THE RELATION OF HIGH SCHOOL ACADEMIC ACHIEVEMENT AND CURRICULA AND OTHER FACTORS TO ACADEMIC ACHIEVEMENT AT A COMMUNITY COLLEGE

by

JANE KATHRYN HARPER

B.H.E., University of British Columbia, 1969

B.Ed., University of Toronto, 1970

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF ARTS

in

THE FACULTY OF GRADUATE STUDIES
(Department of Higher Education)

We accept this thesis as conforming
In the required standard

THE UNIVERSITY OF BRITISH COLUMBIA

October, 1978

Department of Higher Education

The University of British Columbia
2075 Wesbrook Place
Vancouver, Canada
V6T 1W5

Date October 5, 1978

ABSTRACT

This study investigated the relationship of academic achievement and curricula in Grades 11 and 12 in high school, and other factors, to subsequent achievement at a community college.

British Columbia high school graduation requirements were changed in September 1972 which resulted in the removal of compulsory province-wide Grade 12 examinations, the introduction of more liberal course selection requirements and the promotion of locally developed curricula.

The sample of 643 subjects included students who attended all or part of Grades 11 and 12 at New Westminster secondary schools (NWSS) and subsequently completed course work at Douglas College between September 1970 and July 1977. T-tests, product-moment correlations and multiple regression analyses were the statistical procedures used.

The first major hypothesis explored the correlation between high school and college grade point averages (GPA's). This relationship was studied by grouping the data according to college entry age, number of years between high school and college, high school leaving date (pre- or post-September 1972) or completion of high school graduation requirements. The other major hypothesis involved the correlation between high school and college achievement in similar clusters of courses/subject areas. Courses were alloted to one of ten clusters--Art, Business, Early Childhood Education, English/Communications, Fashion and Interior Design, Humanities, Industrial Arts, Recreation, Science or Social Science. Changes in college cluster GPA's were investigated according to the number of courses a student had taken in corresponding high school clusters. The variables sex, college entry age and college enrolment status were considered for all hypotheses tested.

Women did better than men at college, an advantage that diminished with increased college entry age. Part-time students did not do as well as their full-time counterparts, especially if they were young and/or male. Further study was recommended on part-time college students.

There was a positive correlation between GPA's in high school and college. A "maturity factor" played a significant role in the academic achievement of college students. Mature entries (25+) and those who took at least two years "off" after high school earned higher grades. Lack of a high school diploma made little difference to the college success of mature entries, which was not the case for young entries. These results gave support to the college "open door" admissions policy. Further research was recommended on the components of the "maturity" (entry age) variable and the relationship between it and academic success.

Students who attended high school before the 1972 changes did slightly better in college, despite the fact that their high school GPA's had been lower. The findings were attributed to variables in their high school background such as required basic preparation in "essential" curricula (English, mathematics, sciences, social sciences and second languages) and/or a more "rigorous" high school experience with higher academic standards. The data pointed to a recent decline in academic standards at New Westminster Secondary School.

Correlations between high school and college GPA's were slightly higher for post-September 1972 high school leavers. High school GPA's were more reliable as predictors of college achievement for the post-1972 group. This was attributed to the fact that this group of students had been able to select their high school courses mainly by interest, ability and need instead of by the pre-1972 restrictions and requirements. Presumably college programs were selected on the former bases.

The variables used in the regression equations accounted for only 17 to 24% of the variance of grades in the college clusters of Business, English/Communications, Humanities, Recreation, Science and Social Science. Regressions were not run on four clusters due to insufficient numbers of subjects. Academic achievement in college clusters was not related to any great extent to either the grades received or the number of courses taken in corresponding high school clusters, for either pre- or post-1972 high school leavers. The suggestion that college entrance examinations be introduced to ensure minimal entry standards of preparation in "essential" curricula was not supported. Success in all college clusters tested, except English, was more closely related to high school GPA than it was to experience and/or grades in corresponding high school clusters. This implied that most patterns of high school courses were equally good college preparation, as long as certain thresholds of ability and past performance had been achieved.

TABLE OF CONTENTS

(Table of Contents continued on next page)

TABLE OF CONTENTS. Continued.

LIST OF TABLES

(List of Tables continued on next page)

LIST OF TABLES. Continued.

ACKNOWLEDGEMENT

I wish to acknowledge the limitless assistance given by three gentlemen associated with Douglas College: Jerry DellaMattia, the Director of Admissions and Records, Ken Battersby, the Assistant Director of Admissions and Marsh Price, Systems Analyst Consultant.

For his contributions to the development of this thesis and for his consistent encouragement, I gratefully acknowledge Dr. John D. Dennison.

Special appreciation and thanks is extended to my husband, Andy, for the way he has sustained me in this effort through his patience, support and consideration.

CHAPTER I

INTRODUCTION

The Problem

This study is intended to investigate the relationship of academic achievement and curricula of Grade 11 and 12 students at New Westminster high schools, and other factors, to subsequent achievement at Douglas College.

Purposes of the Study

The researcher's initial interest in the stated problem was heightened by the current concern over academic standards in British Columbia (B.C.) high schools and, related to this, the effect of high school academic and course background on success in community college courses.

A statement issued by the Academic Board on April 15, 1975 expressed the Board's "concern at the apparent increasing lack of uniformity in academic standards and curricula in the Province of B.C. and with an apparent decrease in the standards of some University programs."[1] The Academic Board had been created to advise the Provincial Minister of Education on academic standards in universities and colleges.

Their statement suggested that high school academic standards had been diverging since September 1972 when the B.C. high school gradua-

[1]Statement by the Academic Board on Academic Standards and Curricula, April 15, 1975, page 1.

tion requirements changed and province-wide examinations were phased out. A comparison of overall academic achievement of those community college students who left high school before and after September 1972 could reveal any general trends in academic standards resulting from the 1972 changes.

Students whose projected graduation date was pre-September 1972 had been required to take more structured high school programs than post-September 1972 potential graduates. The two groups differed according to the following graduation requirements:

1. Pre-September 1972--General education constants (Social Studies 11, Physical and Health Education and Guidance 11, English 11 and English 12), Program Constants, Program Specialties and Electives.

   Students chose to follow one of the "Selected Studies Programs": Academic and Technical Program--Arts, Sciences or Technical (Community Services, Commercial or Visual and Performing Arts) Specialty. (Appendix I)

2. Post-September 1972--General education constants and EITHER "Selected Studies Program" as outlined in 1. above OR Electives. (Appendix II)

   Courses were still grouped into programs, but the groupings for specific specialties were amended to allow for different combinations of studies, in essence, a "smorgasbord of courses". As an expansion of the basic idea of programs, provision was made for a new organization of courses called "Combined Studies Program" which permitted groupings of courses into other than the traditional patterns. For example, a student could graduate from high school without taking a single mathematics or science course.

School Districts and individual high schools were encouraged to develop their own curricula when the graduation requirements changed. This reduction of curriculum uniformity disturbed the Academic Board. They asserted that there was no guarantee that locally developed curricula were following the core curricula developed by the Department of Education. Consequently, the Board stated, high school students were not necessarily prepared "in certain areas of the traditional curriculum of each discipline."[2]

A comparison of pre- and post-September 1972 graduates in particular subject groupings or clusters could reveal whether or not academic success and experience in particular curricular areas in high school were related to being successful in college courses.

The Academic Board also asserted that the lack of compulsory externally set high school examinations since September 1972 had resulted in "inadequate guidelines to maintain uniform academic standards of high school graduation."[3] They believed that the wide variety of graduating standards throughout B.C. caused high school grades, which were formally reliable predictors of academic ability, to become less valid as predictors for colleges and universities to use. The Board proposed entrance examinations to colleges and universities as a possible solution to the problems of diverging high school standards and reduction of uniformity of high school curricula.

[2]Ibid.
[3]Ibid.

However, B.C. community colleges are characterized by liberal admissions policies which have provided opportunities for many previously excluded and diverse populations (Dennison, et al., 1975) and Lightfield, 1974).[4] This basic "raison d'être" of the colleges would be negated if entrance examinations were instituted. Also, the administration of preadmission tests can be an expensive and time-consuming operation.

At Douglas College, an individual is eligible for admission if he meets one of the following criteria:

1. he has completed B.C. secondary school graduation on any program, or the equivalent from another school system; or
2. he is deficient in not more than one course for B.C. high school graduation, or the equivalent from another school system; or
3. he is 19 years of age or older on the first day of the current semester; or
4. he has not been in regular daytime attendance at school for at least one year; or
5. if none of the above requirements can be met, he is eligible to apply for admission as a "special" student.[5]

Students applying for admission to a career, technical or vocational program must meet any admission requirements specific to that program. However, there are few prerequisites for introductory level courses at the college.

Douglas College administered few entrance tests since its opening in 1970 to Fall 1977. Applicants for the Dental Assisting Basic Program and the Nursing Program used to write selected tests from the

[4]References in the text give only author and year of publication. Further details appear in the Bibliography at the end of the text.

[5]Douglas College Calendar 1977-78, page 12.

General Aptitude Test Battery because it was a method of measuring certain levels of skills required in those programs. This testing resulted from the high number of applicants for these programs. In conjunction with this demand, limited instructional space and equipment and the high cost of these and other career, technical and vocational programs resulted in more stringent admission requirements for these programs than for entrance into other programs at Douglas College.

The Academic Board proposed another solution to the problem of diverging standards. They suggested that province-wide Grade 12 examinations in English, mathematics, sciences, social sciences and second languages--the "essential areas"--be reintroduced. The curricula and standards would be set by representatives from all educational sectors. Implicit in their suggestion was the assumption that students going on to higher education needed to be better prepared in certain "essential" curricular areas.

Community college students, because of the colleges' liberal admissions policies, often have not obtained this curricular background. There are many reasons: perhaps they did not complete Grade 11 and/or 12; perhaps the only high school courses they took that gave them this background were the general education constants (Social Studies 11 and English 11 and 12); perhaps they failed or barely passed these subjects; perhaps they decided to go on to college during Grade 12 or years after they left high school and, therefore, it was too late to pick up extra "essential" courses.

College students as a group tended to make the decision to continue their education later than university students did: 37% decided after leaving high school, 12% during Grade 12, 22% between Grades 8 and 11 and 12% by Grade 7 or earlier (Dennison, et al., 1975). Therefore, at least 49% of community college students did not consciously select their high school program of studies with the intent of continuing their education.

A comparison of the grades received by students in specific high school courses to their academic record in college could reveal any relationships between achievement in similar curricular areas. Comparing students who left high school and then immediately started college to students who waited more than two years to go to college may also reveal trends in subsequent college achievement.

Dennison, et al. (1975) collected information on B.C. community college students concerning who influenced their decisions regarding future educational plans. The researchers found that parents were most influential, followed by friends and relatives. High school and college instructors and counsellors exerted limited influence on college students' educational decisions. The investigators suggested that "greater emphasis should be placed by colleges on ensuring that the families and friends of students have access to useful material upon which decisions may be made."[6]

The literature review for this study revealed many instances of attempts to predict academic achievement of students enroled in college and university courses. The review indicated that many independent variables can be used to predict student success, with high

[6]John D. Dennison, Alex Tunner, Gordon Jones and Glen C. Forrester, <u>The Impact of Community Colleges: A Study of the College Concept in B.C.</u>, Vancouver, Canada: B.C. Research, November 1975, page 49.

school grade point average being the most reliable and strongest predictor. Based upon the findings, there appeared to be ample justification for attempting to predict student academic performance at Douglas College. The development of a relatively easily replicated and understood predictive instrument, designed to make use of available information contained in the high school transcripts of students, could be an important aid to increasing the amount of "useful material" from which educational decisions can be made.

This study investigated relationships between academic achievement in clusters of high school and community college subjects. If significant positive relationships were found, new Douglas College (DC) students could be told that previous students from their high school with their "track record" tended to acheive in certain ways and areas at DC. The data presented to prospective students should not be used for screening purposes, but rather to help them make decisions regarding courses and educational goals. Also, high school counsellors could encourage students who <u>have</u> expressed interest in going on to college to include certain courses which show positive relationships with success in college in their high school program of studies.

"The 'open door' policy of the community college dictates that it must admit nearly all who apply and philosophically makes it vitally concerned with individual student differences."[7] Decision-makers, students included, legitimately want to know more about how to increase

[7] Gary A. Rice and William Scofield, "A Contrast Between the 'Successful' and 'Dropout' Student at Yakima Valley College," Olympia, Washington: Washington State Board for Community College Education, March 1969, page 24.

students' chances of successfully finishing their courses of study. The search for answers may be based on the loss of talent, waste of limited educational resources, or the vocational, personal and financial setbacks that result from students' impeded career developments and unproductive expenditure of time and effort.

The sample selected for this study was composed of students who attended all or part of Grades 11 and 12 at New Westminster high schools (NWSS) and subsequently completed course work at DC. New Westminster Secondary School has been the only public high school in New Westminster School District since September 1955 when Lester Pearson High School (later renamed New Westminster Secondary School) opened, and Trapp Technical and Duke of Connaught closed. Only two DC students in the sample had attended Catholic schools in New Westminster; four students had attended Trapp Technical or Duke of Connqught; and the rest of the sample, 637 students, had attended Lester Pearson.

The only college students excluded were those who did not make their New Westminster high school transcript available to the DC Admissions Office. The data from as many students as possible were used to give more power to the predictions that were made.

The sample used in the study and procedures for selecting it helped to make the sample fairly representative of the local New Westminster population as well as the local high school population. In Dennison's et al. (1975) study, college students comprised a group with socio-economic characteristics which were close to those of the general population, locally and regionally across Canada. The variables he examined were father's education and occupation, family financial status and time of decision to continue education beyond high school. Dennison also concluded that college students' abilities and high school achievements indicated that they had a heterogeneous academic background as well.

This investigation covered several years of student records which helped to reduce the problem of "stopouts" (in/out/etc. students) when collecting the data. A short-term longitudinal study such as this could also result in more accurate predictions over time.

Most of the research on academic and performance prediction over the past 25 years has utilized multivariate methods for data analysis. These methods which employ multiple predictors and multiple regression analysis are essential for productive work in the area of predictive studies. Multiple regression analysis was used in this study to investigate relationships between various combinations of the following predictors and academic achievement in college: cumulative high school grade point average, number of courses taken and grade point averages in clusters of courses, sex, college entry age, high school graduation, college enrolment status (part- or full-time) and high school leaving date (pre- or post-September 1972).

Relationships between numbers of courses taken in cluster/subject areas as well as academic achievement in those clusters and college academic achievement were investigated. Cumulative averages mask important differences in grading practices and standards in different subject areas. The lack of formalized standard approaches to the computation of averages at the high school and college, and the common scarcity of effective review procedures for correcting ordinary computational errors, may contribute further to the unreliability of cumulative averages.

Academic grade inflation is occuring in high schools and colleges in the United States, and is probably occurring in our educational institutions. The mean academic high school average (English, mathematics, social sciences and natural sciences) in the United States (U.S.) increased from 2.67 to 2.91 between 1970 and 1975 for students who wrote the American College Test (ACT) during those years (Maxey, Wimpey, Ferguson and Hanson, 1976). The mean high school average for students who attended first year college* or university increased from 2.65 to 2.75 over those years, although ACT scores in the content areas on which the high school average was based had declined markedly. The authors conjectured that this may have been the result of a lowering or relaxation of grading standards, arbitrary as they were, and a greater diversity in the academic abilities of students taking the ACT assessment.

Trends in the data of the present study indicated that high school GPA's of NWSS students entering Douglas College were increasing. Scattergram plots showed that in 1962-63 the high school GPA (total, not just the academic courses) range of all NWSS students who later entered DC was from 1.10 to 2.80. By September 1970, the range had spread upwards and downwards, with the majority of the GPA's falling between 1.50 and 2.50. This range was relatively stable up to September 1977, showing a slight rise.

As the number of years the college was in operation increased,

*The word "college", when used in this paper, refers to a two-year community college.

there were many more NWSS students enrolling with high school GPA's at the top end of the scale (3.1 - 4.0) and slightly fewer at the bottom end (0.0 - 1.5). Dennison et al. (1975) suggested that colleges have achieved higher status over the years and "A" and "B" high school students were choosing the college over a university for the first two years of their post-secondary education. If the student population at DC was changing for this reason, it could explain the change in the range of high school GPA's of entering students.

Such a change could also account for the fact that mean high school GPA's of DC students who graduated or left NWSS after September 1972 were .24 of a grade point higher than those of pre-1972 high school leavers. Table I summarizes the data.

