directed to the expectancy tables associated with the Grade IX Average marks. The seven expectancy tables, Table XV, XXIV, XXXIII, XLII, LI, LX, LXIX (see Appendix), which show the relationship between Grade IX Average and the seven dependent variables merit careful consideration. The range of the scores obtained on the independent variable Grade IX Average is relatively restricted in each of these expectancy tables. In no instance did any student with a Grade IX Average mark of less than 50 per cent attain a pass mark of 50 per cent in an individual twelfth-grade examination of the University Entrance Course.

Relatively few students with a Grade IX Average mark in the 51-60 per cent interval obtained a "pass" mark of 50 per cent in a number of individual twelfth-grade subject. On the basis of the expectancy tables showing relationship between Grade IX Average and the seven individual twelfth-grade subjects, the probability of a student, whose Grade IX Average score is 51 per cent, obtaining a mark of 50 per cent or better in the twelfth-grade subjects may be expressed as a per cent for each of these subjects as follows: English 300 - 53 per cent, History 300 - 25 per cent, Mathematics 300 - 75 per cent, Chemistry 300 - 22 per cent, Physics 300 - 33

per cent, Biology 300 - 83 per cent and French 300 - 36 per cent. By comparing these results we note that a student with a Grade IX Average score of 51 per cent has 85 chances out of a hundred of attaining his standing in Biology 300 while a student with the same Grade IX Average score has only 22 chances in a hundred of attaining a pass standing in Chemistry 300.

Similar comparisons can be made to predict the probability of a students' academic performance with respect to various selected scores on the independent variable range as well as the dependent variable range. For example, as shown in Table LX (see Appendix), the probability of a student with a Grade IX Average mark of 61 obtaining a score of 60 or greater in Physics 300 is 12 chances out of a hundred. The expectancy tables based on the Grade IX Average scores reveal a more meaningful relationship with each of the seven dependent variables than is shown by any of the other independent variables.

Prediction Based on the Dominion Tests

The expectancy tables which present the relationship between students' Dominion Test scores and seven twelfth-grade subject scores are recorded in Tables XVI, XXV,

XXXIV, XLII, LII, LXI and LXX, (see Appendix). These expectancy tables do not provide discriminative information at the lower level of the Dominion IQ range of scores with respect to the academic performance in the individual twelfth-grade subjects. This inconsistent relationship of independent and dependent variable scores at the lower level of the Dominion IQ range is accounted for by the circumstance that only relatively few of the total original ninth-grade student population whose Dominion IQ scores fell in the lower range level were included in the population sample of this investigation.

As shown in Table XVI (see Appendix), 70 per cent of these students with an IQ score in the 95-99 interval who completed the English 300 examination received a "pass" mark of 50 per cent or better. However, less than one-half of the original group of junior high school students who obtained Dominion IQ scores in the 95-99 score interval completed the English 300 examination. A large number of students with IQ scores in the 95-99 score interval were not academically eligible to write the English 300 examination. Therefore it is unrealistic to generalize, on the basis of data obtained of a select group of students, and state that a student with a Dominion IQ score in the 95-99 score interval has 70 chances in a 100 of receiving a mark of 50 per cent or better if he were to complete the English 300 examination.

At the higher range of the Dominion IQ scores, relatively consistent and meaningful relationships with the individual dependent variables were demonstrated. As shown in Table XVI (see Appendix) 88 per cent of the students with a Dominion IQ score of 120 received a pass standing in English 300 while 44 per cent of these same students received a score of 60 per cent or better in English 300.

III. FINDINGS BASED ON A COMPARISON OF THE TWO TECHNIQUES

A significant finding of the multiple regression investigation is that prediction of students' scores in the twelfth-grade examinations of the University Entrance Course is subject to a considerable error of estimate when the prediction is based on the scores of the nine selected tests of mental ability, academic achievement and general intelligence. As indicated in Table VII, page 64, the standard error of estimate for Chemistry 300 is 12.00 marks. This implies that 68 per cent of the predicted scores will be within the limits of plus or minus 12.00 of the actual score. Such a great range of fluctuations of predicted scores provides for little improvement of the margin of error of prediction that would result from a shrewd guess based on knowledge of the means of the variables. A student's score in a particular subject can be predicted; however, it is of little value due to the large error of

estimate. Therefore the multiple regression equations obtained for prediction of individual dependent variables do not provide the necessary information that a counsellor must possess as he seeks to counsel a ninth-grade student with respect to the selection of University Entrance Course subjects in senior high school.

In contrast a number of the expectancy tables provide information that is relatively precise and quite useful in a counselling situation. The SCAT percentiles at the higher interval level of the range provide fairly discriminating information with respect to the probability (expressed as a certain number of chances out of a hundred) of a student, who has a given independent variable mark, obtaining a score at least as great as a designated dependent variable score. The Grade IX Average expectancy tables provide the most valuable counselling information since the delineation of probability of success or failure to obtain a particular dependent variable score is more precise at all interval levels of the range of both the independent and dependent scores.

The expectancy tables have a number of additional advantages. An expectancy table provides a large number of comparisons with respect to the whole range of level of achievements as measured by both the independent and

dependent variables. Also the expectancy tables provide information that may be presented directly to the student. The prediction based on probability of academic performance at a series of points on an independent variable scale allows the student to relate the generalized information provided on the expectancy tables to his own situation after the counsellor has provided him with information related to his scores on achievement tests and other test scores that the counsellor chooses to reveal.

A student with a Grade IX Average mark of 61 may be told that 40 per cent of the students with scores like his do not attain their twelfth-grade standing in English 300 (see Table XV, Appendix). On the other hand the student recognizes that 60 per cent of the students obtain a "pass" mark of 50 per cent or better. The same student may be told that 13 per cent of the students with scores like his obtain a mark of 60 per cent or better in English 300 while 87 per cent of these students obtain a mark that is less than 60 per cent in this subject. In this manner a student is provided with valuable information and counsel and is not given a false impression of security that may result from a single predicted score obtained by a multiple regression equation which is however relatively meaningless due to the large error of estimate.

IV. SUMMARY

In this chapter the findings of the investigations have been reported. In the first section the findings of the multiple regression investigation were reported. In the second section of this chapter the findings related to the construction of expectancy tables were presented. Lastly the findings of these two investigations were compared. The relative usefulness of the information obtained by these two methods of prediction was evaluated from the standpoint of its utility in a guidance situation in which a student is counselled with respect to selection of senior high course subjects. In Chapter V a summary of the findings will be presented and some implications of these findings will be discussed.

CHAPTER V

SUMMARY AND CONCLUSIONS

This chapter includes a review of the study and the techniques employed in the separate investigations, a summary of the major findings of the study and a brief discussion of the implication of the findings. Also concluding recommendations will be presented.

I. REVIEW OF THE STUDY

This study has been concerned with the prediction of students' academic performance in seven twelfth-grade subjects of the University Entrance Course. Students' scores on junior high school tests of mental ability, academic achievement, and general intelligence served as the nine independent variables of the prediction study while the students' scores obtained on the twelfth-grade June examinations of the University Entrance Course served as the seven dependent variables (see Table I, page 30). One objective of the study was to determine which independent variables and groups of independent variables most effectively predicted academic performance in the individual twelfth-grade subjects. The second aspect of the study was to compare and evaluate the effectiveness of two techniques

of prediction of students' academic performance.

One method of prediction consisted of the application of multiple regression to the variables and the construction of multiple regression equations of prediction. A sub-group of independent variables consisting of those three or four independent variables which collectively accounted for the largest portion of the variance of the individual dependent variables was selected for the multiple regression equation. The initial multiple regression investigation was cross-validated on data obtained from another population sample.

The second method of prediction was performed by means of expectancy tables. The object of this investigation was not to predict precise students' scores on the dependent variables but to express the probability of a student, with a given score on an independent variable, of successfully obtaining or failing to obtain a designated score on the dependent variable.

II. MAJOR FINDINGS

The major findings of the study will be summarized under the sub-titles related to the two main investigations.

Prediction by Multiple Regression

A consideration of the findings which resulted from an analysis of the data by the application of multiple correlation, multiple regression and the construction of multiple regression equations is summarized by the following statements:

1. It appears that regardless of the significance of the tests of mental ability, school achievement and general intelligence used as predictors and irrespective of the twelfth-grade subject areas being predicted, only forty-five per cent or less of the variance of the dependent variables was associated with the total battery of independent variables (see Table V, page 59).

2. More than 80 per cent and in some instances more than 90 per cent of the total variance accounted for by the total battery of nine independent variables was accounted for by a sub-group of three or four independent variables (see Table VI, page 62).

3. Quantitative SCAT and History IX were the independent variables most frequently selected as variables of the multiple regression equations of prediction of dependent variables (see Table VII, page 64). They were included in the prediction equations of four dependent variables. Language IX and Mathematics IX and Grade IX

Average were each selected for three different multiple regression equations. Dominion IQ was selected least frequently as a predictor of dependent variable scores. It was included in only one prediction equation.

4. The standard error of estimate of the seven multiple regression equations of prediction of the seven dependent variable varied from a minimum of 9.50 for English 300 to a maximum of 13.60 for History 300. This indicates that large errors of estimate of predicted scores will frequently occur. The predicted scores of students selected by the lottery method also illustrated this error of estimate. The average differences between the three predicted and three actual scores of History 300 was 11.6 marks.

5. The cross-validation analysis corroborates the evidence based on the information obtained from the initial multiple regression investigation that prediction of twelfth-grade subject scores of the University Entrance Course by multiple regression equations results in a large error of estimate. The error of estimate of the predicted score is not appreciable reduced beyond what can be achieved by a shrewd guess on the basis of knowledge of the mean of the dependent variable scores.

Prediction by Expectancy Tables

The major findings associated with the analysis of the data by the construction of expectancy tables may be stated as follows:

1. The expectancy tables based on the Verbal SCAT, Quantitative SCAT and Total SCAT percentiles showed a meaningful delineation at the higher range of the percentile intervals between the percentage of the students who did obtain a series of designated scores on the individual twelfth-grade subjects and those students who failed to obtain such a designated mark. However, at the lower end of the scale of SCAT percentiles, the relationships of the SCAT percentiles and the individual twelfth-grade subjects were inconsistent and unreliable.

2. The expectancy tables which presented the relationship with Grade IX Average scores and the individual twelfth-grade subjects revealed consistent and meaningful discrimination with respect to the percentage of the students who achieved a designated twelfth-grade subject score and those who failed to do so. This delineation of academic performance was consistent throughout the intervals of the range of scores of both the Grade IX Average and of the individual twelfth-grade subjects

represented in the bivariate distributions of scores. The expectancy tables based on Language IX, Mathematics IX, Science IX and History IX showed varying degrees of discrimination. Certain individual dependent variables were particularly useful with respect to prediction of particular twelfth-grade subjects.

3. Dominion IQ scores only showed reasonably consistent relationships with the twelfth-grade subject scores at the higher range intervals of the Dominion IQ scores.

III. OBSERVATIONS AND IMPLICATIONS

Since a relatively small portion of the variance of the individual twelfth-grade subjects was associated with the tests of mental ability, school achievement and general intelligence selected as predictors in this prediction study, it is apparent that many factors which may contribute to academic performance in the individual twelfth-grade subjects of the University Entrance Course are not found in or measured by these nine independent variables used in this study. Less than a perfect degree of reliability of the tests used as predictors would also account for some of the variance difference.

The population samples of this study consisted of a select group of students since only those members of the total ninth-grade student population who completed the twelfth-grade subject examinations of the University Entrance Course were chosen as the population samples of this study. As a result the relationship between some independent variable, namely the three SCAT Tests and the Dominion IQ, and the individual dependent variables became distorted at the lower end of the independent variable scale. Grade IX Average, on the other hand, represented a relationship with the twelfth-grade subjects that enabled this variable to be used meaningfully in expectancy tables. Only students in the ninth-grade who obtained a Grade IX Average mark of 50 per cent or more completed the individual twelfth-grade University Entrance Course examinations. Also, by virtue of the fact that Grade IX Average is not a measure of potential ability but rather a measure of applied ability, it inherently, at least to some extent, also measures such non-intellectual traits as motivation and work habits.

The findings of this study restricted to one secondary school, indicate that the prediction of students' academic performance in the individual twelfth-grade subjects of the University Entrance Course by means of multiple regression equations will be subject to a large error

of estimate. Prediction of academic performance in twelfth-grade subjects by this method may therefore result in a misrepresentation of facts related to future academic performance. Counsel based on information obtained by multiple regression in this study could actually be a disservice to the ninth-grade student seeking counsel with respect to course and subject selection in senior high school. Expectancy tables based on Grade IX Average provided the necessary information for the prediction of academic performance in terms of the probability of a student obtaining a score as great as or greater than a designated twelfth-grade subject on the University Entrance Course. Expectancy tables can be readily constructed by the guidance counselor in a local school counseling situation. By means of these tables information may be shared with a student faced with the selection of courses and subjects. The student will readily be able to comprehend the implications of the information in terms of what probability exists that he will or will not attain certain academic goals under consideration.