Table I. Mean High School GPA's, Standard Deviations and "t" Statistic for Pre- and Post-September 1972 High School Leavers.

Student Characteristic	Mean HS GPA	S.D.	n	Test of Significance
Pre-September 1972 High School Leaver	2.04	.029	327	$t = 5.58^*$
Post-September 1972 High School Leaver	2.28	.033	316	

$^*p<.05$

Hypotheses

A. General Hypothesis

There is a correlation between academic achievement of students in Grades 11 and 12 in New Westminster high schools and subsequent academic achievement at Douglas College.

B. Specific Hypotheses and Sub-Hypotheses

I. There is a significant correlation between high school cumulative grade point average (HS GPA) and Douglas College cumulative grade point average (DC GPA).

1. There is a significant difference between the DC GPA's of those students who entered college before turning 25 years old and those who were at least 25 years old upon entry into DC.
2. There is a significant difference between the DC GPA's of those students who entered college within two years of leaving high school and those students who waited for more than two years before attending DC, with neither group having attended another post-secondary institution in the meantime.
3. There is a significant difference between the DC GPA's of those students who graduated from or left New Westminster high schools (NWSS) before September 1972 and those who graduated or left after that date.
4. There is a significant difference between the DC GPA's of those NWSS students who completed high school graduation requirements and those who did not graduate from high school.

I. 5. There is a significant correlation between HS GPA and first semester DC GPA.

6. There is a significant correlation between HS GPA and DC GPA, after students attend more than one semester at DC.

II. There is a significant correlation between academic achievement in similar clusters of courses taken at NWSS and DC.

1. There is a significant correlation between academic achievement in similar clusters of courses taken at DC and NWSS.

2. There is a significant difference between college cluster GPA's (CLUST GPA DC) of those students who took zero, one to two, three to four, or five or more courses in that cluster in high school.

Definition of Terms

The following terms are defined according to their intended meaning in this investigation:

Clusters of courses: those courses whose subject matter can be classified under one general subject area, for example, social sciences--anthropology, criminology, law, political science, psychology and sociology. The listing of courses by clusters and cluster labels appears in Appendix III.

College: a community or two year college which is a two year post-secondary educational institution providing, on a full- or part-time basis, a variety of courses in academic, career, technical, vocational and university transfer programs.

Douglas College cluster grade point average (DC CLUST GPA, for example, DC ART GPA): the sum of the grade points earned in all courses completed at Douglas College within a particular cluster, divided by the total number of credits those courses represent, excluding withdrawal and incomplete grades, duplicate courses with a lower grade point and advanced credit.

Douglas College cumulative grade point average (DC GPA or college GPA): the sum of the grade points earned at Douglas College, divided by the total number of credits taken, with the same exclusions at DC CLUST GPA.

High school cluster grade point average (HS CLUST GPA): the sum of the grade points earned in all courses taken in Grades 11 and 12 in high school within a particular cluster, divided by the number of courses taken in the cluster, excluding duplicate courses with a lower grade point.

High school cumulative grade point average (HS GPA or high school GPA): the sum of the grade points earned in Grades 11 and 12 in high school, divided by the total number of courses taken, excluding duplicate courses with a lower grade point. Appendix IV outlines the New Westminster Secondary School and Douglas College grading systems.

Mature adult student: an individual who was at least 25 years old upon first enrolment at Douglas College.

New Westminster Secondary School (NWSS): this name was used as a descriptor for all of the high schools in New Westminster, since only six students in the sample had not attended New Westminster Secondary School.

Success: attainment if a Douglas College GPA of 2.0 or greater.

University: a four year degree granting educational institution; also called a four year college.

Limitations of the Study

1. Student motivation was not considered as an independent variable in this study. Also there was no record to show whether individual courses were selected by choice or as a result of program requirements.

2. Curricular demands were not taken into consideration, that is, equating the degree of difficulty of curricula to each other.

3. The results of this study may be generalized to students who attended high schools in New Westminster up to December 1977 and later completed courses at DC. It would be invalid to try to extrapolate from these findings with any confidence to other school districts and provinces where teaching procedures and learning conditions may differ.

4. The concept of "environmental press" may affect academic performance. Such performance is determined by the abilities and attitudes a student brings to DC and a complexity of factors in the college environment such as instructor differences, size of institution, other students attending and the administration. Individuals are seen as having characteristic needs and the strength and relationships of these needs characterizes their personalities. The college environment has the potential to satisfy or frustrate these needs as it interacts with the student.

Stern, Stein and Bloom (1956) elaborated this need-press concept by showing that the prediction of academic performance improved as one defined the "environmental press" (psychological demands) in which performance was to occur. They postulated that students with particular personality characteristics performed better in some curricular areas because those areas were hospitable to particular personality types.

It seems quite clear from studies on "environmental press" that "different college environments do have demonstrable consequences on student behaviour, over and above the student culture which is part of the total college culture."[8]

Should the data reveal either low or non-significant correlations between high school and college academic achievement, then it may be assumed that the "environmental press" exerted by DC on the student was playing a role in his academic performance. "When the ways in which 'press' influences the student are sufficiently well understood, it may become possible to modify 'press' in such a way as to influence the student and his level of performance."[9]

[8] Robert C. Pace, "Implications of Differences in Campus Atmosphere for Evaluation and Planning of College Programs." In R.L. Sutherland, W.H. Holtzman, E.A. Koile and B.K. Smith (Eds.), Personality Factors on the College Campus: Review of a Symposium. Austin: The Hogg Foundation for Mental Health, 1962, page 54.

[9] Nevitt Sanford, "Higher Education as a Field of Study." In Nevitt Sanford (Ed.), The American College: A Psychological and Social Interpretaion of the Higher Learning. New York: John Wiley and Sons, Inc., 1962, page 67.

Summary

Chapter I presented the problem, purposes, hypotheses and sub-hypotheses, definitions of terms and limitations of this investigation.

Academic standards of students in B.C. high schools were discussed in relation to the overall academic and individual curricular area success of those students who later attended college. The changes in the B.C. high school graduation requirements were outlined to help explain the Academic Board's concern over academic standards and curricula in high schools and their effect on standards in post-secondary institutions.

Community college admission policies and student characteristics were described to explain how they differ from those at a university.

CHAPTER II

REVIEW OF THE LITERATURE

Innumerable studies on the relationship between high school record and academic achievement in post-secondary institutions have been carried out since 1923. The majority of the investigations were concerned with four year colleges and universities, in spite of the fact that community colleges have been operating in the United States for 77 years and in Canada for 15 years. Consequently, 65% of the background literature cited in this study focused on four year colleges and universities. These references were included in the review to provide a basis for the comparison of correlations between and predictability of academic achievement of community college and university students.

High School Academic Achievement and Its Relationship to Academic Achievement in College

High school grade point average (GPA) predicts academic success in college and university, as shown in this section of the literature background. Perhaps there is an underlying reason for the success of high school GPA as a predictor. Frequently it merely reveals how closely a student's work habits resemble the generally preferred work habits of the middle class academic world. Academic success in post-secondary institutions reveals many of the same preferences, so logically high school GPA's are the best predictors of college and university grades (Astin, 1972 and Fishman, 1962 and 1964).

While high school GPA is a composite which can be computed in alternative ways, few studies even mentioned how this composite was obtained. Those papers reviewed which included Scholastic Aptitude Test (SAT) and American College Test (ACT) scores as independent variables used only achievement in academic courses in high school to determine high school GPA--English, mathematics, social studies and natural sciences. This researcher assumed high school GPA's in all the other references were computed in the same manner, unless otherwise specified.

Goldman and Sexton (1974) investigated the validity of the components of high school GPA, specifically the grades achieved in different types of courses taken in high school. High school students received higher grades in non-academic courses, therefore, it was expected that a university GPA predicted from a high school GPA would be lower if all high school courses taken were used to compute the high school GPA than if only academic courses were used. Goldman and Sexton randomly sampled 475 students in first and second year university to test their hypothesis. They found that by using either method of computing high school GPA (academic or total), then putting the GPA into regression equations, they could accurately predict nearly identically the university GPA's of the students (academic high school GPA correlation coefficient (r) = .46 and total high school GPA r = .47). They suggested that the comparable results using either high school GPA could have been due to the fact that high school students who attend university generally take more academic high school courses (about 80% of all courses) than non-academic, therefore, the computation of their total high school GPA's placed greater weight on academic courses.

Community college students do not necessarily take the same types of courses in high school as do university students because almost half of the former group have not made the decision to go on to post-secondary education until they either are in Grade 12 or have left high school (Dennison, et al. 1975). Consequently, many select their high school courses for reasons other than aspiring to university or college entrance. The computation of high school GPA in this study included all courses taken in Grades 11 and 12 instead of just academic courses to avoid weighting the GPA's of those students who took a "university program" in high school.

In the following summary of the background literature, whenever correlation figures are given, the corresponding percentage of the variance in academic achievement accounted for by that variable was also given. This was done to clearly indicate the predictive strength of the variables.

Community College Students

From a representative sample of American two year colleges--27 colleges--Baird (1969) selected 2707 students. Predictive correlations were computed for students grouped into occupational or academic college curricula. He found that the best single predictor of college GPA was high school GPA (r = .50/25% for men and r = .59/35% for women). For men, grades in occupational curricula were predicted about as well as or better than the grades in academic curricula. The present research analyzed the relationship between high school GPA and high school cluster GPA's (HS CLUST GPA's) and corresponding college cluster GPA's (DC CLUST GPA's). Therefore, all curricular areas--academic, vocational, career, technical--were considered to determine if predictions similar to Baird's could be made.

The findings of Feldstein's (1974) study of the academic records of some 32,000 students enrolled in five "open door" California community colleges revealed that there was no significant difference between high school graduates and non-graduates regarding college GPA's achieved. The mean GPA for the former group was 2.51 and, of the 2200 students in the latter group, 2.56. Feldstein stated that differences in GPA's which are less than .20 are considered to be insignificant by educators. He found that GPA increased with age and suggested that this was caused by some maturation factor. Feldstein conjectured that older students consciously decided to return to college and were less influenced by peer or parental expectations. The conclusion he came to was that few, if any, high school courses were a prerequisite for success in college. The present investigation also compared the college GPA's of high school graduates and non-graduates to determine if significant differences existed.

Boutelle (1975) used multiple regression analysis to determine how much variance in academic success in four first semester business courses was accounted for by Grade 12 marks and test scores on the Florida Twelfth Grade Test. Both variables predicted 40% ($R = .20$) of the variance. Grade 12 grades of the students who had graduated from eleven different high schools were the best predictor. Boutelle developed simple prediction tables for use in student advisement regarding business courses. The results of the present study were also used to develop prediction equations for eight of the ten clusters of courses. By comparing academic achievement in the clusters in high school and college, this research also indicated the strength of any relationships found.

Community College and University Students

Research conducted in 13 community colleges and 19 four year colleges with data from 5695 freshmen concluded that high school GPA was the best predictor of all measures of academic accomplishment in the freshman year--r = .50 for men/.55 for women (Richards and Lutz, 1967).

Astin (1975) undertook a study of great magnitude in 1972 when he followed up on 101,000 students he had randomly selected in 1968 from a national sample of 358 two and four year colleges and universities. He selected only those students who were enrolling for the first time and who were aspiring to a baccalaureate degree. Forty-one per cent of his followup questionnaires were returned and he weighted his data to correct the resulting non-response bias. Astin found that high school grades were the most consistently accurate predictor of attrition and that the chances of attrition increased consistently as high school grades decreased. The present study, by investigating the relationship between a student's high school and college academic record, determined if high school GPA was a consistently accurate predictor of success, instead of attrition.

Nicols (1966) took a sample of 2000 students attending 246 colleges drawn from Astin's study discussed above. For predicting post-secondary grades, high school grades were the best variables, with an average correlation of .33 (11%). The present investigation had a smaller, non-randomly selected sample on which predictive equations were computed to determine the best predictors of college academic achievement.

University Students

In their four year long study of 6660 high aptitude students--National Merit finalists--Holland and Astin (1962) determined that past achievement in high school was the best predictor (r = .52/27%) of academic success in university. Another study of National Merit Scholars investigated the prediction of academic and extracurricular achievements during the first year of university from the assessment of several factors in student backgrounds. Questionnaires were returned by 1033 out of 10,000 students and after statistical analyses of all predictors, high school GPA proved to be the best indicator (r = .33/11%) of academic success during the freshman year (Nicols and Holland, 1963).

High school GPA was also the variable showing the highest and most consistent correlation of 31 variables with first semester GPA of 630 nursing students over three campuses and three years. High school averages in mathematics, science and English generally correlated only slightly lower with first semester GPA than did high school GPA (corresponding r's = .31, .31 and .27) (Meier, Miller and Wilk, 1975). The present study compared GPA's and number of courses in clusters of subjects instead of individual subjects. First semester and cumulative college GPA's were both used for one data analysis.

Astin's (1971) data based on a national representative sample of 36,581 students who entered 180 different universities in the fall of 1966, found high school GPA to be the best single indicator of first year university academic performance (r = .50/25% for men and r = .51/26% for women). Fishman and Pasanella (1960) had also calculated a mean positive correlation of r = .50 between high school grades and grades obtained in the freshman year. Their data was compiled by reviewing 263 university admission studies which had been conducted over a ten year period.

Lunneborg (1975) studied long term criteria in university performance (graduation in four years, cumulative GPA, credits earned and graduating major) in relation to a comprehensive pre-university battery of tests administered in Grade 11. She selected a sample of 1633 senior university students and found that their high school GPA's correlated as highly with cumulative university GPA as with freshman GPA (r = .51/26%). Lunneborg used stepwise regression equations to come to her conclusions which agree with Astin's 1971 study where the average correlation was .505. She also clustered subjects under the following headings: English, mathematics, natural sciences, social sciences, foreign languages and electives. Cluster GPA's correlated at .50/16% or higher with university GPA, except for the electives cluster GPA (r = .28/8%). The present research combined mathematics and natural sciences into the Science cluster and foreign languages was part of the Humanities cluster. There is no Electives cluster, as such, in this study because courses are clustered according to subject areas. High school cluster GPA's were correlated with college cluster GPA's but not with cumulative college GPA.

Numerous other studies concluded that academic record in high school was a reliable instrument for predicting university grades.

(Gallant, 1966, Judy, 1975, Lavin, 1965, Lunneborg, 1968 and Tinto and Cullen, 1973). Academic high school GPA correlated .35/12% with first year university GPA and .41/17% with second year GPA in an investigation by Richards, Holland and Lutz (1967). Academic high school GPA was also the best single predictor of university GPA with a positive correlation of at least r = .5/25% usually reported (Brown and Wolins, 1965).

Sedlacek and Brooks (1972) found a very low correlation in their research conducted on 95 freshman, 90 of whom were colored students. Their sample had been systematically chosen to ensure few or no relationships between traditional predictors of academic success and university GPA. The non-significant correlation between high school and university GPA was .08/1%.

In their study of 475 randomly selected students in freshman and junior classes in five colleges on the University of California campus, Goldman and Sexton (1974) computed two high school GPA's by averaging marks from Grades 9 through 12. The academic high school GPA was positively correlated (r = .46/21%) with university GPA. In general, the non-academic high school GPA (all other high school courses excluding physical education, driver education, health and ROTC) was positively correlated with university GPA (r = .47/22%). This Douglas College study used a non-academic high school GPA which included physical education since it is a course required for high school graduation. As was stated earlier in this report, college students may take a much greater percentage of non-academic courses in high school than university students, therefore, an academic high school GPA would not be truly representative of the total high school GPA's of many college students.

High School Courses and Academic Achievement and Their Relationship to Academic Achievement in College

This portion of the background of the literature concentrates on academic achievement and number of courses taken in specific subject areas.

Community College Students

In a study of the student population at an Ontario College of Applied Arts and Technology between 1967 and 1969, Kelly (1970) found that success in the two year programs was significantly related to a student's sex and high school program, the recommendation of his high school, his Grade 13 papers passed and his Grade 12 academic average. The present investigation also considered the variables of sex and high school program, but grouped the latter into subject area clusters as well as considering cumulative high school GPA.

Lunneborg and Lunneborg (1969) determined that grades received in high school English (r ranging from .20 to .47) and electives (r ranging from .15 to .25) were the most consistent predictors of the GPA's of 2890 vocational and technical students at six community colleges. The investigators concluded that the high school record was an essential aid in the community college counselling of prospective vocational and technical students because the behaviours that were getting good grades in high school vocational and technical programs were also getting good grades in similar college programs. The present research, in addition, compared the academic achievement in high school and college of any student who took courses in the same subject area in both institutions.