A word of caution may be in order, however, with respect to the use of expectancy tables based on certain independent variable scores. Expectancy tables, based on IQ scores, may serve as useful information for the counselor.

students' academic performance.

It would also be fruitful to apply analyses, based on multiple regression and expectancy tables, to variables in order to assess the effectiveness of prediction of students' academic performance on individual subjects of the General Course, the Commercial Course and the Industrial Course. If meaningful relationships were proven to exist between various independent variables and the subject of these alternate senior high school courses, a student who would probably not be successful in the University Entrance Course could be counseled with respect to academic courses and subjects most suited for him in terms of probability of being successful.

V. CONCLUSION

The ultimate goal of this study was to provide additional information and evidence that will enable school counselors to offer guidance to students with respect to the selection of academic courses and subjects in the senior high school. Hopefully the findings of this study will be of value to counselor and student alike in determining the probability of the individual student attaining his twelfth-grade standing in individual subjects of the University Entrance Course if he were to enroll in this course.

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APPENDIX

SUPPLEMENTARY TABLES

TABLE IX

ENGLISH 300 EXPECTANCY TABLE BASED ON QUANTITATIVE SCAT TEST

Quant. SCAT Percentile	N	Grade XII Subject Scores							Median Score
		50	55	60	65	70	75	80	
91-99	32	90	80	58	50	23	19	3	65
81-90	30	90	67	54	30	14	3		61
71-80	30	89	54	32	26	10	7	7	56
61-70	30	64	53	47	20	7	3	3	57
51-60	29	70	48	29	13	3	3		54
41-50	21	74	64	29	24	20	15	10	57
31-40	25	68	44	20	16	8	4		54
21-30	14	77	35	21	7				53
11-20	16	60	30						51
1-10	6	66	33	16	16				52
Total N-	233								

TABLE X

ENGLISH 300 EXPECTANCY TABLE BASED ON TOTAL SCAT TEST

Total SCAT Percentile	N	Grade XII Subject Scores							Median Score
		50	55	60	65	70	75	80	
91-99	39	93	78	61	52	23	15	5	65
81-90	41	79	55	49	25	14	14	5	57
71-80	33	82	63	36	21	3	3		57
61-70	29	70	48	35	16	13	3	3	54
51-60	26	70	40	12	8				53
41-50	16	55	25	12	6				51
31-40	14	56	56	14	14				56
21-30	21	50	23	5	5				50
11-20	13	54	23	8					51
1-10	1	0							
Total N-	233								

TABLE XI

ENGLISH 300 EXPECTANCY TABLE BASED ON LANGUAGE IX TEST

Language Percent	N	Grade XII Subject Scores							Median Score
		50	55	60	65	70	75	80	
91-100	4	50	50	50	50	25			65
81-90	31	77	68	54	44	23	23	7	62
71-80	84	87	69	44	27	13	7	2	59
61-70	68	62	33	16	9				52
51-60	32	60	41	22	6	3			52
41-50	13	46	15	8				below	50
31-40	1								
1-30	0								
Total N-	233								

TABLE XII

ENGLISH 300 EXPECTANCY TABLE BASED ON MATHEMATICS IX TEST

Mathematics Percent	N	Grade XII Subject Scores							Median Score
		50	55	60	65	70	75	80	
91-100	46	89	61	47	36	15	9	2	59
81-90	63	78	55	33	21	13	9	3	56
71-80	62	70	47	31	17	3	1	1	54
61-70	43	60	39	20	9	5	2		53
51-60	16	57	38	20	20				52
41-50	3	66	33						52
31-40	0								
1-30	0								
Total N-	233								

TABLE XIII

ENGLISH 300 EXPECTANCY TABLE BASED ON SCIENCE IX TEST

Science Percent	N	Grade XII Subject Scores							Median Score
		50	55	60	65	70	75	80	
91-100	21		60	44	40	20	15	5	58
81-90	54	91	70	56	34	21	16	6	61
71-80	75	78	57	34	18	4	3		52
61-70	55	72	39	16	14	4			54
51-60	18	56	41	15	10				52
41-50	8	85	56	28					56
31-40	2	50							50
1-30	0								
Total N-	233								

TABLE XIV

ENGLISH 300 EXPECTANCY TABLE BASED ON HISTORY IX TEST

History Percent	N	Grade XII Subject Scores							Median Score
		50	55	60	65	70	75	80	
91-100	25	92	76	52	40	24	12	8	61
81-90	59	90	66	52	40	23	17	2	61
71-80	70	69	55	30	20	4	1	1	56
61-70	54	58	29	15	10				51
51-60	19	65	40	20	5				53
41-50	6	67	50	33					55
31-40	0								
1-30	0								
Total N-	233								

TABLE XV

ENGLISH 300 EXPECTANCY TABLE BASED ON GRADE IX AVERAGE

Grade IX Average	N	Grade XII Subject Scores							Median Score
		50	55	60	65	70	75	80	
91-99	6	83	83	66	66	33	16		67
81-90	57	92	70	57	40	20	15	6	62
71-80	91	72	50	32	19	6	4	1	55
61-70	66	60	36	13	7	1			52
51-60	13	53	23	8					51
41-50	0								
31-40	0								
1-30	0								
Total N-	233								

TABLE XVI

ENGLISH 300 EXPECTANCY TABLE BASED ON DOMINION TEST

Dominion I.Q. Scores	N	Grade XII Subject Scale							Median Score
		50	55	60	65	70	75	80	
135+	23	90	68	43	33	8	8		58
130-134	14	100	84	70	56	28	21	7	66
125-129	20	85	65	60	40	30	15	5	62
120-124	35	88	70	44	18	12	9	3	59
115-119	38	74	49	30	20	3	3		54
110-114	35	51	32	17	14	6	3	3	50
105-109	25	84	52	28	12	4			56
100-104	16	54	24	6	6			below	50
95-99	14	70	56	14	14				56
less than 95	13	47	16	8					
Total N-	233								

TABLE XVII

HISTORY 300 EXPECTANCY TABLE BASED ON SCAT VERBAL TEST

Verbal SCAT Percentile	N	Grade XII Subject Scores 50	55	60	65	70	75	80	Median Score
91-99	13	92	77	77	77	44	44	15	69
81-90	13	77	77	68	38	30	15	8	64
71-80	10	80	80	70	40	40	40		64
61-70	11	72	55	45	18	18	9		56
51-60	5	60	40	20	20				52
41-50	3	66	66	66	66	66	66		75
31-40	7	57	27	27	27	13	13		51
21-30	7	39	39	39	13			below	50
11-20	7	71	55	27	13				51
1-10	1								
Total N-	67								