After completing a research project which assessed the validity of the selection criteria of 91 students in four Allied Health Programs at a college, Bistreich (1977) found only two significant (.05 level) predictors: high school grades in natural science and English courses predicted graduation from the Medical Laboratory Technology Program. Bistriech's procedures for data analysis included multiple regression analysis, stepwise correlations, predictor equations and F-tests, which were similar to the procedures used in the present study. He used grades in single courses, whereas the present study used grade point averages of clusters of courses.

In order to reduce the 35-40% dropout/failure rate in chemistry classes at the Perkinston campus of Mississippi Gulf Coast Junior College, Mann (1976) sought predictors which would provide early identification of students in need of special or additional help. Academic achievement data collected over two years were subjected to regression analysis. Data included, among other variables, sex and previous experience in high school chemistry. The results revealed that sex had almost no value in predicting mid-term grades. Students who had taken a high school chemistry course achieved higher college chemistry mid-term grades than those who had not, although the predictive value of this variable was low ($r = .33/10\%$). The present study also determined if previous experience in high school courses and sex contributed to differences in grades in similar courses in college.

University and Four Year College Students

Mallinson's (1969) data indicated that achievement in university science was higher for students who took a large number of science courses in high school. Conversely, Sexton and Goldman (1974) concluded that although the selection of a university field was significantly related to the number of high school courses in specific areas, performance differences were related to high school grades in specific areas, not to the number of courses. The present study analyzed the independent variables academic achievement and number of high school courses (in each cluster) to determine existing relationships.

Grades in high school English and science were the best indicators of university mathematics success in a study completed by Ashmore (1946). Stepwise multiple linear regression was performed by Troutman (1977) on data on 123 first semester freshmen. Four variables--SAT test scores in math, high school rank, IQ scores and high school math grades--when used in the full model, explained 37% ($R = .61$, $p =< .01$) of the variation of the freshman math grade.

Physical science, language, music, history and social science experience in high school had some bearing on success in university in Harris' (1940) research. The highest correlations were history ($r = .67$/45%) and social sciences ($r = .56$/31%). In a study of 495 freshmen in university between 1943 and 1947, Williams (1950) found correlations of .77 (59%) between high school and first year university biology marks, but low positive correlations for chemistry, physics or English ($r = .33$/11%). The correlations were generally higher between social science marks, perhaps due to the wider variety of subject matter and approach, Williams suggested.

In another investigation, the best predictor of academic achievement in university was similar achievement in high school--median r = .38 (Richards, Holland and Lutz, 1967) Correlations between achievement tests in high school subjects and first/second year achievement in corresponding subjects were: literature (r = .43 (19%)/.46 (21%)), arts (r = .41 (17%)/.42 (18%)) and science (r = .27 (7%)/.32(10%)).

Studies at the Purdue School of Agriculture indicated that students who completed high school vocational agriculture were more likely to complete requirements for a degree in agriculture than those not having vocational agriculture (Hamilton and Goecker, 1974).

Five studies conducted between 1931 and 1961 concluded that the number or pattern of subjects taken in high school did not affect success in university. Douglass (1931) concluded that university success could not be predicted from the number of credits completed in specific subject areas. The correlations he computed were near zero, except for languages (r = .17/3%). Byrns and Henmon (1935) determined that success in university was not enhanced by high school experience in foreign languages or mathematics. A median correlation of .40 resulted when achievement tests in Latin (r = .63/40%), French (r = .57/32%), Social Studies (r = .39/15%) and the sciences (math r = .42/18% and science r = .35/12%) were used to predict university GPA (Garrett, 1949). He found that high school history and science grades correlated much more highly with university GPA than did English grades. Garrett believed, however, that foreign languages and sciences courses in university "selected" superior intellects, rather than "making" them. In a study by Travers (1949), students who took high school courses in the sciences and foreign languages did slightly better in corresponding first year university courses, but found some evidence that this initial advantage was not maintained. Leonard's (1945) correlations between success in specific university subjects and scores on general achievement tests were: foreign languages (r = .36/13%), English (r = .42/18%), mathematics or science (r = .32/10%). He felt these correlations had little value when predicting university success.

Ashcraft (1969) found that students who took university preparatory courses in high school excelled over those who did not take them, but not significantly so. Achievement in subject matter areas in university did not depend upon any particular pattern of high school courses. Ashcraft determined that high school achievement was not particularly decisive in university achievement. He conjectured that non-academic subjects and activities in high school contributed to maintained interest in and adjustment to the academic curriculum in university. The present research compared the college academic achievement of high school students taking pre-September 1972 and post-September 1972 high school graduation requirements to determine if a "smorgasbord" of courses was more conducive to success than highly restricted graduation requirements. (See Appendix II.)

Sex and Age and Their Relationship to Academic Achievement in College

Several studies definitely concluded that sex was one of the basic correlates of academic performance. Men appeared to have more academic difficulty than women (DellaMattia, 1977, Earmarks, 1973, Lavin, 1965, Nicols, 1966 and Peng and Fetters, 1977). Women were more predictable than men in academic settings (Baird, 1969 and Gross, Faggen and McCarthy, 1974).

Many researchers have investigated the relationship between mature adults and academic achievement in community college and university. Most of the research tended to indicate that older students did at least as well as, and often better than, their younger counterparts, even though they had similar or lower high school GPA's (DellaMattia, 1977, Fagin, 1971, Feldstein, 1974, Ferguson, 1966, Hull, 1970, Ice, 1971, Reed and Murphy, 1975, Ryan, 1969, Seltzer, 1976, Sensor, 1964 and Winslow, 1968).

Years Between High School and College

The only variable that was considered in this study, but not specifically referred to in any of the reviewed literature, was the number of years between leaving high school and entering college. The concept of maturity is an integral part of this variable.

This researcher hypothesized that the group of students who waited for more than two years before going on to a post-secondary education had significantly different mean college GPA's from the group who immediately went on to college.

Summary

The selective review in Chapter II dealt with samples of predictive studies which were conducted relative to the prediction of post-secondary achievement, primarily from high school academic record. The literature indicated that traditional measures such as high school GPA, achievement in specific subjects, as well as personal variables such as age and sex, provided varying degrees of reliance as predictors of academic success in college and university.

CHAPTER III

METHODOLOGY

Description of the Sample

The sample of 643 subjects used in this investigation included students who attended all or part of Grades 11 and 12 at New Westminster secondary schools (NWSS) and subsequently completed course work at Douglas College (DC) between September 1970 and July 1977. Students for whom no high school transcripts were available (180) and for whom no files could be found (five) were excluded from the sample. NWSS students were selected because there have never been more than three high schools in the District and New Westminster Secondary School has been the only secondary school since 1955. Therefore, these students were fairly representative of the local population.

That population has been relatively stable since 1961. New Westminster is an example of an area which has been urbanized for a long time and whose population has been increasing more slowly than in other suburban areas. Census data show an approximate 14% population growth rate between 1951 and 1961 and an approximate 20% growth rate from 1961 to 1974. The size of the NWSS graduating class between 1975 and 1978 was stable: 309, 320, 328, 279 and 300.

Design of the Study

The research was ex post facto--a correlational survey with a short-term logitudinal approach. The subjects had attended DC from a minimum of one semester to as many as twelve semesters. The first date NWSS students entered DC was September 1970 when the college opened. Once a student began completing courses at DC, data were collected on any courses he had completed up to July 1977.

The survey was designed to estimate the extent to which NWSS courses and academic achievement, and other variables (sex, college entry age, number of years between leaving high school and attending DC, college enrolment status, high school graduation and date of leaving high school) were related to academic achievement at college.

Procedures for Data Collection

A NWSS Student Handbook and a DC Calendar were obtained. All courses offered by either institution were designated to one of ten clusters according to basic subject area--Art, Business, Early Childhood Education, English/Communications, Fashion and Interior Design, Humanities, Industrial Arts, Recreation, Sciences or Social Sciences. The resulting list, Appendix IV, was perused by instructors at the college and high school levels to confirm the acceptability of the groupings.

A printout was obtained from the DC computer file (at Simon Fraser University) which indicated, by student identification number and name, those students who had written on the DC application form that either the last high school they had attended or the high school they graduated from was in New Westminster. The schools were Our Lady of Fatima (only one student in the sample), St. Ann's (one student), Trapp Technical, Duke of Connaught, Lester Pearson or New Westminster Secondary School. Trapp Technical and Duke of Connaught were combined and moved into a new school building in 1955 and were renamed Lester Pearson. Four students had attended Trapp or Duke of Connaught in this sample. Lester Pearson, a senior secondary school, was renamed New Westminster Secondary School when it was combined with Vincent Massey Junior Secondary.

Student files were pulled at the Admissions Office on the Surrey campus of DC. Any student who had registered, but had not completed course work at DC was excluded from the sample. If the file did not contain a high school transcript, the student was also excluded (about 180). Files could not be located for five students. Therefore, from the number of NWSS students who did eventually take courses at DC (825), 22% could not be used for this study (185). The final sample size was 643. All files were checked to determine if, indeed, the last high school which the student attended was a New Westminster school.

The following data, which was manually collected, was not on the DC computer file, except for identification numbers. This data included high school graduate or non-graduate, prior attendance at another post-secondary institution, date of leaving high school, high school cumulative grade point average (high school GPA), number of courses taken in each cluster in high school and cluster grade point averages (CLUST GPA). All GPA's were computed with a hand calculator. (See Definition of Terms for calculation procedures.) The data were then keypunched on cards.

The next step in the data collection involved pulling more information on each student from the DC computer file. The information included: sex, college entry date and age, birthdate, college GPA for first semester, first semester credit hours, cumulative college GPA, college credits taken and earned, college full- and part-time semesters, number of courses taken in each cluster in college and college cluster GPA's. If a student had completed Skill Development (upgrading) courses, Douglas Four or Douglas Arts 1 Seminar, data on these courses were not collected. The latter two courses are combinations of English, humanities and social sciences which made it difficult to assign to individual clusters.

A computer program was written to combine the manually-collected and computer-stored data and print it. The data were broken down into numbers of students per cluster to confirm that there were an adequate number with which the researcher could work, because for multiple regression analysis there should be at least 30-40 subjects for each predictor variable. The Early Childhood Education, Fashion and Interior Design and Industrial Arts clusters were excluded from all regression analyses because their respective n's were 32, 12 and 7. The combined data were then keypunched on cards by the computer. This final set of cards was used for the data analyses.

Procedures for Data Analyses

Results of data analyses were tested at the .05 level of significance for t-tests and product-moment correlations and at the .01 level for the regression analyses since there were several variables involved.[10]

There were three variables that were considered for all analyses of the data--sex, college entry age and enrolment status. Table II gives a

[10] Fred N. Kerlinger and Elazar R. Pedhazur, Multiple Regression in Behavioral Research, New York: Holt, Rinehart and Winston, Inc., 1973, page 287.

breakdown of the sample on these characteristics. Data were subjected to t-tests to determine any differences between the college GPA's of males and females and part- and full-time students, stratifying by entry age.[11]

Table II. NWSS Students Attending Douglas College Between September 1970 and June 1977, by Sex, Entry Age and Primary Enrolment Status.

	ENTRY AGE				
	MALE 57.54% (N=370)		FEMALE 42.46% (N=273)		
ENROLMENT STATUS	Young[a]	Mature[b]	Young	Mature	TOTAL
Part-Time	20.84[c] (134)[d]	3.27 (21)	13.38 (86)	4.04 (26)	41.53 (267)
Full-Time	32.50 (209)	0.93 (6)	24.73 (159)	0.31 (2)	58.47 (376)
TOTAL	53.34 (343)	4.20 (27)	38.11 (245)	4.35 (28)	100.00 (643)

[a]Young adult = younger than 25 years old

[b]Mature adult = 25 years old or more

[c]Number = % of total sample

[d]Number in brackets ( ) = number of students in that cell

The rationale for considering the variable "sex" was discussed in the review of the literature on page 30.

There was a need to compare the relationship between "entry age"

[11]Fred N. Kerlinger, Foundations of Behavioral Research, New York; Holt, Rinehart and Winston, Inc., 1973, page 220.

(young adults versus mature adults) and college success because the number of mature adults was increasing at DC and high school GPA for this group had not proven to be a good predictor of post-secondary GPA.

Between Fall 1971 and Spring 1972, 47% of enrolments at DC were either 19 years old or had been out of high school one year before entering college. By the academic year 1976/77, that number had increased to 64%.[12] Averaging the total student population between September 1970 and September 1977, 55.3% were mature students (DC definition as given above) when they first enroled at college. Mature adult students in this investigation were in the category of 25 years of age or older. Using this definition, the number of NWSS mature entry enrolments at DC for the same period of time constituted an average of 25% of the student body.

Enrolment data at DC indicated a slight trend to more part-time students between 1970 and 1977. Part-time students constituted approximately 60% of the student body in 1977.[13] Since the trend did exist, this researcher believed it was worthwhile to consider the relationship between enrolment status and college GPA. This status was determined by totalling the number of part- and full-time semesters a student attended, then assigning a "primary status". A student who completed 12 or more semester credits was considered a full-time student; a student who completed fewer than 12 semester credits was considered a part-time student.[14] "Primary status" was full-time

[12] Verbal information from Jerome DellaMattia, Director of Admissions, Douglas College, Spring 1978.

[13] Ibid.

[14] Douglas College Calendar 1977-78, page 18.

if total full-time semesters was equal to or greater than total part-time semesters.

Hypothesis I

There is a significant correlation between high school GPA and Doulgas College GPA.

The first four sub-hypotheses of this hypothesis were subjected to t-tests to determine any differences between the independent means. Pearson's product-moment correlations were run to test the last two sub-hypotheses.[15]

Hypothesis II

There is a significant correlation between academic achievement in similar clusters of courses taken in high school and at college.

To test the sub-hypotheses, initially Pearson's correlations were run on the predictor and criterion variables for each cluster with an adequate sample size.[16] Then, two multiple regression analyses were performed on the data. Appendix V outlines some of the details regarding this statistical procedure. Any variables tested in previous hypotheses that showed significant relationships with college GPA were included in the regressions.

Summaries of the stepwise multiple regressions on college cluster GPA's were tabulated for clusters with significant multiple correlation coefficients (R's).* Tables include the multiple R and R^2, standard errors (SE), regression equations and increases in R^2 attributed to

[15]Kerlinger, page 69.

[16]Kerlinger and Pedhazur, page 290.

*Non-significant multiple R's are generally <u>not</u> discussed in this paper.

each variable. Secondary statistics are outlined in a different table and include final F-ratios, degrees of freedom and partial correlations of the predictor variables.

Assumptions Regarding Data and Data Analyses

1. Grading procedures at the high school and college level are similar, that is, they are close to those grades and related percentage ranges suggested by the British Columbia Department of Education.

2. The success of the regression analyses requires that the college GPA's are normally distributed at each value of a predictor variable. The adequate sample sizes of the clusters tested in this study helped ensure a more normal distribution. Plots were run with the regression analyses to check this assumption.

Limitations Regarding Data and Data Analyses

The results of this study must be interpreted in light of several factors which may affect their generalizability.

1. The study is ex post facto research, therefore,

a. any significant correlations found between high school and college variables merely indicated relationships; and

b. there was the problem of student self-selection into DC, but in the sampling sense this is not an important factor since the study was not comparing NWSS students who went to college to other NWSS students.

2. Data could not be collected to identify students who were employed while attending college. It was impossible to determine any relationship between employment and academic achievement.

3. Socio-economic data could not be gathered, for example,

parents' professions, method of financing education, income, etc., therefore could not be included in the regression equations. Since the sample in this study represented the socio-economic range of the entire population of New Westminster, the effect of any socio-economic variables may be "averaged out" of the results.

4. No data on intellectual ability were available, for example, IQ scores.

5. Departures from randomness in sample selection increased the dangers of generalizing from these data. As indicated above, it was necessary to eliminate students who did not have a high school transcript on file. This had the effect of reducing the pppulation from which the sample might have been selected by 22% and introduced a bias.

6. There are cautions in using the predictive equations which reflect the fact they they actually predict GPA's of previous students rather than probabilities of college GPA's of future students.

Summary

Chapter III presented the sample, research design, data collection and analysis procedures, research hypotheses and assumptions and limitations for this investigation.

The typical student under study has completed course work at both a New Westminster high school and Douglas College, and has made a record of his high school grades available to the college.