TABLE XVIII

HISTORY 300 EXPECTANCY TABLE BASED ON QUANTITATIVE SCAT TEST

Quant. SCAT Percentile	N	Grade XII Subject Scores 50	55	60	65	70	75	80	Median Score
91-99	4	75	75	75	75	75	75	75	80+
81-90	9	88	77	66	44	33	33	33	64
71-80	9	89	89	78	66	33	22		62
61-70	9	66	55	55	33	22	22		61
51-60	10	60	50	50	40	30	20		60
41-50	6	85	85	85	50	50	33		70
31-40	6	67	67	67	50	33	33	17	65
21-30	5		80	60	40	20	20		62
11-20	7	75	58	38	16	16			52
1-10	2				50				65
Total N-	67								

TABLE XIX

HISTORY 300 EXPECTANCY TABLE BASED ON TOTAL SCAT TEST

Total SCAT Percentile	N	Grade XII Subject Scores							Median Score
		50	55	60	65	70	75	80	
91-99	8	87	75	75	63	50	50	25	75
81-90	11	90	90	90	72	54	54	18	76
71-80	13	78	78	71	48	32	23		65
61-70	7	70	70	56	42	28	14		62
51-60	7	70	70	70	42	28	14		63
41-50	5	80	60	40	20	20	20		57
31-40	5	60	60	60	20	20	20	20	61
21-30	5	60	60	60	20				61
11-20	6	68	68	51	34	17			60
1-10									
Total N-	67								

TABLE XX

HISTORY 300 EXPECTANCY TABLE BASED ON LANGUAGE IX TEST

Language Percent	N	Grade XII Subject Scores							Median Score
		50	55	60	65	70	75	80	
91-100	2	50	50	50	50	50	50	50	80
81-90	10	90	90	90	80	60	50	20	75
71-80	24	77	69	66	53	42	33	12	66
61-70	16	87	75	56	32	19	19		61
51-60	10	90	80	80	40	20			64
41-50	5	40	20	20				below	50
31-40	0								
1-30	0								
Total N-	67								

TABLE XXI

HISTORY 300 EXPECTANCY TABLE BASED ON MATHEMATICS IX TEST

Mathematics Percent	N	Grade XII Subject Scores 50	55	60	65	70	75	80	Median Score
91-100	8	87	75	75	75	64	50	25	75
81-90	15	93	86	86	63	28	28	14	67
71-80	19	90	78	72	47	40	20	5	64
61-70	13	85	78	55	30	22	15		61
51-60	12	75	50	50	25	17	17	8	60
41-50	0								
31-40	0								
1-30	0								
Total N-	67								

TABLE XXII

HISTORY 300 EXPECTANCY TABLE BASED ON SCIENCE IX TEST

Science Percent	N	Grade XII Subject Scores 50	55	60	65	70	75	80	Median Score
91-100	3	66	66	66	66	66	66	33	77
81-90	12	91	82	82	66	50	50		75
71-80	20	85	80	75	50	35	35	20	65
61-70	21	79	74	65	34	20			63
51-60	8	75	36	36	25	25	12		52
41-50	2	100	50	50	50				65
31-40	1	100	100						
1-30	0								
Total N-	67								

TABLE XXIII

HISTORY 300EXPECTANCY TABLE BASED ON HISTORY IX TEST

History Percent	N	Grade XII Subject Scores 50	55	60	65	70	75	80	Median Score
91-100	2	100	100	100	100	50			70
81-90	16	93	87	75	68	55	55	25	76
71-80	25	92	88	80	52	36	24	8	65
61-70	18	65	41	35	15	10	5		53
51-60	6	66	66	66	33	16			62
41-50	0								
31-40	0								
1-30	0								
Total N-	67								

TABLE XXIV

HISTORY 300 EXPECTANCY TABLE BASED ON GRADE IX AVERAGE

Grade IX Average	N	Grade XII Subject Scores 50	55	60	65	70	75	80	Median Score
91-100	2	100	50	50	50	50			70
81-90	11	90	90	90	81	54	54	27	76
71-80	25	84	80	76	56	36	32	8	66
61-70	25	88	68	76	24	24	8		62
51-60	4	25	25	25	25				
41-50	0								
31-40	0								
1-30	0								
Total N-	67								

TABLE XXV

HISTORY 300 EXPECTANCY TABLE BASED ON DOMINION TEST

Dominion I.Q. Scores	N	Grade XII Subject Scores							Median Score
		50	55	60	65	70	75	80	
135+	5	80	80	80	60	40	40		67
130-134	3	100	100	100	67	67	67		75
125-129	7	100	85	85	85	56	42	42	72
120-124	11	81	72	72	54	36	36	18	66
115-119	7	70	56	56	28	28	14		61
110-114	12	82	75	75	57	41	25		67
105-109	4	75	25	25					52
100-104	5	40	40	20	20			below	50
95-99	6	83	83	83	50	50	16		70
less than 95	7	100	85	56	14				60
Total N-	67								

TABLE XXVI

MATHEMATICS 300 EXPECTANCY TABLE BASED ON VERBAL SCAT TEST

Verbal SCAT Percentile	N	Grade XII Subject Scores							Median Score
		50	55	60	65	70	75	80	
91-99	39	95	83	78	63	48	45	40	69
81-90	33	87	84	66	54	51	30	27	70
71-80	35	91	80	75	57	42	33	24	67
61-70	15	75	68	68	54	40	20	14	68
51-60	38	88	78	63	42	27	14		63
41-50	9	77	77	66	55	55	33		71
31-40	10	80	60	40	20	20	20		57
21-30	22	84	65	50	45	30	10	5	60
11-20	14	92	78	55	24	24	16		61
1-10	3					100	33	33	71
Total N-	219								

TABLE XXVII

MATHEMATICS 300 EXPECTANCY TABLE BASED ON QUANTITATIVE SCAT TEST

Quant. SCAT Percentile	N	Grade XII Subject Scores							Median Score
		50	55	60	65	70	75	80	
91-99	31		100	96	89	77	70	65	
81-90	31	89	81	77	66	60	44	35	73
71-80	33	90	72	63	48	33	18	12	64
61-70	27	77	58	40	22	22	11		57
51-60	27	73	66	58	45	29	25	11	63
41-50	15		80	74	48	33	20	13	65
31-40	23		94	68	47	37	8		64
21-30	14	92	76	38	23	8	8		57
11-20	14	85	69	46	23	16			59
1-10	4	100	66	33	33				57
Total N-	219								