The statistical procedures used in this study are effective in determining the differences between the means of two groups (t-test), the relationships between groups (Pearson's correlation) and the influences of several variables upon one independent variable (multiple regression analysis).

CHAPTER IV

ANALYSIS OF DATA

The results of the statistical tests on the hypotheses are summarized in this chapter under three major headings: Sex, Entry Age and Enrolment Status; Hypothesis I; and Hypothesis II. Data have been analyzed and compared to the results of previous research. Because the n's in this study are large, a small absolute difference can be highly significant. For the most part, the actual differences resulting from the t-tests were small relative to the standard deviations.

There were differences between the college GPA's of male/female and part-/full-time students. All sub-hypotheses of the first hypothesis were supported, so there was a significant correlation between GPA's in high school and college.

In testing the second hypothesis concerning the relationship between high school and college success in similar clusters of courses, three clusters could not be analyzed due to small cell sizes. However, data on five of the remaining seven clusters--Business, English/ Communications, Humanities, Science and Social Science--supported this first sub-hypothesis. The second sub-hypothesis was rejected in all cases, indicating the number of high school courses taken in particular clusters did not affect college achievement in similar clusters.

Sex, Entry Age and Enrolment Status

The data summarized in Table III support the validity of considering sex, entry age and enrolment status as variables in all data analyses.

The results show that female students achieved significantly higher college GPA's than male students ($t = -6.17$, $p < .05$, $df = 617.29$).

The data supported the findings of previous researchers (DellaMattia, 1977, Earmarks, 1973, Lavin, 1965, Nicols, 1966 and Peng and Fetters, 1977).

Table III. Mean Douglas College GPA's, Standard Deviations and "t" Statistics for Students, by Sex and Entry Age.

Student Characteristic	Mean DC GPA	S.D.	n	Test of Significance
All Students				
Female	2.52	.939	273	t = -6.17*
Male	2.04	1.048	370	
Mature Adult Students (25+ years)				
Female	3.18	.677	28	t = -1.30
Male	2.87	1.047	27	
Young Adult Students (<25 years)				
Female	2.45	.937	245	t = -5.85*
Male	1.97	1.021	343	

*p<.05

When the students were grouped by age and sex, the only significant difference was between the college GPA's of males and females under 25 years of age--females had higher GPA's ($t = -5.85$, $p<.05$, df=550.86). Weitz, Clark and Jones (1955) reported similar results.

Table IV shows that college GPA's of full-time students were significantly higher than those of part-time students ($t = 2.93$, $p<.05$, df=445,81). This variable was an important one to consider because of the increasing numbers of part-time students at Douglas College (DC). When t-tests were run comparing full- and part-time students according to "sex", full-time male students achieved significantly higher GPA's than part-time males ($t = 3.00$, $p<.05$, df=254.30). The comparison of students by "enrolment status" and "age" resulted in young adult full-time students achieving significantly higher GPA's than young part-time students ($t = 4.77$, $p<.05$, df=356.04).

Table IV. Mean Douglas College GPA's, Standard Deviations and "t" Statistics for Students, by Enrolment Status, Sex and Entry Age.

	Full-Time			Part-Time			
Student Characteristic	Mean DC GPA	S.D.	n	Mean DC GPA	S.D.	n	Test of Significance
Sex							
Female	2.57	.815	161	2.45	1.093	112	t = 0.96
Male	2.18	.851	215	1.83	1.246	155	t = 3.00*
Age							
Mature Adult	3.06	.578	8	3.02	.931	47	t = 0.15
Young Adult	2.33	.846	368	1.89	1.186	220	t = 4.77*
Average for Total Sample	2.35	.857	376	2.09	1.221	267	t = 2.93*

*p<.05

Hypothesis I

There is a significant correlation between high school GPA and college GPA. This hypothesis was supported by all data analyses, although the significant correlations were low and the actual differences in the mean college GPA's were small relative to the standard deviations.

Sub-Hypothesis 1: There is a significant difference between the college GPA's of those students who entered college before turning 25 years old and those who were at least 25 years old upon entry into DC.

The means and standard deviations of college GPA's for students who entered DC as young and mature adults are summarized in Table V. The results show that mature adult students achieved significantly higher college GPA's than young adult entries ($t = 6.78$, $p<.05$, $df=68$). This finding was consistent with previous investigations (DellaMattia, 1977, Feldstein, 1974, Ferguson, 1966, Hull, 1970, Ice, 1971, Reed and Murphy, 1975, Ryan, 1969, Seltzer, 1976, Sensor, 1964 and Winslow, 1968).

Table V. Mean Douglas College GPA's, Standard Deviations and "t" Statistics for Entering Young and Mature Adult Students, by Enrolment Status.

	Mature Adult (25+)			Young Adult (<25)			
Student Characteristic	Mean DC GPA	S.D.	n	Mean DC GPA	S.D.	n	Test of Significance
Full-Time	3.05	.478	8	2.33	.856	368	t = 3.46*
Part-Time	3.02	.931	47	1.89	1.186	220	t = 7.13*
Average for Total Sample	3.03	.884	55	2.17	1.013	588	t = 6.78*

*p<.05

<u>Sub-Hypothesis 2</u>: There is a significant difference between the college GPA's of those students who entered DC within two years of leaving high school and those students who waited for more than two years before attending college, with neither group having attended another post-secondary institution in the meantime.

The results of the t-test on the differences between the college GPA's of students who had more or less than a two year time period between leaving high school and entering college are summarized in Table VI.

Table VI. Mean Douglas College GPA's, Standard Deviations and "t" Statistic for Students Who Entered College Within Two Years of Leaving High School and Students Who Waited for More Than Two Years, Without Attending Another Post-Secondary Educational Institution in the Meantime.

Student Characteristic	Mean DC GPA	S.D.	n	Test of Significance
Two or More Years Between High School and College	2.37	1.217	145	$t = 1.99^*$
Less Than Two Years Between High School and College	2.15	.954	445	

$^*p<.05$

The results indicate that after leaving high school, students who waited for at least two years before attending DC, without attending another post-secondary institution, achieved higher GPA's ($t = 1.99$, $p<.05$, $df=204.76$). This finding supports the sub-hypothesis and is also consistent with the results of the previous sub-hypothesis.

<u>Sub-Hypothesis 3:</u> There is a significant difference between the college GPA's of those students who graduated from or left New Westminster high schools (NWSS) before September 1972 and those who graduated or left after that date.

The information in Table VII confirms the sub-hypothesis that there is a significant difference between the college GPA's of those students who graduated from or left high school before September 1972 and those who graduated or left after that date ($t = -3.25$, $p<.05$, $df=640.49$). Mean college GPA's and "t" statistics were computed for mature pre- and post-September 1972 as well as young pre- and post-September 1972 students. There were no significant differences between the college GPA's of the young or mature groups.

Table VII. Mean Douglas College GPA's, Standard Deviations and "t" Statistics for Pre- and Post-September 1972 High School Leavers, by Entry Age.

	Pre-September 1972 High School Leavers			Post-September 1972 High School Leavers			
Student Characteristic	Mean DC GPA	S.D.	n	Mean DC GPA	S.D.	n	Test of Significance
Young Adult	2.24	1.002	276	2.10	1.020	312	t = -1.72
Mature Adult	3.05	.883	51	2.67	.943	4	t = -0.78
Average for Total Sample	2.37	1.026	327	2.11	1.020	316	t = -3.25*

*p<.05

Sub-Hypothesis 4: There is a significant difference between the college GPA's of those NWSS students who completed high school graduation requirements and those who did not graduate from high school.

The means and standard deviations of college GPA's for high shcool graduates and non-graduates are summarized in Table VIII. The results show that graduates achieved significantly higher college GPA's than non-graduates, whether or not they left high school before or after September 1972 ($t = -3.92$, $p<.05$, $df=126.25$).

When the data were stratified by age, however, the mature adult graduates and non-graduates did about the same and the young adult graduates earned significantly higher GPA's than young adult non-graduates ($t = -4.29$, $p<.05$, $df=109.27$). This finding was consistent with Feldstein's (1974) study that used high school graduation as a variable.

Table VIII. Mean Douglas College GPA's, Standard Deviations and "t" Statistics for High School Graduates and Non-Graduates, by High School Leaving Date and College Entry Age.

	High School Graduate			High School Non-Graduate			
Student Characteristic	Mean DC GPA	S.D.	n	Mean DC GPA	S.D.	n	Test of Significance
HS Leaving Date							
Pre-Sept. 1972	2.46	1.001	257	2.04	1.056	70	t = -3.01*[a]
Post-Sept. 1972	2.17	.994	289	1.43	1.067	27	t = -3.46*[b]
DC Entry Age							
Mature Adult	3.08	.893	42	2.84	.861	13	t = -0.87
Young Adult	2.24	.989	504	1.72	1.045	84	t = -4.29*
Average for Total Sample	2.31	1.007	546	1.85	1.071	97	t = -3.92*

*$p<.05$ [a]df=105.18 [b]df=30.37

Sub-hypothesis 5: There is a significant correlation between high school GPA and first semester college GPA.

Sub-hypothesis 6: There is a significant correlation between high school GPA and college GPA, after students attend more than one semester at DC.

The data summarized in Table IX confirm the hypotheses that there are low, positive correlations between high school GPA and either first semester college GPA (r = .27*/7%) or cumulative college GPA (r = .32*/ 10%).

Table IX. Correlation Coefficients of High School GPA with First Semester Douglas College GPA and Cumulative Douglas College GPA.

DOUGLAS COLLEGE GPA	r (n = 643)
First Semester	.27*
Cumulative	.32*

*p<.05

The relationships were relatively consistent with previous research that showed high school GPA correlating slightly higher with cumulative post-secondary GPA than with first semester GPA (Lunneborg, 2975 and Richards, Holland and Lutz, 1967).

*Data are significant at the .05 level.

The correlation between high school and cumulative college GPA was similar to that of Nichols' (1966) r of .33. The finding was lower than those correlations found in other investigations at the college level where the r's ranged from .50 to .59 (Baird, 1969 and Richards and Lutz, 1967). Compared to studies at the university level, the r in this study was also smaller than their average correlation of .45 (Astin, 1962 and 1971, Brown and Wolins, 1965, Fishman and Pasanella, 1960, Goldman and Sexton, 1974, Lunneborg, 1975, Nicols and Holland, 1963 and Richards, Holland and Lutz, 1967).

Hypothesis II

Sub-Hypothesis 1: There is a significant correlation between academic achievement in similar clusters of courses taken at NWSS and DC.

This sub-hypothesis was supported for five clusters: Business, English/Communications, Humanities, Science and Social Science. The primary trend in Table X is for low, positive, significant relationships to exist between the high school and college clusters in which the cell size was 100 or more. The correlation coefficients are summarized in Table X: Business (r = .25/6%), English/Communications (r = .32/10%), Humanities (r = .34/12%), Science (r = .35/12%) and Social Science (r = .24/6%).

Table X. Product-Moment Correlation Coefficients of High School Cluster GPA's with Douglas College Cluster GPA's.

Cluster	r	n
Art	.18	61
Business	.25*	100
Early Childhood Education	-.08	32
English/Communications	.32*	282
Fashion and Interior Design	.29	12
Humanities	.34*	394
Industrial Arts	.30	7
Recreation	.16	77
Science	.35*	373
Social Science	.24*	140

*$p < .05$

The findings for the Business, English/Communications and Science clusters were consistent with the literature on achievement in specific subject areas (Lunneborg and Lunneborg, 1969, Mann, 1976 and Williams, 1950). Other cluster areas have not been studied and written upon by researchers although correlations between individual subjects have been analyzed.

Sub-Hypothesis 2: There is a significant difference between college cluster GPA's of those students who took zero, one to two, three to four, or five or more courses in that cluster in high school.

To ensure that the results of all previous hypotheses were included while testing the final hypothesis concerned with relationships between high school and college clusters, multiple regression analysis was performed on the data.

The first step involved computing Pearson's product-moment correlations for each cluster. The correlations were between the criterion variable (college cluster GPA) and the predictor variables (high school cluster GPA, number of high school courses taken in the cluster, college entry age and high school GPA). The predictors having the highest degree of correlation with college cluster GPA were "high school GPA" and "high school cluster GPA". Summaries of the intercorrelation matrices are reported in Appendix VI. The correlations involving dichotomous variables--sex, enrolment status, high school leaving date (pre- or post-September 1972) and high school graduation--were not included in the appendix because the correlation figures would be misleading. However, these variables were included in the regression equations because previous t-tests proved them to be significant.

As the second step, two regression analyses were run on the clusters that had significant correlations between high school cluster GPA and college cluster GPA--Business, English/Communications, Humanities, Science and Social Science. Results were checked for homoscedacicity (homogeneity of variance) by producing plots to examine the residuals. There were no abnormalities with any of the regressions.

The first regression analysis forced two predictor variables: "number of high school courses taken in the cluster" and "high school cluster GPA".

The second analysis, in which no variables were forced, produced slightly more powerful prediction equations. Consequently, only the summary for the second analysis and its secondary statistics are reported in Appendices VII and VIII. Table XI provides skeletal details of this second analysis.

Table XI. Significant Multiple Predictions with Douglas College Cluster GPA's as Criterion.

Cluster	n	R	R^2	Standard Error
Business	100	.31**[a]	.09	1.15
English/Communications	282	.41**[b]	.17	1.08
Humanities	394	.44**[b]	.20	.95
Science	372	.46**[c]	.21	1.00
Social Science	140	.36**[d]	.13	1.06

**$p<.01$

[a] R reached with 2 predictors in the equation.

[b] R reached with 5 predictors in the equation.

[c] R reached with 6 predictors in the equation.

[d] R reached with 4 predictors in the equation.

The results were expected from the previous analysis of the intercorrelation matrices. The "high school cluster GPA" was selected as the first variable in all cases except for the Social Science cluster. The "number of high school courses" was seldom included in the equation, and when it was selected, it was one of the last variables to be chosen.

Low, positive significant (**) multiple correlation coefficients (R's) were found for all clusters tested: Business (R = .31/9%), English/Communications (R = .41/10%), Humanities (R = .44/20%), Science (R = .46/21%) and Social Science (R = .36/13%).

"High school cluster GPA" was the only variable selected for all the regression equations and it was selected first in all cases but the Social Science cluster where it was selected third. This variable accounted for 6 to 12% of the variance in college cluster GPA when it was selected first. "High school graduation" was the first variable chosen in the Social Science regression and accounted for 6% of the variance in college Social Science cluster GPA.

"Age" and "sex" were included in the prediction equations for the English/Communications, Humanities, Science and Social Science clusters, but contributed $<1/1000\%$ to the variance in college cluster GPA.

Only the Science and Humanities clusters selected the variable "number of courses taken in the cluster in high school" and it was chosen towards or at the end of the computations, contributing an extremely small amount (1% or less) to the variance of college cluster GPA. When the equivalency figures were substituted for the variable labels in the regression equations, for every high school course taken in Science, the predicted college Science GPA increased by .07 points. The corresponding increase in the Social Science cluster GPA was .11. Therefore, the number of high school courses taken in a cluster made no significant difference in the college cluster GPA in that area. The sub-hypothesis 2 was rejected. This finding was supported by the majority of the reviewed literature conducted on university students (Ashcraft, 1969, Byrns and Henmon, 1935, Douglass, 1931, Garrett, 1949, Leonard, 1945, Sexton and Goldman, 1974 and Travers, 1949) and rearch conducted on college students (Feldstein, 1974).

In summary, high school academic variables, on their own had lot ability to predict academic success in college. However, when equivalency figures were substituted for the variable labels in the regression equations, as high school grades in clusters increased, so did achievement in corresponding college clusters.

Summary

The hypotheses of this study were concerned with academic achievement and courses taken in Grades 11 and 12 in New Westminster high schools and subsequent achievement by students at Douglas College.

The first hypothesis that there was a significant correlation between overall academic achievement in high school and college was supported. Sub-hypotheses confirmed moderately low, significant, positive correlations between high school and college GPA's and significant differences in college GPA's favoring the female, mature entry, full-time student who completed high school graduation requirements before September 1972 and waited at least two years before entering college. For the most part, actual differences resulting from the t-tests were small relative to the standard deviations.

Within the five clusters, the hypothesis that there was a significant correlation between academic achievement in similar clusters of courses at the high school and college level was supported in the curricular areas of Business, English/Communications, Humanities, Science and Social Science. The predictive ability of grades in the significantly correlated clusters was low. The primary trend was for students with higher cluster GPA's in high school to earn higher college GPA's in the five corresponding clusters tested.

The sub-hypothesis that the number of high school courses taken in a cluster made a significant difference in the college GPA of that same cluster was rejected.

CHAPTER V

ANALYSIS OF OTHER FINDINGS

In the course of analyzing the data, previously unanticipated analyses were decided upon, which enabled the researcher to investigate additional questions.

Correlation of College GPA with High School GPA, by High School Leaving Date

Pearson's product moment correlations (r's) were computed between high school grade point average (GPA) and first semester and cumulative college GPA for pre- and post-September 1972 high school leavers. The data were stratified by Douglas College (DC) "enrolment status", "college entry age" and "sex". The results of the analysis are summarized in Table XII.

The overall correlation between high school and college cumulative GPA's, as previously tested, was r = .32*/10%, and for first semester college GPA, r was .27*/7%.

When the total sample was categorized according to "high school leaving date", the pre-1972 group's high school GPA's showed low, positive correlations with first semester (r = .25*/6%) and cumulative (r = .27*/7%) college GPA. The r's for the post-1972 high school leavers were higher: r = .36*/13% and .44*/20%, respectively.

Most of the significant correlations with cumulative college GPA for the post-1972 group (r's ranging from .26 to .55) fell within the range of those found by previous investigators (r = .33 to .51) in

*$p<.05$

studies published between 1960 and 1975.

The primary trend for Table XII is for the high school GPA's of post-September 1972 leavers to correlate more highly with college GPA's than those of students who left high school before the 1972 graduation requirement changes.

Table XII. Product-Moment Correlation Coefficients of High School GPA with First Semester College GPA and Cumulative College GPA, for Pre- and Post-September 1972 High School Leavers, by Enrolment Status, Entry Age and Sex.

Student Characteristic	Pre-September 1972 High School Leavers: First Semester College GPA	Pre-September 1972 High School Leavers: Cumulative College GPA	Pre-September 1972 (n)	Post-September 1972 High School Leavers: First Semester College GPA	Post-September 1972 High School Leavers: Cumulative College GPA	Post-September 1972 (n)
	"r"					
Enrolment Status						
Full-Time	.36*	.36*	(180)[a]	.46*	.55*	(196)
Part-Time	.16*	.20*	(147)	.19*	.26*	(120)
DC Entry Age						
Mature Adult	.11	.16	(51)	.75	.85	(4)
Young Adult	.32*	.33*	(276)	.37*	.45*	(312)
Sex						
Female	.10	.15*	(120)	.33*	.41*	(153)
Male	.25*	.25*	(207)	.31*	.39*	(163)
Average for Total Sample	.25*	.27*	(327)	.36*	.44*	(316)

*p<.05

[a]The number in the brackets ( ) = number of students in the cell.

When correlations were computed for the subsets of the sample, the tendencies of the pre- and post-1972 correlations remained. The r's for post-1972 full- and part-time, mature and young adult and males and females were higher than those of their pre-1972 counterparts by .04 to .26.

Notably higher correlations were found between high school GPA and first semester and cumulative college GPA for full-time, post-1972 high school leavers: r = .46*/21% and r = .55*/30%.

Regression Analysis Including High School GPA as a Predictor

A third set of regression analyses were run with the inclusion of the variable "high school GPA" to determine if this variable was a better predictor of college cluster GPA than was "high school cluster GPA". The Pearson's correlations computed for the first regression analysis indicated such a possibility (Table XIII).

Relationships that had been significant between "high school cluster GPA" and college cluster GPA were also significant between "high school GPA" and college cluster GPA. The correlation for the Recreation cluster was only significant with "high school GPA".

All non-significant correlations computed were in the "electives" clusters which had numbers less than 100: Early Childhood Education, Fashion and Interior Design and Industrial Arts.

In most of the clusters, except English/Communications and Industrial Arts, there were greater correlations between "high school GPA" and college cluster GPA than between "high school cluster GPA" and college cluster GPA. The English r dropped from .32* to .25* and that of Industrial Arts, from .30 to .09.

Table XIII. Product-Moment Correlation Coefficients of Douglas College Cluster GPA's with High School GPA and High School Cluster GPA.

Cluster	High School GPA "r"	High School Cluster GPA "r"	n
Art	.29*	.18	61
Business	.43*	.25*	100
Early Childhood Education	-.03	-.08	32
English/Communications	.25*	.32*	282
Fashion and Interior Design	.33	.29	12
Humanities	.36*	.34*	394
Industrial Arts	.09	.30	7
Recreation	.31*	.16	77
Science	.39*	.35*	373
Social Science	.42*	.24*	140

*$p<.05$

The analyses were run on the clusters that had significant correlations between "high school GPA" and college cluster GPA--Business, English/Communications, Humanities, Recreation, Science and Social Science. Residuals were again examined revealing no abnormalities. Skeletal results are given in Table XIV. Summaries are reported in Appendices IX and X.

Only five clusters had significant ($p<.01$) multiple correlation coefficients (R's): Business (R = .48/23%), English/Communications (R = .41/17%), Humanities (R = .46/21%), Science (R = .49/24%) and Social Science (R = .47/22%). As in the second regression analysis, the coefficients were low, although they were slightly higher than the R's in the second regression analysis for all clusters except English/Communications. Those R's were: Business (R = .31/9%), English/Communications (R = .41/17%), Humanities (R = .44/20%), Science (R = .46/21%) and Social Science (R = .36/13%). The multiple correlation coefficients just given were significant at the .01 level. The Recreation R in the previous regression was not significant, and therefore is not reported.

Table XIV. Significant Multiple Predictions with Douglas College Cluster GPA's as Criterion, Including High School GPA as a Predictor.

Cluster	n	R	R^2	Standard Error
Business	100	.48**[a]	.23	1.07
English/Communications	282	.41**[b]	.17	1.08
Humanities	394	.46**[c]	.21	.94
Recreation	77	.42**[d]	.18	.98
Science	372	.49**[c]	.24	.99
Social Science	140	.47**[e]	.22	1.00

**$p < .01$

[a] R reached with 4 predictors in the equation.

[b] R reached with 6 predictors in the equation.

[c] R reached with 7 predictors in the equation.

[d] R reached with 3 predictors in the equation.

[e] R reached with 4 predictors in the equation.

The correlation coefficient of "high school GPA" to college cluster GPA, when it stood alone, ranged from .32 to .42. This r was lower than those found by Baird (1969)--r = .50 to .59, however he was predicting college GPA, not college cluster GPA.

The English multiple correlation coefficient remained the same as with the previous regression analysis because "high school English GPA" was selected first for the English/Communications equation, accounting for 10% of the variance in college English GPA. This was the only high school subject area that was the strongest predictor of academic achievement in its corresponding college subject area. "High school GPA" predicted college cluster GPA more strongly for all other clusters tested. "High school GPA" was chosen first in these clusters, accounting for 13 to 18% of the variance in college cluster GPA's.

Since "high school cluster GPA" and "high school GPA" were moderately correlated (see Appendix VI), it was expected that only one of these variables would be included in each regression equation. Three clusters selected both of these variables, entering the "high school cluster GPA" towards the end--Humanities, Science and Social Science. The "high school cluster GPA" contributed less than 1% to the variance of college GPA in each of these clusters, which is also typical for highly correlated variables in regression analysis.

Only one consistent pattern appeared for the order of selection of the variables: "entry age" was chosen before "sex". "Entry age" was the only variable other than "high school GPA" selected in all significant predictions. However, "entry age" explained almost none (less than 1%) of the variance in the college cluster GPA. "Sex" was included in all equations but Business, contributing even less to the variance. "Enrolment status" and "high school leaving date" were included in some equations, but their contributions were negligable.

As with the second regression run, the variable "number of courses taken in the cluster in high school" was selected only for the Humanities and Science clusters. It was chosen towards the middle of the equations, again contributing an extremely small amount (less than 1%) to the variance of college cluster GPA.

So, as with the academic predictors in the second regression run, "high school GPA" along with other academic variables displayed low, positive relationships with academic achievement in college. However, the primary trend was for students who had higher GPA's in high school to have higher GPA's in college, with high school record having decreased effect as students get older.

CHAPTER VI

DISCUSSION OF DATA

The results of the statistical tests on the hypothesis and additional tests are combined, analyzed and interpreted in this chapter under three headings: Sex, Entry Age and Enrolment Status; Hypothesis I; and Hypothesis II. Other Findings are included with the appropriate hypothesis.

The reader is encouraged to keep two facts in mind when reading this discussion. Although there were significant differences between GPA's of various groups, for the most part, the actual differences were small relative to the standard deviations. Secondly, the correlation coefficients, although significant, were generally low with relatively large standard errors for the multiple coefficients.

Sex, Entry Age and Enrolment Status

Female students consistently earned higher grades than male students, with their average GPA (grade point average) being .5 above that for men. When the data was stratified by college "entry age", young women did significantly better than young men, but the differences were not significant for mature men and women. Perhaps young women are motivated to be "good" students and young men are encouraged to be and do other things during their youth; the reasons are open to guesswork.

Similarly, when considering "enrolment status", full-time young adults did better than those enrolled part-time, by almost .5 of a grade point. Full-time males earned slightly higher grades than part-time males. However, the college GPA's of mature adults and females were not related to "enrolment status". There could be several reasons for these results. Perhaps the out-of-class activities of young part-time students were interfering with their academic work--employment, family responsibilities, recreation, etc.; perhaps the "environmental presses" of the DC campuses did not "fit" with the personalities of the young adult or male part-time students; mature adults and women do better even as full-time students; or, young students simply have not made their educational decisions and are simply "filling time".

It appears that maturity, especially for males, was related to academic success at college, that is, college GPA increased significantly with age. It may simply be a result of the mature student having had time to identify his educational and career goals and, therefore, having a different attitude towards a college education.

Tables III and IV summarize the above data.

Hypothesis I

There is a significant correlation between high school GPA and college GPA.

Sub-Hypothesis 1: There is a significant difference between the college GPA's of those students who entered college before turning 25 years old and those who were at least 25 years old upon entry into Douglas College (DC).

Sub-Hypothesis 2: There is a significant difference between the college GPA's of those students who entered DC within two years of leaving high school and those who waited for more than two years before attending college, with neither group having attended another post-secondary institution in the meantime.

These two sub-hypotheses are grouped together because the results of their tests indicated similar relationships. Mature adults (25+) earned much higher college GPA's than young adult entries, whether part- or full-time. High school students who took two or more years "off" before starting at DC had GPA's .25 higher than those who went straight to college from high school or had less than two year break between the two institutions.

The fact that the college GPA's in this study reflected the grades of students who might have been taking courses over several semesters and years, even though those individuals maintained their original group membership according to college "entry age", provided strong support for the interpretation that original "entry age" was significantly related to academic achievement at college.

The above results, summarized in Tables V and VI, indicate that college GPA increased with "entry age". They could also point to a positive relationship between the duration of time between high school and college and the resulting college GPA. Experiences between leaving high school and actually entering college may help young people to reassess their abilities and goals, as well as increasing their motivation for doing well in college. This "maturity factor" did, indeed, bear some relationship to the academic achievement of DC students.

Sub-Hypothesis 3: There is a significant difference between the college GPA's of those students who graduated from or left New Westminster high schools (NWSS) before September 1972 and those who graduated or left after that date.

The British Columbia (B.C.) high school graduation requirements changed significantly in 1972. The data showed that pre-September 1972 high school leavers did earn slightly higher college GPA's (Table VII). Their higher mean GPA could have been related to the fact that there was a larger percentage of mature adults in the pre-1972 group (16%) compared to 1% in the post-1972 group. However, neither the differences between the GPA's of pre- and post-1972 young adults nor those between pre- and post-1972 mature adults were significant. Consequently, maturity was not the primary variable accounting for the higher grades of the pre-1972 group.

Perhaps changing academic standards at the high school level contributed to the findings. Academic grade inflation was briefly discussed in the introduction to this paper. Dennison,et al. (1975) suggested that more "A" and "B" high school students were choosing college over university for the first two years of their post-secondary education. This would provide an explanation for the increased mean high school GPA's of the post-1972 students entering DC, especially since the scatterplots showed many more students enrolling after 1973 with high school averages above 3.0.

The mean high school GPA's of the post-1972 group were significantly higher than the pre-1972 students by .24 of a grade point, with small standard deviations (.029 and .033) (Table I). Therefore, it was expected that the post-1972 students would earn higher college

GPA's than the pre-1972 leavers. The reverse was true; they earned GPA's an average .26 of a grade point lower although this difference was small relative to the S.D.'s (1.026 and 1.020).

If grading standards at NWSS were lowered or relaxed after the 1972 removal of province-wide Grade 12 examinations, the introduction of more liberal graduation requirements, and the promotion of locally developed curricula, then it would explain the increase in the mean high school average for the post-1972 high school leavers and the subsequent decrease in their college GPA's.

A partial explanation for the success of the pre-September 1972 students could be that they acquired study habits, skills and attitudes from a more academically "rigorous" high school experience which stood them in good stead in their college courses. Perhaps, as the Academic Board suggested, it was important for high school students to be minimally prepared in the curricula of "essential" disciplines--English, mathematics, sciences, social sciences and second languages. Such a background may be a good foundation on which to build future academic success.

Sub-Hypothesis 4: There is a significant difference between the college GPA's of those students who completed high school graduation requirements and those who did not graduate from high school.

The primary trend in Table VIII was for secondary school graduates to earn college GPA's an average .5 higher than non-graduates. Graduates did better whether they left high school before or after the change in high school graduation requirements.

The GPA's of young adult graduates were significantly higher than those of young adult non-graduates, but this difference did not hold for mature adult students. Again, the "maturity factor" seemed to counterbalance the lack of a high school diploma and course background for a mature student later attending college.

Sub-Hypothesis 5: There is a significant correlation between high school GPA and first semester college GPA.

Sub-Hypothesis 6: There is a significant correlation between high school GPA and college GPA after students attend more than one semester at DC.

The correlations between high school GPA and either first semester college GPA (r = .27*/7%) or cumulative college GPA (r = .32*/10%) were low and positive.

The correlation between high school and college GPA was roughly equivalent with Nicols' (1966) r of .33, even though his study was concerned with students of high academic ability. Such individuals have not been typical community college students in B.C. (Dennison, et al., 1975).

The finding was lower than those correlations in previous investigations at the college level--r = .50 to .59 (Baird, 1969 and Richards and Lutz, 1967). Baird used academic high school GPA, optimally weighted with American College Test scores to predict college grades

*p<.05

in occupational and academic curricula. Richards and Lutz also used academic high school GPA. The above factors resulted in GPA's not truly representative of the high school GPA's of typical college students. This investigation used total high school GPA.

When comparing the correlation coefficient of this investigation (r = .32) to those found in studies at the university level, it was also smaller than their average r of .45 (Astin, 1962 and 1972, Brown and Wolins, 1965, Fishman and Pasanella, 1960, Goldman and Sexton, 1974, Lunneborg, 1975, Nicols and Holland, 1963 and Richards, Holland and Lutz, 1967). Again the high school GPA's used in their studies were probably weighted because university students' high school programs are generally 80% academic. This would explain the higher correlations with the academic programs at universities.

Correlation of College GPA with High School GPA, by High School Leaving Date

By separating the students according to the date they left high school, the data could be looked at in light of the 1972 changes in high school graduation requirements.

Correlations between high school and college GPA's of students who attended high school under the new, more liberal graduation requirements were consistently higher than those found for the pre-1972 group, with an average r of .36*/13% for first semester college GPA and .44*/19% for cumulative college GPA. Table XII summarizes the data. It appears that, contrary to the Academic Board's statement, NWSS grades as predictors of college achievement are more reliable now than those grades earned under prior graduation requirements.

The results could reflect the fact that the post-1972 leavers more likely selected their high school courses on the basis of interest, ability and need, rather than the pre-1972 restricted course selections. Presumably, students chose college courses and programs primarily on this same basis, thus, higher correlations resulted.

The data were further stratified by "enrolment status", college "entry age" and "sex". The resulting significant correlations with cumulative college GPA were in a similar range (r = .33 to .59) to those found by previous investigators at the community college level (Table XII). Specifically, for the pre-1972 group, r's were: full-time students (.36) and young adults (.33); and for the post-1972 students: full-time (.55), young adults (.45), females (.41) and males (.39).

The findings for the young adult students indicated that their high school GPA's were more highly correlated with college GPA than were those of mature adults. Perhaps "maturity" variables (encompassing life experiences, motivation, etc.) in younger students were not developed to the point that they showed a strong relationship with academic achievement.