TABLE XXVIII

MATHEMATICS 300 EXPECTANCY TABLE BASED ON TOTAL SCAT TEST

Total SCAT Percentile	N	Grade XII Subject Scores							Median Score
		50	55	60	65	70	75	80	
91-99	37	97	91	88	81	67	53	53	80
81-90	42	90	82	73	53	46	37	30	67
71-80	33	84	78	72	57	51	36		70
61-70	24	80	80	60	32	16	8		62
51-60	19	83	70	55	44	25	10		62
41-50	15	73	54	47	33	26	14		58
31-40	14	77	63	42	28	14			58
21-30	18	94	80	54	40	24	12	6	61
11-20	15	90	79	53	30	30	16	8	61
1-10	1								
Total N-	219								

TABLE XXIX

MATHEMATICS 300 EXPECTANCY TABLE BASED ON LANGUAGE IX TEST

Language Percent	N	Grade XII Subject Scores							Median Score
		50	55	60	65	70	75	80	
91-100	2							100	80+
81-90	30	96	96	80	70	66	54	42	76
71-80	80	97	88	78	60	46	34	25	68
61-70	75	74	59	42	38	28	14	8	57
51-60	27	86	70	51	30	15	11	7	60
41-50	5	80	80	80	20	20			62
31-40	0								
1-30	0								
Total N-	219								

TABLE XXX

MATHEMATICS 300 EXPECTANCY TABLE BASED ON MATHEMATICS IX TEST

Mathematics Percent	N	Grade XII Subject Scores							Median Score
		50	55	60	65	70	75	80	
91-100	47	85	85	80	70	32	60	56	80+
81-90	64	98	90	78	62	50	30	21	70
71-80	59	91	88	74	48	43	23	13	65
61-70	35	84	70	54	31	17	3		61
51-60	13	78	78	53	24	12			61
41-50	1	100							
31-40	0								
1-30	0								
Total N-	219								

TABLE XXXI

MATHEMATICS 300 EXPECTANCY TABLE BASED ON SCIENCE IX TEST

Science Percent	N	Grade XII Subject Scores 50	55	60	65	70	75	80	Median Score
91-100	20	100	90	85	85	80	70	60	80+
81-90	55	98	96	87	60	49	30	27	70
71-80	70	90	60	62	49	40	29	20	65
61-70	53	82	66	49	40	24	8	4	60
51-60	12	75	66	50	24	16	8		60
41-50	7	100	70	64	16				61
31-40	2	100							
1-30	0								
Total N-	219								

TABLE XXXII

MATHEMATICS 300 EXPECTANCY TABLE BASED ON HISTORY IX TEST

History Percent	N	Grade XII Subject Scores 50	55	60	65	70	75	80	Median Score
91-100	21	100	88	82	77	70	55	55	80+
81-90	59	96	90	83	70	60	44	35	74
71-80	67	86	70	60	40	31	18	12	62
61-70	48	76	62	44	32	18	6	4	57
51-60	16	80	73	54	40	40	35	18	62
41-50	8	72	60	36	12	12			57
31-40	0								
1-30	0								
Total N-	219								

TABLE XXXIII

MATHEMATICS 300 EXPECTANCY TABLE BASED ON GRADE IX AVERAGE

Grade IX Average	N	Grade XII Subject Scores							Median Score
		50	55	60	65	70	75	80	
91-100	9							100	80+
81-90	56	98	92	87	75	61	46	38	74
71-80	84	86	77	64	51	36	19	14	65
61-70	55	84	60	42	27	19	10	4	53
51-60	15	75	54	40	20	7			56
41-50	0								
31-40	0								
1-30	0								
Total N-	219								

TABLE XXXIV

MATHEMATICS 300 EXPECTANCY TABLE BASED ON DOMINION TEST

Dominion I.Q.Scores	N	Grade XII Subject Scores							Median Score
		50	55	60	65	70	75	80	
135+	23	96	96	96	96	83	64	60	80+
130-134	15	100	80	60	53	46	27	14	66
125-129	21		100	90	62	47	47	42	69
120-124	34	84	79	63	48	33	24	24	64
115-119	33	82	69	57	46	42	21	9	63
110-114	35	95	80	60	52	37	23	14	65
105-109	21	100	90	76	38	24	5		63
100-104	11	63	36	36	27				53
95-99	15	80	80	66	47	33	13	7	64
Less than 95	11	100	100	54	27	9	9		61
Total N-	219								

TABLE XXXV

CHEMISTRY 300 EXPECTANCY TABLE BASED ON VERBAL SCAT TEST

Verbal SCAT Percentile	N	Grade XII Subject Scores							Median Score
		50	55	60	65	70	75	80	
91-99	36	91	86	75	57	47	28	16	69
81-90	29	71	66	60	48	35	13	3	64
71-80	34	81	69	60	29	33	15	9	62
61-70	16	54	42	25	25	18	12		51
51-60	32	69	53	47	18	15	3		53
41-50	10	70	50	40	30	30	20	20	55
31-40	6	100	83	66	16				61
21-30	15	63	54	44	28	14			57
11-20	11	63	36	18	9	9			52
1-10	3	100	100	66	33				62
Total N-	192								

TABLE XXXVI

CHEMISTRY 300 EXPECTANCY TABLE BASED ON QUANTITATIVE TEST

Quant.SCAT Percentile	N	Grade XII Subject Scores							Median Score
		50	55	60	65	70	75	80	
91-99	28	93	93	75	68	68	42	25	74
81-90	31	79	73	67	42	30	17	9	64
71-80	30	80	67	50	30	26	7		60
61-70	23	65	52	48	25	16	4		57
51-60	25	64	48	36	24	16			55
41-50	14	70	56	42	21	7			57
31-40	17	84	78	60	36	24	6		62
21-30	9	77	66	66	11				61
11-20	11	63	27	18	9	9	9		53
1-10	4	25	25					below	50
Total N-	192								

TABLE XXXVII

CHEMISTRY 300 EXPECTANCY TABLE BASED ON TOTAL SCAT TEST

Total SCAT Percentile	N	Grade XII Subject Scores 50	55	60	65	70	75	80	Median Score
91-99	36	90	88	80	67	67	41	27	73
81-90	39	85	80	70	50	33	6	2	65
71-80	29	67	51	40	20	17	7	3	55
61-70	23	63	52	43	20	20	8	4	55
51-60	17	70	58	36	17	11	6		56
41-50	10	70	60	50	30	10	10		60
31-40	11	63	45	36	27	18			54
21-30	17	66	53	36	17	11			56
11-20	9	66	33	22	11				52
1-10	1								
Total N-	192								

TABLE XXXVIII

CHEMISTRY 300 EXPECTANCY TABLE BASED ON LANGUAGE IX TEST

Language Percent	N	Grade XII Subject Scores 50	55	60	65	70	75	80	Median Score
91-100	3	90	66	66	33	33	33		62
81-90	37	86	80	67	58	53	33	28	71
71-80	71	84	70	60	44	36	13	3	64
61-70	50	66	56	36	20	16	6	2	54
51-60	24	60	36	28	8	4			54
41-50	9		44	22	11				
31-40	0								
1-30	0								
Total N-	192								