The correlations for females and males were quite a bit higher for the post-1972 high school leavers. Specifically, for women they increased from .15/1% to .41/17% and for men, from .25/6% to .39/15%. Part of the increase was simply due to larger sample sizes for the post-1972 group. These results are probably a reflection of the changes in graduation requirements which allowed students to pursue curricular areas in high school complementary to their personal needs, interests and abilities. Again, presumably college programs were selected on the same basis.

Hypothesis II

There is a significant correlation between academic achievement in similar clusters of courses taken at NWSS and DC.

Sub-hypothesis 1: as above.

The positive correlations resulting from the data analysis provided partial support for the sub-hypothesis, although the values were low. The general trend for Table X was for clusters with n's over 100 to produce significant correlations ranging from .25/6% to .35/12% in Business, English/Communications, Humanities, Science and Social Science. The findings for Business, English and Science were similar to those in the literature on achievement in clusters and to 50% of the r's calculated in specific subjects, especially in the science area.

Slightly lower, non-significant r's (-.08/1% to .30/9%) resulted when clusters of less than 100 subjects were analyzed (Art, Early Childhood Education, Fashion and Interior Design, Industrial Arts and Recreation). These clusters represented subjects in areas commonly known as "electives". Unfortunately, their sample sizes were not of equal size to those mentioned above, because it would have been valuable to see if larger samples would give correlations which were significant and in a similar range to those of "academic" clusters. Such results would point to similarities in grading practices and standards in curricular areas at the college and high school levels. However, because correlation coefficients do generally increase with sample size, these results may point to even lower "real" relationships for the large clusters.

The Academic Board Suggested that province-wide Grade 12 examinations in English, mathematics, sciences, social sciences and second languages be reintroduced. Embodied in this statement was the assumption that high school students should meet minimum standards in these "essential" disciplines. The results of the correlational analysis in this investigation indicated that the relationship between achievement in high school and college subject areas was low, therefore, background in the "essential" subjects in high school did not seem a valid prerequisite for success in similar college subjects.

Sub-hypothesis 2: There is a significant difference between college cluster GPA's of those students who took zero, one to two, three to four, or five or more courses in that cluster in high school.

The variable "number of high school courses", when not forced, was selected in two of the five regression equations. It was the last predictor selected for Humanities, contributing 1/1000% to the variance of college Humanities GPA. This variable contributed an equally small amount when it was chosen second from last in the Science cluster. It seems quite clear that success in college clusters bore little, if any, relationship to the number of courses taken by a student in similar high school clusters.

Again, the Academic Board's concern over adequate preparation in the traditional curriculum of the "essential" disciplines was not supported by the results of this investigation.

Variables showing significant (* $p<.05$) relationships with college GPA in earlier statistical tests were included as predictors in the regression analyses. These variables were "high school cluster GPA", "enrolment status" at college, college "entry age", "sex", "high school leaving date", "high school graduation" and "number of courses taken in the cluster in high school". Generally, "high school cluster GPA" contributed from 6 to 12% of the variance in college cluster GPA (R^2 column in Table XI). When from one to five other variables were included, this percentage only increased by 3 to 9% due to intercorrelations among the variables.

The values of the significant (** $p<.01$) multiple correlation coefficients (R's) were as follows: Business (.31), English/Communications (.41), Humanities (.44), Science (.46) and Social Science (.36).

The standard errors ranged from .95 to 1.15, indicating that college cluster GPA's predicted on a 0.0 - 4.0 grading scale could be "out" by $\pm$.95 to $\pm$ 1.15. This range is quite a bit on a four-point grading scale.

Resulting R's when High School GPA was Included as a Predictor in the Final Multiple Regression Analysis

Upon examining the Pearson's product-moment correlations between high school GPA and college cluster GPA (Table XIII), all r's but two were higher than the correlations between "high school cluster GPA" and college cluster GPA. This increase indicated that "high school GPA" was a better predictor of success in most college subject areas than was "high school cluster GPA". An interesting change resulted from the inclusion of "high school GPA" as a predictor: the r in English/Communications dropped from .32*/10% to .25*/6%. This suggests that students planning on taking college courses in this subject area would be wiser to use their high school achievement in the English cluster instead of their high school GPA as a yardstick for future success in English/Communications.

As was expected, when the regressions were performed, the values of the R's increased, except for English. The new significant (**) R's were: Business (.48), Humanities (.46), Recreation (.42), Science (.49) and Social Science (.47). The multiple correlation coefficient for the Recreation cluster had not been significant in the first and second regressions.

"High school GPA" was selected first in all equations except English/Communications. This variable accounted for 10 to 18% of the variance in college cluster GPA. When from one to six other predictors were included, the percentage increased by 3 to 7%. These figures were similar to those calculated for the first two regressions.

The standard errors decreased slightly in this regression, ranging from .94 to 1.08, but still diminished the utility of the prediction equations.

The increases in the predictability of college GPA's in the Business (+14%) and Social Science (+ 9%) clusters, and the newly significant R of the Recreation cluster must have been a result of "high school GPA" representing other variables which related significantly to achievement in those curricular areas. Perhaps by using "high school GPA", the addition of experiences in other high school courses provided an "all-round" measure of student ability and achievement.

The lack of change in the English/Communications R was due to the fact that "high school English GPA" was the first predictor selected in the English regression equation, just as it was first in the earlier regression runs. "High school GPA" was the last variable chosen in this cluster, contributing virtually nothing to the variance of college English GPA.

"High school GPA" was more highly correlated with all college cluster GPA's, except English/Communications, than was "high school cluster GPA". Academic achievement in college was, therefore, more related to a student's total ability, as demonstrated by "high school GPA", than it was to success in particular subjects.

Summary

In this investigation, all hypotheses except the last two sub-hypotheses were supported by the data analyses. Although the results were significant, for the most part, the actual differences in GPA's were small, relative to the standard deviations. Similarly, the significant correlation coefficients were generally low and their standard errors were relatively large for the R's.

The variables "sex", college "entry age" and college "enrolment status" were significantly related to academic achievement in college. Women did better than men--a difference that diminished with increased college "entry age". Part-time students earned lower GPA's, especially if they were young adult entries or males.

The low relationship between high school record--GPA, grades in subject/cluster areas, completion of graduation requirements, number of subjects taken in high school clusters--and college success also diminished with increased "time off" between high school and college. The student who entered college as a mature adult appeared to be motivated differently. He probably had clarified his educational and career goals and brought his "life experiences" with him.

Students who left high school before the September 1972 changes in graduation requirements did better in college than the post-1972 group although their high school GPA's had been lower. Either their curricular background and/or high school academic standards provided them with an academic advantage during their time at college. There was a distinct possibility that academic grade inflation had occurred at New Westminster Secondary School.

College GPA's of post-1972 high school leavers were much more predictable than those of the pre-1972 students. These results were attributed to the fact that since September 1972, students had been able to select their high school programs almost totally by choice, instead of by requirement. The researcher suggested that college programs, on the whole, were also chosen by interests, abilities and needs; therefore, higher correlations resulted.

Regressions were run on only six of the ten clusters due to inadequate sample sizes: Business, English/Communications, Humanities, Recreation, Science and Social Science. Although significant multiple correlations resulted, the ability of the variables used in these regression equations to predict grades in college clusters was low. The variables were: high school GPA, high school cluster GPA, number of courses taken in high school cluster, college entry age, sex, college enrolment status, high school graduation and high school leaving date. Other variables such as intelligence, "environmental press" including personality characteristics and psychological demands, motivation, socio-economic and employment status, "grade-getting" skills, etc. were accounting for 76 to 87% of the variation in college cluster GPA's.

Success in college clusters bore little, if any, relationship to the number of courses taken in corresponding high school clusters.

CHAPTER VII

CONCLUSIONS AND SUGGESTIONS FOR ADDITIONAL RESEARCH

Conclusions

This study investigated how the academic achievement and curricula of Grade 11 and 12 students at New Westminster high schools (NWSS), and other factors, were related to subsequent achievement at Douglas College (DC)--a community college.

Academic achievement at the high school and college levels was related; several variables helped to explain the extent of this relationship. Although the differences between the grade point averages (GPA's) of various groups tested were significant, they often were small relative to the standard deviations (average S.D. = .89). Similarly, the Pearson's product-moment and multiple correlation coefficients were low (.50) with relatively large standard errors for the latter statistics.

Sex, Entry Age and Enrolment Status

Women did better than men academically, although this advantage diminished with increased college entry age.

Part-time enrolments had slowly been increasing over the past six years at DC and in 1977 they constituted 60% of the student body. This investigation concluded that part-time students did not do as well as those registered full-time, especially if they were young and/or male. The GPA's of mature students and females varied slightly with enrolment status.

Hypothesis I

The data analyses for the six sub-hypotheses supported the hypothesis that there was a significant correlation between cumulative GPA's in high school and college.

There was a "maturity factor" which played a significant role in the academic success of college students. Students who were 25 years old or more when they first entered DC consistently did much better than younger entries. Even students who "stopped out" of education for two years after leaving high school did better than those who initially continued right through to college. The fact that a mature student had not completed high school graduation requirements made little difference to later college success. This was not the case for young entries who had been high school dropouts. These results gave support to the "open door" policy of Douglas College with its provision of a second chance at an education.

This study addressed the question of diverging high school academic standards by investigating the cumulative academic achievement of college students who left high school before and after the September 1972 changes in British Columbia (B.C.) high school graduation requirements. These changes involved the removal of compulsory province-wide Grade 12 examinations, the introduction of more liberal course selection requirements and the promotion of curricula developed at the district level instead of the provincial level.

Students who took the more structured programs before the changes did slightly better in college than the post-1972 students who had more freedom of course selection and the opportunity of taking two locally developed courses as part of their graduation requirements.

Therefore, the pre-1972 group had higher college grades despite the fact that their high school GPA's had been lower than the post-1972 students'. The researcher attributed the academic advantage of the pre-1972 leavers to variables in their high school background, such as required basic preparation in "essential" curricula (English, mathematics, science, social science and possibly languages) and/or a more "rigorous" high school experience with higher academic standards.

The results of statistical tests did point to the possibility of lowered or relaxed grading standards at NWSS since the 1972 changes. Almost all of the students in this sample had attended only one high school--New Westminster Secondary School. The post-1972 students in this investigation had been experiencing academic grade inflation in Grades 11 and 12 at that school. If community college students are representative of high school graduates (Dennison, et al., 1975) and NWSS students are representative of community college students, then academic standards had declined at New Westminster Secondary School.

Another interesting finding was revealed when the low correlations between cumulative high school and college GPA's were stratified by high school leaving date (pre- or post-1972). The GPA's were more highly related for students who left high school after 1972. The resulting correlation coefficients of this post-1972 group were also more comparable to those reported in the reviewed literature, although they were still lower. This was most likely due to the fact that the studies reviewed in the literature involved either high ability or university students and used an academic high school GPA. This investigation involved only community college students and used a total high school GPA.

The correlations showed that high school grades of NWSS students had become more reliable as predictors of college achievement since the 1972 changes, especially for full-time students. The results were attributed to the fact that after 1972, students could select their high school courses of study primarily by interest, ability and need instead of by restrictions and requirements. Presumably, college programs were selected primarily on the former bases.

Hypothesis II

There is a significant correlation between academic achievement in similar clusters of courses taken at high school (NWSS) and college (DC). The data analyses gave partial support to the hypothesis.

Academic achievement in college clusters was not related to any great extent to either the grades received or number of courses taken in corresponding high school clusters. The year of leaving high school also made little difference to the predictive ability of high school grades. Therefore, the suggestion that college entrance examinations be introduced to ensure that entering students have met minimum standards in "core" or "essential" curricula was not supported.

When "cumulative high school GPA" was compared to academic achievement in college clusters, all resulting correlations except English ($p<.05$) and Industrial Arts (p=non-significant) were higher than those correlations calculated using "high school cluster GPA's". These findings suggested that academic achievement in college was more closely related to a student's total ability, as demonstrated by high school GPA, than it was to success in corresponding high school clusters. The exception was the high school English cluster--encompassing communications, creative and expository writing, English (including grammar) and journalism--which provided a more accurate measure of college English/Communications achievement. Put more simply, except for English, it did not really matter how well a student did in particular subject areas in high school; rather, overall academic achievement in high school was a better predictor of college success.

High school academic record and other variables used in the regression equations only accounted for 17 to 24% of the variation in college GPA's of these clusters: Business, English/Communications, Humanities, Recreation, Science and Social Science. The low values of the six significant multiple correlation coefficients (R's), the large standard errors, and the number of predictors used to arrive at the R's were considered when determining the usefulness of the resulting equations. Weighing the above factors and the time and effort involved in collecting and calculating the data from high school and college transcripts, the procedures used in this investigation provided neither meaningful nor useful data for predicting grades in college clusters. Using the regression equations to build expectancy tables based on records of previous college students would not provide meaningful material for educational decision-making of potential college students, their parents and friends, or counsellors.

Implications

Educators involved with secondary schools, as a result of the B.C. Department of Education's impetus, are already addressing the question of diverging high school standards and curricula. The steps the Department has taken--implementation of province-wide core curricula and provincial assessment of baseline levels of knowledge in subjects (PLAP--Provincial Learning Assessment Program)--were not grounded in an extensive research program. Rather, the Department assumed the results from studies on diverging high school standards and curricula in the United States were indicative of similar patterns in B.C.

This investigation supported the first part of their assumption, but provided inconclusive evidence about diverging high school curricula. Specifically, academic standards at New Westminster Secondary School appeared to be declining. Students who recently attended this high school did not do as well at DC as those who left high school before the 1972 changes in graduation requirements, even though their mean high school GPA had been higher than the pre-1972 group.

The relationship of high school grades and experience in "essential" curricular areas to similar college achievement was weak. Cumulative high school GPA was a better predictor of academic success in college clusters than were high school grades in those clusters (except English), regardless of high school leaving date. These factors indicated that a student's overall academic achievement at high school gave a better indication of future academic success in all subject areas except English. Consequently, this researcher would not support either the reintroduction of province-wide Grade 12 examinations or the introduction of college entrance examinations <u>if</u> their sole purpose was to establish baseline requirements in the "essential" curricular areas: English, mathematics, sciences, social sciences and second languages.

Granted, students who left high school before the 1972 changes in graduation requirements had an overall academic advantage at college, but the reasons for this advantage are open to conjecture. If it was their more academically rigorous high school experience and broad foundation of "essential" curricular experience that provided the advantage, there are implications for the present system of secondary school education in B.C. Such implications would support the present "back to basics" movement and the return to a more "rigorous" academic approach to all curricula in high school. These directions would benefit individuals who eventually go on to college, but may provide no future advantage to the majority of high school students who never go on to post-secondary education.

The remaining implications contain useful information for students, their parents and friends, and counsellors who are making educational decisions.

High school GPA's are more reliable predictors of college academic achievement now than they were before the liberalization of high school graduation requirements. Consequently, there is less need than ever to introduce entrance examinations at the college. Also, individuals who have been away from high school, even for as few as two years, do significantly better once at college, whether they have a high school diploma or not. The above results gave support to the "open door" policy of the community college, a policy that provides young and mature adults with easier access to a post-secondary education regardless of their academic background.

Cumulative high school GPA predicted college achievement in all subject areas (except English) better than corresponding high school cluster GPA's did. However, high school academic variables, on their own, were weak predictors of college achievement. Therefore, if high school records are used when counselling students on educational choices, then overall high school achievement provides a more accurate gauge of future success, unless the subject area is English/Communications.

There is a high percentage of part-time enrolments at DC. Generally, these students did not do as well as their full-time counterparts, especially if they were young and/or male. Since particular concern for part-time students is one of the mandates of community colleges, hopefully explanations for these findings are being explored by the college.

Limitations to the Conclusions

There are certain aspects of this research which must be considered before accepting the Conclusions and Implications.

The investigation was concerned only with students who attended all or part of Grades 11 and 12 at New Westminster high schools and subsequently completed course work at Douglas College between September 1970 and July 1977.

Furthermore, almost one-quarter of the potential sample was not included in the study because they had not given the college a transcript of their high school record. Thus, the sample was not randomly selected in any way. Conclusions must be restricted to those students who had New Westminster high school transcripts on file at DC.

Nevertheless, generalizations may be made to all NWSS students who later attend DC on the grounds that college students tend to be representative of high school graduates and that NWSS students and graduates are typical community college students. However, it would be invalid to try to extrapolate from these findings with any confidence to high schools in other school districts, other colleges or provinces where teaching procedures and learning conditions may differ.