TABLE XXXIX

CHEMISTRY 300 EXPECTANCY TABLE BASED ON MATHEMATICS IX TEST

Mathematics Percent	N	Grade XII Subject Scores							Median Score
		50	55	60	65	70	75	80	
91-100	44	93	91	83	75	67	40	18	73
81-90	58	83	68	60	28	20	6	2	61
71-80	54	68	57	50	25	16	2	2	60
61-70	28	61	44	22	14	7	7		54
51-60	6	72	36	18	18	18			53
41-50	2	0							
31-40	0								
1-30	0								
Total N-	192								

TABLE XL

CHEMISTRY 300 EXPECTANCY TABLE BASED ON SCIENCE IX TEST

Science Percent	N	Grade XII Subject Scores							Median Score
		50	55	60	65	70	75	80	
91-100	21	91	91	87	78	73	44	34	74
81-90	54	91	80	67	48	42	24	4	65
71-80	58	70	64	60	34	19	5	2	62
61-70	46	60	39	20	12	6	2		52
51-60	11	63	45	18	18	9			54
41-50	2	50							50
31-40	0								
1-30	0								
Total N-	192								

TABLE XLI

CHEMISTRY 300 EXPECTANCY TABLE BASED ON HISTORY IX TEST

History Percent	N	Grade XII Subject Scores 50	55	60	65	70	75	80	Median Score
91-100	21	96	92	84	75	65	40	30	73
81-90	54	93	90	80	66	53	26	12	70
71-80	61	75	62	50	25	14	3		60
61-70	36	75	59	41	22	19	8		57
51-60	13	28	21	21	14	7	7	below	50
41-50	7	42	14	14	14				
1-30	0								
Total N-	192								

TABLE XLII

CHEMISTRY 300 EXPECTANCY TABLE BASED ON GRADE IX AVERAGE

Grade IX Average	N	Grade XII Subject Scores 50	55	60	65	70	75	80	Median Score
91-100	6			100	83	83	83	83	80+
81-90	59	91	86	78	67	60	32	15	71
71-80	80	81	83	57	31	19	4		61
61-70	39	53	38	25	14	5			51
51-60	9	22							
41-50	0								
31-40	0								
1-30	0								
Total N-	192								

TABLE XLIII

CHEMISTRY 300 EXPECTANCY TABLE BASED ON DOMINION TEST

Dominion I.Q. Score	N	Grade XII Subject Scores 50	55	60	65	70	75	80	Median Score
135+	23	84	84	72	58	50	29	12	70
130-134	14	78	64	64	42	35	14		64
125-129	21	95	88	88	63	53	24	20	70
120-124	26	82	70	46	31	31	19	4	59
115-119	32	75	65	53	37	27	12	3	61
110-114	28	71	63	54	25	18	4		61
105-109	22	72	44	35	20	5			54
100-104	7	42	28	28	14	14	14		below 50
95-99	11	72	63	54	27	9			61
Less than 95	10	60	40	20	20	10	10		53
Total N-	194								

TABLE XLIV

PHYSICS 300 EXPECTANCY TABLE BASED ON VERBAL SCAT TEST

Verbal SCAT Percentile	N	Grade XII Subject Scores 50	55	60	65	70	75	80	Median Score
91-99	25	88	68	64	52	40	24	12	65
81-90	16	87	70	70	44	38	18	6	64
71-80	20	85	60	50	15	10	10	10	60
61-70	7	84	84	56	14	14	14		61
51-60	16	67	31	24	12	6	6	6	52
41-50	4	50	25	25					50
31-40	3	66	66	33	33	33			52
21-30	8	75	62	25	12	12			51
11-20	3	66							
1-10	2	100	100	50					60
Total N-	104								

TABLE XLV

PHYSICS 300 EXPECTANCY TABLE BASED ON QUANTITATIVE SCAT TEST

Quant. SCAT Percentile	N	Grade XII Subject Scores							Median Score
		50	55	60	65	70	75	80	
91-99	23	91	85	69	60	52	39	25	70
81-90	20	75	65	55	35	15	10	5	61
71-80	13	80	72	56	24	24			61
61-70	10	90	40	30	10	10	10		54
51-60	10	90	50	40	10	10			55
41-50	8	50	25	24	12	12			50
31-40	9	66	55	44	22	11			57
21-30	4	100	50	50					60
11-20	6	71	57	18					56
1-10	1	100							
Total N-	104								

TABLE XLVI

PHYSICS 300 EXPECTANCY TABLE BASED ON TOTAL SCAT TEST

Total SCAT Percentile	N	Grade XII Subject Scores							Median Score
		50	55	60	65	70	75	80	
91-99	25	96	80	76	68	56	40	24	72
81-90	26	77	64	54	24	12			61
71-80	14	85	68	40	24	8	8		52
61-70	8	73	24	24	12	12	12		52
51-60	9	88	55	44	11	11			56
41-50	4	50	50	50	25	25	25	25	60
31-40	3	33							
21-30	12	72	56	40	16	16			
11-20	3	66	33						
1-10	0								
Total N-	104								

TABLE XLVII

PHYSICS 300 EXPECTANCY TABLE BASED ON LANGUAGE IX

Language Percent	N	Grade XII Subject Scores 50	55	60	65	70	75	80	Median Score
91-100	3				100	67	33	33	73
81-90	20	85	80	70	50	40	30	20	65
71-80	34	87	72	57	39	27	12	9	62
61-70	29	68	48	40	11	11	7	3	55
51-60	10	80	50	40	30	20			55
41-50	7	58	29						52
31-40	1					100			
1-30	0								
Total N-	104								

TABLE XLVIII

PHYSICS 300 EXPECTANCY TABLE BASED ON MATHEMATICS IX

Mathematics Percent	N	Grade XII Subject Scores 50	55	60	65	70	75	80	Median Score
91-100	36	88	78	75	64	40	25	16	68
81-90	29	80	69	48	25	19	15	4	60
71-80	26	69	48	44	16	12	4	4	55
61-70	13	47	24	8					below 50
51-60	0								
41-50	0								
31-40	0								
1-30	0								
Total N-	104								

TABLE XLIX

PHYSICS 300 EXPECTANCY TABLE BASED ON SCIENCE IX

Science Percent	N	Grade XII Subject Scores							Median Score
		50	55	60	65	70	75	80	
91-100	19	95	90	90	80	54	37	26	71
81-90	30	80	66	58	33	24	20	10	62
71-80	30	80	58	48	20	16	4		59
61-70	20	65	40	15					53
51-60	4	25	25	25	25	25		below	50
41-50	0								
31-40	1		100						
1-30	0								
Total N-	104								