There are many variables related to academic performance which were neither included nor controlled in this ex post facto research. Some of these identifiable variables are: intelligence; motivation; curricular demands; "environmental press", which includes personality characteristics and psychological demands; employment status; socio-economic status; and "grade-getting" skills. These and other factors accounted for at least 75% of the variance of grades earned in college clusters/subject areas.

Multiple regression could not be performed on four clusters due to inadequate sample size: Art (visual and performing), Early Childhood Education, Fashion and Interior Design, and Industrial Arts. These clusters represent subject areas commonly referred to as "electives". It was unfortunate that only one "electives" cluster, Business, met the requirements for regression analysis. None of the multiple correlation coefficients proved to be of high, or even moderate, value in predicting achievement in college clusters. Nevertheless, it would have been valuable to see if "electives" grades predicted college achievement as well as "academic" high school grades.

Suggestions for Further Research

A Question Remaining Unanswered

Due to small cluster sizes, relationships between college and high school achievement in most of the "electives" areas could not be explored adequately. If the number of students taking Art, Early Childhood Education, Fashion and Interior Design, and Industrial Arts had been larger, the predictive ability of these subject areas could be meaningfully compared to that of "academic" subject areas.

Explanations Requiring Testing by Further Research

1. Pre-September 1972 high school leavers earned higher grades in college than post-1972 students who started out with higher secondary school GPA's. The suggested reasons for these results were either their broad range of "essential" curricular background and/or higher academic standards in secondary school before liberalized graduation requirements.

Further testing would need to be carried out in order to confirm these explanations. It would be worthwhile to compare pre- and post-1972 groups according to various levels of high school GPA's to see if the relationships remain stable for high and low achievers.

2. Mature adult entries did better in college than young adults, irrespective of high school graduation, enrolment status, high school leaving date or sex. The "maturity factor" was given as the explanation, a factor encompassing motivation, clarified educational and career goals and life experiences. Data would need to be collected from students on entry into college regarding these elements to be able to determine similarities and differences between young and

mature entries.

3. Cumulative high school GPA's of students who left secondary school after September 1972 were more highly correlated with their subsequent college GPA's than were those of pre-1972 high school leavers. This increase was particularly large for full-time students.

The explanation for the large correlations of the post-1972 group was that liberal graduation requirements gave them the opportunity of spending up to 75% of their Grade 11 and 12 years in courses complementary with their interests, abilities and needs; presumably, college courses were chosen on the same basis.

Information collected from students as to the reasons for their course selections throughout college and high school would be necessary data to have for exploring the above explanation.

Questions Formulated as a Result of This Investigation

1. Part-time college students did not do as well as full-time students if they were young adult entries and/or male.

The explanations for the findings were open to conjecture because this variable had not been reviewed in the literature. Since attending to the part-time student and his needs is a mandate of the college, this researcher would be interested in investigating how the college deals with this mandate and what conclusions previous studies have reached.

The question raised by the finding is: What relationships exist among off-campus activities, "environmental press" and enrolment status as far as success in college is concerned?

Douglas College had campuses in five of its supporting school districts: New Westminster, Surrey, Richmond,Maple Ridge and Coquitlam.

Students attended one or more of these campuses, depending upon their programs. Therefore, it was unlikely that DC exerted an "environmental press" on students; rather, each campus "press" probably played a different role in the academic achievement of its respective students, although a central administration oversees all campuses. The impact of institutional characteristics could not be discussed in relation to a specific campus, for example, size of campus, faculty, other students attending and classroom and library facilities.

2. Academic achievement and number of courses taken in clusters in high school bore little relationship to college achievement in similar clusters. Cumulative high school GPA showed higher correlations with grades in all college clusters except English/Communications and Industrial Arts. The conclusion most easily drawn from this finding was that it did not really matter how well a student did in specific high school subject areas because overall high school academic achievement provided a better indication of future college success.

The question arising from these results is: Do high school students with similar high school GPA's do equally well in a given college program irrespective of the specific grades received and type of subjects taken in high school?

3. Sex, college entry age, enrolment status, high school leaving date and high school academic variables of New Westminster students were related to college success in varying degrees. How representative are the students in this study to high school students throughout the province? Do the above variables show similar relationships with academic achievement for students in other colleges?

4. The variable high school GPA was added to the predictors for the final regression analysis on the clusters. In all cases except English, high school GPA was a stronger predictor of college cluster GPA than were respective high school cluster GPA's. The increase in the R's of the Business and Social Sciences clusters was much larger than the increases for other clusters. The Recreation cluster produced a significant R for the first time.

Several questions emerged from these results: Why was English GPA a more accurate predictor of subsequent English achievement? Was it something to do with the procedure used to compute high school English cluster GPA's or the subjects included in the cluster? What variables does high school GPA represent which correspond to achievement in the seemingly unrelated subject areas of Business, Recreation and Social Science?

Methodology

There are aspects of sample selection procedures used in this study which limit full understanding of the data and interpretation of the results. The fact that the sample was in no way randomly selected made it unwise to extrapolate conclusions even to college students who did not have their New Westminster high school transcripts on file. In addition, the small sample size did not allow the meaningful investigation of relationships concerning "electives" clusters.

Consequently, a larger sample would be recommended should a similar study be conducted. It seems that the value of using a sample of students who all, essentially, graduated from the same high school, was counterbalanced by the small n's. Besides, it is unlikely that another school district in B.C. could be found that has only one high school, larger in size than New Westminster Secondary School. The use of more than one high school would introduce complications due to socio-economic status and other variables.

Summary

This study investigated the relationship of academic achievement and curricula in Grades 11 and 12 in high school, and other factors, to subsequent achievement at a community college.

British Columbia high school graduation requirements were changed in September 1972 which resulted in the removal of compulsory province-wide Grade 12 examinations, the introduction of more liberal course selection requirements and the promotion of locally developed curricula. Shortly afterwards, public concern was expressed that academic and curricular standards were diverging in the high schools and that grades earned there were no longer reliable predictors of future academic achievement. In addition, there was a concern that a high school education was not preparing students in certain areas of the traditional curriculum of the "essential" disciplines: English, mathematics, sciences, social sciences and second languages.

The "open door" policy of community colleges, unlike university admission requirements, provides individuals with easier access to post-secondary education, regardless of academic record. Almost half of college students did not select their high school courses with the intent of continuing their education and a large percentage never graduated from high school. The researcher anticipated that the findings of this study could be used to develop a predictive instrument which primarily used information from high school transcripts.

Expectancy tables would provide useful material for the educational decision-making of college students, their parents and friends.

The first major hypothesis explored the correlation between high school and college GPA's. This relationship was studied by grouping the data according to various factors: college entry age, number of years between high school and college, high school leaving date (pre- or post-September 1972) or completion of high school graduation requirements. The other major hypothesis involved the correlation between high school and college achievement in similar clusters of courses. All courses offered at the college and high school were alloted to one of ten clusters according to basic subject area--Art, Business, Early Childhood Education, English/Communications, Fashion and Interior Design, Humanities, Industrial Arts, Recreation, Science or Social Science. Changes in college cluster GPA's were investigated according to the number of courses a student had taken in corresponding high school clusters. The variables sex, college entry age and college enrolment status were considered for all hypotheses tested.

The sample of 643 subjects included students who attended all or part of Grades 11 and 12 at New Westminster secondary schools (NWSS) and subsequently completed course work at Douglas College (DC) between September 1970 and July 1977. T-tests, product-moment correlations and multiple regression analyses were the statistical procedures used. Although the differences between the GPA's of various groups tested were significant, they often were small relative to the standard deviations. Similarly, correlation coefficients were low with relatively large standard errors for the multiple correlation coefficients (R's).

Women did better than men at college, an advantage that diminished with increased college entry age. Part-time students did not do as well as their full-time counterparts, especially if they were young and/or male. Since particular concern for part-time enrolments is a mandate of the community college, hopefully explanations for these findings are already being explored.

There was a positive correlation between GPA's in high school and college. A "maturity factor" played a significant role in the academic achievement of college students. Mature entries and those who took at least two years "off" after high school earned higher grades. Lack of a high school diploma made little difference to the college success of mature entries, which was not the case for young entries. These results gave support to the college "open door" admissions policy. Further research was recommended on the components of the "maturity" (entry age) variable and the relationship between it and academic success.

Students who attended high school before the 1972 changes in graduation requirements did slightly better in college, despite the fact that their high school GPA's had been lower. The findings were attributed to variables in their high school background such as required basic preparation in "essential" curricula and/or a more "rigorous" high school experience with higher academic standards. Results of statistical tests pointed to a recent decline in academic standards at New Westminster Secondary School.

Correlations between high school and college GPA's were slightly higher for post-September 1972 high school leavers. This was attributed to the fact that this group of students had been able to select their high school program of studies mainly by interest, ability and need instead of by the pre-1972 restrictions and requirements. Presumably college programs were selected primarily on the former bases.

The variables used in the regression equations accounted for only 17 to 24% of the variance of grades in the college clusters of Business, English/Communications, Humanities, Recreation, Science and Social Science. Regressions were not run on four clusters due to insufficient numbers of subjects. Academic achievement in college clusters was not related to any great extent to either the grades received or the number of courses taken in corresponding high school clusters, for either pre- or post-1972 high school leavers. The suggestion that college entrance examinations be introduced to ensure minimal entry standards of preparation in "essential" curricula was not supported. Success in all college clusters tested, except English, was more closely related to high school GPA than it was to experience and/or grades in corresponding high school clusters. This implied that most patterns of high school courses were equally good college preparation, as long as certain thresholds of ability and past performance had been achieved.

BIBLIOGRAPHY

ASHCRAFT, ROCK. "High School Preparation and College Achievement." The School Counsellor, 16:4:268-271, March 1969.

ASHMORE, B. "High School Marks as Indicators of College Success." Journal of the American Association of Collegiate Registrars, 21:219-320, 1946.

ASTIN, ALEXANDER W. College Dropouts: A National Profile. ACE Research Reports: Vol. 7, No. 1, American Council on Education: Washington, D.C., February 1972. (ED 059 691)

ASTIN, ALEXANDER W. Predicting Academic Performance in College. New York: The Free Press, 1971.

ASTIN, ALEXANDER W. Preventing Students from Dropping Out. San Francisco: Jossey-Bass Publishers, 1975.

ASTIN, ALEXANDER W. Who Goes Where to College. Chicago: Science Research Associates, 1965.

BAIRD, L.L. "The Prediction of Grades in Occupation and Academic Curricula in Two-Year Colleges." Journal of Educational Measurement, 6:247-53, 1969.

BISTREICH, ALAN M. "Predicting Grade Point Average, Withdrawal and Graduation from Four Allied Health Programs at Miami-Dade Community College Medical Centre Campus." (Ed.D. Dissertation, Nova University, Florida), 1977. (ED 140 925)

BOUTELLE, MAURICE H. "Developing a Model for Predicting Success in Florida Community College Business Courses for Recent High School Graduates." (Ed.D. Dissertation, Nova University, Florida), 1975. (ED 135 441)

BROWN, F.G. AND WOLINS, L. "An Empirical Evaluation of the American College Testing Program." Personnel and Guidance Journal, 43: 451-456, 1965.

BYRNS, RUTH AND HENMON, V.A.C. "Educational Research and Statistics: Entrance Requirements and College Success." School and Society, 42:101-104, 1935.

CAMPBELL, GORDON. "Community Colleges in Canada." C.A.U.T. Bulletin, Vol. 23, No. 3, December 1974.

DELLAMATTIA, JEROME. "An Analysis of Student Performance and Persistence for Students Entering Douglas College in the Years 1973, 1974 and 1975." (Unpublished Masters Degree Thesis, Gonzaga Unviersity, Spokane, Washington), 1977.

DENNISON, JOHN D.; TUNNER, A.; JONES, GORDON AND FORRESTER, GLEN C. The Impact of Community Colleges: A Study of the College Concept in British Columbia. Vancouver, Canada: B.C. Research, 1975.

DOUGLASS, HARL R. "The Relation of High School Preparation and Certain Other Factors to Academic Success at the University of Oregon." University of Oregon Publications, Education Series III, September 1931.

"The Earmarks of College Success: A Causal-Comparative Study." Stevens Point Office of Institutional Research, Wisconsin University, June 1973.

FAGIN, MARGARET C. "Life Experience Has Academic Value: Analysis of the Performance of 319 Missouri Women on Three Examinations of the College Level Entrance Program." Paper presented at the Adult Education Research Conference, New York City, February 1971. (ED 047 219)

FELDSTEIN, DONALD. "Who Needs High School?" Social Policy, 5(1): 20-25, May-June 1974.

FERGUSON, M.A. "Adult Students in an Undergraduate University." Journal of College Student Personnel, 7:345-348, 1966.

FISHMAN, JOSHUA A. "Some Social-Psychological Theory for Selecting and Guiding College Students." In Nevitt Sanford (Ed.), The American College: A Psychological and Social Interpretation of the Higher Learning. New York: John Wiley and Sons, Inc., 1962, pp. 666-689.

FISHMAN, JOSHUA A. "Student Selection and Guidance." In Nevitt Sanford (Ed.), College and Character. New York: John Wiley and Sons, Inc., 1964.

FISHMAN, JOSHUA A. AND PASANELLA, A.K. "College Admission-Selection Studies." Review of Educational Research, 30:293-310, 1960.

GALLANT, THOMAS F. "Academic Achievement of College Freshmen and Its Relationship to Selected Aspects of the Student's Background." Dissertation Abstracts, 26:6468-6469, May 1966.

GARRETT, HARLEY F. "A Review and Interpretation of Investigations of Factors Related to Scholastic Success in Colleges." Journal of Experimental Education, 18:91-138, 1949.

GOLDMAN, ROY D. AND SEXTON, DENNIS W. "Archival Experiments with College Admission Policies." American Educational Research Journal, 11(2):195-210, Spring 1974.

GROSS, A.L.; FAGGEN, J. AND MCCARTHY, K. "The Differential Predictability of the College Performance of Males and Females." Educational and Psychological Measurement, 34:363-366, 1974.

HAMILTON, WILLIAM AND GOECKER, ALLAN. "Should I Take French, Physics or Vocational Agriculture?" Agricultural Education Magazine, 47(4):84-85, 1974.

HARRIS, D. "Factors Affecting College Grades." Psychology Bulletin, Vol. 37, 1940.

HOLLAND, JOHN L. AND ASTIN, ALEXANDER W. "The Prediction of the Academic, Artistic, Scientific, and Social Achievement of Undergraduates of Superior Scholastic Aptitude." Journal of Educational Psychology, 53:132-143, 1962.

HULL, DALE. "Maturity as a Variable in Predicting Academic Success." Columbia, Missouri: College of Education, Missouri University, 1970. (ED 045 039)

ICE, D.L. "An Analysis of the Academic Achievement of Adult Undergraduate Students in Language Arts Programs at Macomb Community College During the Academic Year 1968-1969." (PhD Dissertation, Michigan State University), 1971.

JUDY, CHESTER J. "A New Look at the High School Record as a Source of Information for Predicting College Achievement. A Final Report." U.S. Educational Resources Information Centre, 1975. (ED 105 335)

KELLY, D.A. "A Study of the Student Population at an Ontario College of Applied Arts and Technology between 1967 and 1969 with an Analysis of Factors Relating to Academic Success." (Unpublished PhD Thesis, University of Toronto), 1970.

LAVIN, DAVID E. The Prediction of Academic Performance. New York: Russell Sage Foundation, 1965.

LEONARD, PAUL T. "Can We Face the Evidence on College Entrance Requirements?" The School Review, 53(6):327-335, June 1945.

LIGHTFIELD, E.T. "They Do Come Back! Student Attrition at the Community College." August 1975. (ED 095 937)

LUNNEBORG, CLIFFORD E. Biographic Variables in Differential vs. Absolute Prediction. Unpublished report, University of Washington, March 1968, 8 pp.

LUNNEBORG, CLIFFORD E. AND LUNNEBORG, PATRICIA W. "Predicting Success in Community College Vocational Courses." Journal of Counselling Psychology, 16:353-357, 1969.