TABLE L

PHYSICS 300 EXPECTANCY TABLE BASED ON HISTORY IX

History Percent	N	Grade XII Subject Scores							Median Score
		50	55	60	65	70	75	80	
91-100	17	100	84	84	60	54	54	36	76
81-90	35	80	70	67	47	26	12	6	64
71-80	30	87	54	28	20	15			56
61-70	17	66	42	30	6	6	6		53
51-60	5	20	20						
41-50	0								
31-40	0								
1-30	0								
Total N-	104								

TABLE LI

PHYSICS 300 EXPECTANCY TABLE BASED ON GRADE IX AVERAGE

Grade IX Average	N	Grade XII Subject Scores							Median Score
		50	55	60	65	70	75	80	
91-100	2							100	80+
81-90	42	80	70	68	48	28	20	10	65
71-80	41	83	63	40	16	14	4		58
61-70	16	55	25	12	12	12			51
51-60	3		33					below	50
41-50	0								
31-40	0								
1-30	0								
Total N-	104								

TABLE LII

PHYSICS 300 EXPECTANCY TABLE BASED ON DOMINION TEST

Dominion I.Q. Scores	N	Grade XII Subject Scores							Median Score
		50	55	60	65	70	75	80	
135+	16	86	86	86	67	54	36	12	71
130-134	8	50	38	38	25				50
125-129	13	92	68	53	38	29	21	21	61
120-124	14	56	42	35	14	14			52
115-119	16	72	72	50	18	12			60
110-114	15	74	54	47	35	28	21	7	57
105-109	10	60	40	20	10				53
100-104	4	50	50	50	50	25	25	25	65
95-99	7	70	55	44	13	13			57
Less than 95	3		33						
Total N-	104								

TABLE LIII

BIOLOGY 300 EXPECTANCY TABLE BASED ON VERBAL SCAT TEST

Verbal SCAT Percentile	N	Grade XII Subject Scores 50	55	60	65	70	75	80	Median Score
91-99	5			100	80	80			70
81-90	11	90	81	72	63	36	9	9	67
71-80	13	85	78	78	62	40	40	24	68
61-70	9	66	44	44	22	11	11		54
51-60	18	68	56	45	33	15	15	5	58
41-50	6	83	34	34	34	34	17		53
31-40	3				100	33	33		69
21-30	12	75	50	33	25	16	8	8	55
11-20	7	75	45	45	28	14	14		54
1-10	1			100					
Total N-	85								

TABLE LIV

BIOLOGY 300 EXPECTANCY TABLE BASED ON QUANTITATIVE SCAT TEST

Quant. SCAT Percentile	N	Grade XII Subject Scores 50	55	60	65	70	75	80	Median Score
91-99	6	83	83	83	66	33	16		67
81-90	4	50	50	50	50	50	25	25	70
71-80	12	92	67	67	50	33	16	8	65
61-70	7	86	86	86	71	28	28	14	67
51-60	14	75	61	42	28	14	7		57
41-50	9	77	55	55	55	33	22	11	66
31-40	12	84	57	57	50	42	24	8	65
21-30	8	75	50	25	12	12	12		55
11-20	9	88	55	44	22	11			56
1-10	4	75	50	50	25	25	25	25	60
Total N-	85								

TABLE LV

BIOLOGY 300 EXPECTANCY TABLE BASED ON TOTAL SCAT TEST

Total SCAT Percentile	N	Grade XII Subject Scores							Median Score
		50	55	60	65	70	75	80	
91-99	6	83	83	83	67	50	17	17	70
81-90	8	88	88	88	75	50	25		70
71-80	11	81	63	63	45	27	18	9	64
61-70	11	90	72	63	63	45	27	27	69
51-60	11	72	54	45	27	9	9		57
41-50	12	67	50	50	41	17	17		60
31-40	9	100	77	55	44	33	11		59
21-30	10	70	40	30	10				53
11-20	5	60	20	20					51
1-10									
Total N-	83								

TABLE LVI

BIOLOGY 300 EXPECTANCY TABLE BASED ON LANGUAGE IX TEST

Language Percent	N	Grade XII Subject Scores							Median Score
		50	55	60	65	70	75	80	
91-100	0								
81-90	6	83	83	83	50	33	33		65
71-80	30	90	77	67	60	40	20	10	67
61-70	28	69	44	44	37	18	15	7	54
51-60	13	92	60	53	40	32	16	8	61
41-50	6	66	50	50	18				60
31-40	0								
1-30	0								
Total N-	83								

TABLE LVII

BIOLOGY 300 EXPECTANCY TABLE BASED ON MATHEMATICS IX TEST

Mathematics Percent	N	Grade XII Subject Scores 50	55	60	65	70	75	80	Median Score
91-100	2	100	100	100	100	50			70
81-90	25	92	88	84	60	48	28	16	70
71-80	22	70	50	43	43	18	18	5	55
61-70	22	72	43	27	18	14	9	5	54
51-60	12	84	66	66	42	34	17	8	64
41-50	0								
31-40	0								
1-30	0								
Total N-	83								

TABLE LVIII

BIOLOGY 300 EXPECTANCY TABLE BASED ON SCIENCE IX TEST

Science Percent	N	Grade XII Subject Scores 50	55	60	65	70	75	80	Median Score
91-100	1	100	100	100	100				65
81-90	13	100	100	100	88	75	36	8	73
71-80	25	88	68	64	48	24	16	4	65
61-70	26	78	50	36	24	24	16	8	55
51-60	10	40	30	30	20	10		below	50
41-50	5	80	60	60	60	20	20	20	66
31-40	2	50							50
1-30	0								
Total N-	83								

TABLE LIX

BIOLOGY 300 EXPECTANCY TABLE BASED ON HISTORY IX TEST

History Percent	N	Grade XII Subject Scores							Median Score
		50	55	60	65	70	75	80	
91-100	4	100	100	100	100	100	50	50	80
81-90	15	94	87	80	66	54	35	14	71
71-80	25	88	72	68	44	20	12		64
61-70	26	68	44	32	28	16	12		54
51-60	9	77	66	55	44	22	11	11	61
41-50	4	100	100	50	50	50	25	25	70
31-40	0								
1-30	0								
Total N-	83								

TABLE LX

BIOLOGY 300 EXPECTANCY TABLE BASED ON GRADE IX AVERAGE

Grade IX Average	N	Grade XII Subject Scores							Median Score
		50	55	60	65	70	75	80	
91-100	0								
81-90	9			100	88	77	55	22	76
71-80	32	87	76	67	55	33	15	6	66
61-70	35	69	45	36	26	9	9	3	54
51-60	7	85	43	43	28	28	14	14	54
41-50	0								
31-40	0								
1-30	0								
Total N-	83								

TABLE LXI

BIOLOGY 300 EXPECTANCY TABLE BASED ON DOMINION TEST

Dominion I.Q. Scores	N	Grade XII Subject Scores 50	55	60	65	70	75	80		Median Score
135+	3			100	67	33				67
130-134	4	75	75	50	25					60
125-129	1							100		80+
120-124	11	91	72	72	63	27	18	9	9	67
115-119	15	94	66	66	48	40	27	14		65
110-114	12	80	66	40	33	25	8	8		58
105-109	12	66	57	57	57	33	25	8		64
100-104	9	55	44	44	22	22				51
95-99	7	85	85	85	70	28	28			67
Less than 95	9	55	22							51
Total N-	83									

TABLE LXII

FRENCH 300 EXPECTANCY TABLE BASED ON VERBAL SCAT TEST

Verbal SCAT Percentile	N	Grade XII Subject Scores 50	55	60	65	70	75	80	Median Score
91-99	37	83	71	64	54	40	22	14	66
81-90	30	86	70	50	36	23	13	3	60
71-80	38	72	58	50	30	18	7	5	60
61-70	17	66	47	36	24	24	18	12	54
51-60	34	69	45	33	27	15	6	3	54
41-50	9	66	33	33	22	22	11	11	53
31-40	8	50	50	24	12	12	12		55
21-30	21	53	40	20					50
11-20	14	57	42	28	14				52
1-10	2	50	50						50
Total N-	210								

TABLE LXIII

FRENCH 300 EXPECTANCY TABLE BASED ON QUANTITATIVE SCAT TEST

Quant. SCAT Percentile	N	Grade XII Subject Scores 50	55	60	65	70	75	80	Median Score
91-99	29	100	80	68	60	39	30	26	67
81-90	30	76	60	50	36	26	13	6	60
71-80	32	81	75	57	36	23			61
61-70	26	66	50	43	24	20	12		55
51-60	27	58	42	23	15	15	8		52
41-50	13	78	62	55	24	24	15		61
31-40	22	73	49	43	24	15	5		55
21-30	13	78	31	24	8	8			22
11-20	15	20	7	7	7			below	50
1-10	3	33	33						
Total N-	210								

TABLE LXIV

FRENCH 300 EXPECTANCY TABLE BASED ON TOTAL SCAT TEST

Total SCAT Percentile	N	Grade XII Subject Scores 50	55	60	65	70	75	80	Median Score
91-99	35	97	85	73	56	37	23	17	66
81-90	43	83	66	55	44	32	19	8	62
71-80	29	70	58	46	30	23	10	7	58
61-70	29	70	46	30	24	10			54
51-60	19	65	30	20	5	5	5	5	52
41-50	13	60	44	28	14	14	7		52
31-40	12	50	41	32	24	24	8		50
21-30	18	44	22	11				below	50
11-20	11	63	45	36	9				54
1-10	1								
Toal N-	210								

TABLE LXV

FRENCH 300 EXPECTANCY TABLE BASED ON LANGUAGE IX TEST

Language Percent	N	Grade XII Subject Scores 50	55	60	65	70	75	80	Median Score
91-100	3					100	66	33	77
81-90	35	97	88	76	64	45	32	26	69
71-80	82	89	69	56	36	22	10	2	61
61-70	59	50	28	20	8	6	1		50
51-60	25	40	36	20	8	4		below	50
41-50	6	18	18						
31-40	0								
1-30	0								
Total N-	210								

TABLE LXVI

FRENCH 300 EXPECTANCY TABLE BASED ON MATHEMATICS IX TEST

Mathematics Percent	N	Grade XII Subject Scores 50	55	60	65	70	75	80	Median Score
91-100	44	98	81	75	67	50	31	23	70
81-90	62	76	66	56	26	18	8	1	61
71-80	53	76	46	28	20	12	6	2	54
61-70	36	44	27	24	12	9		below	50
51-60	12	40	32	8	8	8			50
41-50	2								
31-40	1			100					
1-30	0								
Total N-	210								

TABLE LXVII

FRENCH 300 EXPECTANCY TABLE BASED ON SCIENCE IX TEST

Science Percent	N	Grade XII Subject Scores 50	55	60	65	70	75	80	Median Score
91-100	24	88	88	71	66	36	32	28	67
81-90	50	88	78	72	54	34	18	8	66
71-80	60	76	54	40	29	23	13	5	57
61-70	55	48	35	28	11	7		below	50
51-60	14	70	50	28	7	7			55
41-50	6	18	18	18	18				
31-40	1			100					
1-30	0								
Total N-	210								

TABLE LXVIII

FRENCH 300 EXPECTANCY TABLE BASED ON HISTORY IX TEST

History Percent	N	Grade XII Subject Scores 50	55	60	65	70	75	80	Median Score
91-100	22	86	82	78	64	46	34	25	69
81-90	59	84	75	64	50	34	19	9	65
71-80	62	70	50	38	23	13	3	1	55
61-70	45	57	33	20	7	5	2		52
51-60	15	53	28	7	7	7			51
41-50	7	45	30	30				below	50
31-40	0								
1-30	0								
Total N-	210								

TABLE LXIX

FRENCH 300 EXPECTANCY TABLE BASED ON GRADE IX AVERAGE

Grade IX Average	N	Grade XII Subject Scores							Median Score
		50	55	60	65	70	75	80	
91-100	8				100	88	63	37	78
81-90	57	95	84	70	58	36	23	13	67
71-80	85	74	54	44	23	16	5	1	57
61-70	52	46	26	16	4	2		below	50
51-60	8	36	36	12				below	50
41-50	0								
31-40	0								
1-30	0								
Total N-	210								

TABLE LXX

FRENCH 300 EXPECTANCY TABLE BASED ON DOMINION TEST

Dominion I.Q. Test	N	Grade XII Subject Scores							Median Score
		50	55	60	65	70	75	80	
135+	23	92	84	68	56	40	26	17	67
130-134	14	85	64	50	42	21	7		60
125-129	20	95	85	75	60	40	20	15	67
120-124	32	72	60	54	30	24	15	11	61
115-119	34	69	45	36	24	18	6		54
110-114	36	67	45	26	14	9	6		54
105-109	19	67	40	25	15	10			53
100-104	10	30	30	30	20	20	10	10	below 50
95-99	11	47	36	27	9	9	9		below 50
Less than 95	11	54	36	27	9				
Total N-	210								