LUNNEBORG, PATRICIA W. "Longitudinal Criteria of College Achievement Predicted from Aptitude, Achievement and Interest Measures." Seattle: Washington University, Educational Assessment Centre, October 1975. (ED 117 149)

MALLINSON, GEORGE G. "Factors Affecting College Students' Achievement in Science. Final Report." Kalamazoo: Western Michigan University, February 1969. (ED 028 100)

MANN, NOEL R. "Predicting Mid-Term Grades for Science Students at Perkinston," Mississippi Gulf Coast Junior College, Perkinston, Mississippi, 1976. (ED 125 730)

MAXEY, E. JAMES; WIMPEY, LEE M.; FERGUSON, RICHARD L. AND HANSON, GARY R. Trends in the Academic Abilities, Background Characteristics and Educational and Vocational Plans of College-Bound Students: 1970-71 to 1974-75. ACT Research Report No. 74. Iowa City, Iowa: American College Testing Program, May 1976. (ED 141 390)

MEIER, ROBERT S.; MILLER, CAROL L. AND WILK, T. SCOTT. "Variables Related to Academic Success for Associate Degree Nursing Students." Paper presented at the Annual Meeting of the National Council of Measurement in Education, Washington, D.C., 1975. (Ed 111 834)

NICHOLS, ROBERT C. "Nonintellective Predictors of Achievement in College." Educational and Psychological Measurement, 26: 899-915, 1966.

NICHOLS, ROBERT C. AND HOLLAND, JOHN L. "Prediction of the First Year College Performance of High Aptitude Students." Psychological Monographs, 77(7): Whole No. 570, 1963.

PACE, ROBERT C. "Implications of Differences in Campus Atmosphere for Evaluation and Planning of College Programs." In R.L. Sutherland, W.H. Holtzman, E.A. Koile, and B.K. Smith (Eds.), Personality Factors on the College Campus: Review of a Symposium. Austin: The Hogg Foundation for Mental Health, 1962, pp. 43-61.

PENG, S.S. AND FETTERS, W.B. "College Student Withdrawal: A Motivational Problem." In J.P. Bailey, Jr. (Ed.), Symposium: Trends in Postsecondary Education. Papers presented at the Annual Meeting of the American Educational Research Association. New York, 1977, pp. 21-42. (ED 142 126)

REED, J.G. AND MURPHY, M.T. "Academic Performance of Mature Adults and Veterans." College and University, 51:129-144, 1975.

RICE, GARY A. AND SCOFIELD, WILLIAM. "A Contrast Between the 'Successful' and 'Dropout' Student at Yakima Valley College." Olympia, Washington: Washington State Board for Community College Education, March 1969. (ED 030 416)

RICHARDS, JAMES M., JR; HOLLAND, JOHN L. AND LUTZ, SANDRA W. "Prediction of Student Accomplishment in College." Journal of Educational Psychology, 58:343-355, 1967.

RICHARDS, JAMES M., JR. AND LUTZ, SANDRA W. Predicting Student Accomplishment in College from the ACT Assessment. ACT Research Report No 21. Iowa City, Iowa: American College Testing Program, August 1967.

RYAN, J.D. "A Comparison of the Academic Achievement of Adult and College-Age Junior College Full-Time Day Students." (PhD Dissertation, Wayne State University), 1969.

SANFORD, NEVITT. "Higher Education as a Field of Study." In Nevitt Sanford (Ed.), The American College: A Psychological and Social Interpretation of the Higher Learning. New York: John Wiley and Sons, Inc., 1962, pp. 31-73.

SEDLACEK, WILLIAM E. AND BROOKS, GLENWOOD C., JR. "Predictors of Academic Success for University Students in Special Programs." College Park: Maryland University, Cultural Study Center, 1972. (ED 073 222)

SELTZER, ROBERT A. "Prediction of Academic Success for Mature Students." Undergraduate Office of Admissions, Michigan University: Ann Arbor, February 1976. (ED 138 178)

SENSOR, P. "A Study of the Mature Women Attending Day Classes at Riverside City College During the Spring Semester, 1964." Riverside, California: Riverside City College, 1964. (ED 010 739)

SEXTON, DENNIS W. AND GOLDMAN, ROY D. "High School Transcript as a Set of 'Nonreactive' Measures for Predicting College Success and Major Field." Journal of Educational Psychology, 67(1): 30-37, 1975.

STERN, GEORGE C.; STEIN, MORRIS I. AND BLOOM, BENJAMIN S. Methods in Personality Assessment. Glencoe: The Free Press, 1956.

TINTO, VINCENT AND CULLEN, JOHN. "Dropout in Higher Education: A Review and Theoretical Synthesis of Recent Research." New York: Teachers College, Columbia University, 1973. (ED 078 802)

TRAVERS, ROBERT M.W. "Significant Research on the Prediction of Academic Success." In Wilma T. Donahue (Ed.), The Measurement of Student Adjustment and Achievement. Ann Arbor: University of Michigan Press, 1949, pp. 147-190.

TROUTMAN, JAMES G. "Predictors of Success in Freshman Mathematics." (Ed. D. Practicum, Nova University, Florida), 1977.

WEITZ, HENRY; CLARK, MARY AND JONES, ORA. "The Relationship Between Choice of a Major Field and Performance." Educational and Psychological Measurement, 15:28-38, 1955.

WILLIAMS, EIRIAN M. "An Investigation into the Value of High School Certificate Results in Predicting Performance in First Year University Examinations." British Journal of Educational Psychology, 20(2):83-98, June 1950.

WINSLOW, J.L. "The 1962-1967 College Study of San Diego Adult School Graduates." (M. Ed. Thesis, U.S. International University), 1968. (ED 035 809)

APPENDIX I

PRE-SEPTEMBER 1972 B.C. HIGH SCHOOL GRADUATION REQUIREMENTS

Guidelines to Academic and Technical Programmes

I. Academic and Technical Programme - Arts Specialty

A. General Education Constants

1. English 11
2. English 12
3. Social Studies 11
4. Physical Health Education & Guidance 11

B. Programme Constants

5. Mathematics 11
6. One of: Biology 11, Chemistry 11, Physics 11, Living Science 11 CS, Physical Science 11 CS.
7. One of: French 11, German 11, Latin 11, Spanish 11.

C. Programme Specialties

8. A minimum of <u>three</u> courses:
9. - of which at least <u>two</u> must be selected from English Literature 12, History 12, Geography 120 <u>or</u> Geography 12R, Mathematics 12, Biology 12, Chemistry 12, Physics 12, Geology 12 CS, French 12, German 12, Latin 12, Spanish 12.
10. - but of which <u>not more than one</u> may be selected from any one of the following seven groups:

   (a) French 12, German 12, Latin 12, Spanish 12
   * (b) History 12, Geography 120, <u>or</u> Geography 12R
   (c) English Literature 12
   (d) Mathematics 12, a Science 11 (Biology 11, Chemistry 11, Physics 11, Living Science 11 CS, Physical Science 11 CS, Physical Science 11 CS) not taken in B.6., a Science 12 (Biology 12, Chemistry 12, Physics 12, Geology 12 CS)
   (e) A Language 11 (French 11, German 11, Latin 11, Spanish 11) not taken in B.7., French 12, German 12, Latin 12, Spanish 12, Beginners' German 11, Beginners' Latin 11, Beginners' Russian 11, Beginners' Spanish 11, Beginners' Italian 11
   * (f) History 12, Geography 12 O, <u>or</u> Geography 12 R, Economics 11, Law 11 (not taken under (b) above).

(Appendix continued on next page)

(g) Art 12, Applied Design 12, Drawing & Painting 12, Commercial Design 12, Graphic Design 12, Band 12, Orchestra 12, Chorus 12, Musicianship 12, Instrumental Survey 12, Stagecraft 12, Acting 12, Writing & Directing 12, Visual Arts 12E, Visual Communication 12A(E), and 12B(E).

*If a candidate offers both Geography 12 O and Geography 12 R, accept one Geography 12 only (that one with the highest Final Grade) as a Specialty course and treat the second as an Elective.

II. Academic and Technical Programme - Sciences Specialty

A. General Education Constants

1. English 11
2. English 12
3. Social Studies 11
4. Physical Health Education & Guidance 11

B. Programme Constants

5. Mathematics 11
6. One of: Biology 11, Chemistry 11, Physics 11, Living Science 11 CS, Physical Science 11 CS.
7. One of: French 11, German 11, Latin 11, Spanish 11.

C. Programme Specialties

8. Mathematics 12
9. One of: Biology 12, Chemistry 12, Physics 12, Geography 12 CS.
10. One of: Biology 11, Chemistry 11, Physics 11, Living Science 11 CS, Physical Science 11 CS, Biology 12, Chemistry 12, Physics 12, Geology 12 CS, which has not been taken in fulfilling either B.6. or C.9. requirements.

III. Academic and Technical Programme - Technical (General) Specialty

A. General Education Constants

1. English 11
2. English 12
3. Social Studies 11
4. Physical Health Education & Guidance 11

B. Programme Constants

5. Mathematics 11

(Appendix continued on next page)

6. One of: Biology 11,
   Chemistry 11,
   Physics 11,
   Life Science 11 CS,
   Physical Science 11 CS.
7. One of:

   French 11,
   German 11,
   Latin 11,
   Spanish 11.

   Accounting 12,
   Bookkeeping 11,
   Bookkeeping 12,
   Business Machines 12,
   General Mathematics 11,
   Office Orientation 12,
   Office Practice 12,
   Shorthand 11A,
   Shorthand 11B,
   Shorthand 11E,
   Secretarial Practice 12,
   Typing 11.

   Construction 11,
   Construction 12A,
   Construction 12B,
   Draughting 11,
   Draughting 12,
   Electricity 11,
   Electricity 12,
   Electronics 12,
   Frame House Construction 11CS,
   Industrial Power 11,
   Industrial Science 12,
   Mechanics 11,
   Mechanics 12A,
   Mechanics 12B,
   Radio & Wireless 11 CS,
   Television 11E.

   Acting 11,
   Acting 12,
   Stagecraft 11,
   Stagecraft 12,
   Theatre 11,
   Visual Arts 11,
   Visual Arts 12,
   Visual Communication 12AE,
   Visual Communication 12BE,
   Writing 11,
   Writing & Directing 12.

   Child Care 12,
   Community Recreation 12,
   Foods 11,
   Foods 12A,
   Foods 12B,
   Home & Industrial Services 12,
   Management 11,
   Textiles 11,
   Textiles 12A,
   Textiles 12B.

   Applied Design 11,
   Applied Design 12,
   Art 11,
   Art 39 CS,
   Art 12,
   Commercial Design 11,
   Commercial Design 12,
   Drawing & Painting 11,
   Drawing & Painting 12,
   Graphic Design 11,
   Graphic Design 12.

   Band 11,
   Band 12,
   Chorus 11,
   Chorus 12,
   Instrumental Survey 11,
   Instrumental Survey 12,
   Musicianship 11,
   Musicianship 12,
   Orchestra 11,
   Orchestra 12.

   <u>Vocational</u>

   Automotive 11,
   Automotive 12,
   Carpentry 11,
   Carpentry 12,
   Draughting 11,
   Draughting 12,
   Electronics 11,
   Electronics 12,
   Foods 11,
   Foods 12,

(Appendix continued on next page)

Agriculture 11,
Agriculture 12,
Farm Mechanics 11,
Farm Mechanics 12,
Forestry 11E,
Forestry 11 CS.
Foundry 11,
Foundry 12,
Graphics Arts 11,
Graphic Arts 12,
Hairdressing 11,
Hairdressing 12,
Industrial Electricity 12,
Machine Shop 11,
Machine Shop 12,
Sheet Metal 11,
Sheet Metal 12,
Small Engine Repair 11,
Small Engine Repair 12,
Tailoring 11,
Tailoring 12.

C. Programme Specialties.

8. Mathematics 12
9. One of: Biology 12,
   Chemistry 12,
   Physics 12,
   Geology 12 CS.
10. One course other than a Foreign Language 11 (French 11, German 11, Latin 11, Spanish 11) named under B.7. but <u>not</u> used in fulfilling that Programme Constant requirement.

IV. <u>Academic and Technical Programme - Technical (Community Services) Specialty</u>

A. General Education Constants

1. English 11
2. English 12
3. Social Studies 11
4. Physical Health Education & Guidance 11

B. Programme Constants

5. Mathematics 11
6. One of: Biology 11,
   Chemistry 11,
   Physics 11,
   Living Science 11 CS,
   Physical Science 11 CS.
7. One of: Foods 11,
   Textiles 11,
   Management 11.

C. Programme Specialties

8. Mathematics 12
9. One of: Biology 12,
   Chemistry 12,
   Physics 12,
   Geology 12 CS.
10. One of: Foods 12A,
   Child Care 12,
   Textiles 12A.

(Appendix continued on next page)

V. Academic and Technical Programme - Technical (Commercial) Specialty

A. General Education Constants

1. English 11
2. English 12
3. Social Studies 11
4. Physical Health Education & Guidance 11

B. Programme Constants

5. Mathematics 11
6. One of: Biology 11, Chemistry 11, Living Science 11 CS, Physical Science 11 CS, Physica 11.
7. One of: Bookkeeping 11, Shorthand 11B.

C. Programme Specialties

8. Mathematics 12
9. One of: Accounting 12, Secretarial Practice 12.
10. One of: Economics 11, Law 11.

VI. Academic and Technical Programme - Technical (Visual & Performing Arts) Specialty

A. General Education Constants

1. English 11
2. English 12
3. Social Studies 11
4. Physical Health Education & Guidance 11

B. Programme Constants

5. Mathematics 11
6. One of: Biology 11, Chemistry 11, Physics 11, Living Science 11 CS, Physical Science 11 CS, French 11, German 11, Latin 11, Spanish 11.
7. One of: Art 11, Musicianship 11, Acting 11, Stagecraft 11, Art 39 CS, Writing 11.

C. Programme Specialties

8. One of: Biology 12, Chemistry 12, Physics 12, Geology 12 CS, French 12, German 12, Latin 12, Spanish 12.

(Appendix continued on next page)

9. One of: English Literature 12,
History 12.

10. One of: Art 12,
Applied Design 12,
Drawing & Painting 12,
Commercial Design 12,
Graphic Design 12,
Band 12,
Orchestra 12,
Chorus 12,
Musicianship 12,
Instrumental Survey 12,
Acting 12,
Stagecraft 12,
Writing & Directing 12,
Visual Arts 12,
Visual Communication 12AE,
Visual Communication 12BE.

APPENDIX II

POST-SEPTEMBER 1972 B.C. HIGH SCHOOL GRADUATION REQUIREMENTS

GRADE 11 AND 12 PROGRAMME

SELECTED STUDIES PROGRAMME

(a) EN 11 and EN 12.
(b) SS 11 and PHE 11.
(c) 4 courses from one group.
(d) 2 courses numbered 12 from the same group as in (c).
(e) 1 additional course numbered 12 from any group.
(f) 1-3 more courses from any group.

Total: 12-14

ALL STUDENTS TAKE: EN 11 SS 11
EN 12 PHE 11

COMBINED STUDIES PROGRAMME

(a) EN 11 and EN 12.
(b) SS 11 and PHE 11.
(c) 5-7 courses from any listed below.
(d) 3 courses numbered 12 from any listed below.

Total: 12-14

ARTS & SCIENCES		COMMERCIAL		INDUSTRIAL		COMMUNITY SERVICES		VISUAL & PERFORMING ARTS	
ALG 11	ALG 12	BK 11	AC 12	AUT 11	AUT 12A	CMA 11	CC 12	ACT 11	ACT 12
BI 11	ALG 12H	CMA 11	BK 12	CST 11A	AUT 12B	FD 11	CR 12	AD 11C	AD 12C
CANL 11	BI 12	MKT 11	BM 12	CST 11C	CST 12A	MGT 11	FD 12A	AD 11G	AD 12G
CH 11	CH 12	SH 11A	CO 12	DRF 11	CST 12B	MFL 11	FD 12B	AD 11P	AD 12P
CSC 11	FR 12	SH 11B	GB 12	DRF 11A	CST 12C	TX 11	TX 12A	AR 11	AR 12
EC 11	GEO 12	TY 11	OP 12	ELX 11A	DRF 12		TX 12B	BA 11	BA 12
FR 11	HI 12	TY 11B	SP 12	ELX 11C	ELX 12A		TX 12C	CHO 11	CD 12P
GER 11B	LIT 12			MX 11C	ELX 12B			CD 11P	DP 12
IT 11B	PH 12			MX 11D	MX 12D			DP 11	INS 12
JOU 11	ESC 11			MX 11E	MX 12C			GUIT 11	ORCH 12
LAW 11	FR 11C			TMA 11				INS 11	WD 12
PH 11	FR 12C							ORCH 11	ST 11
PST 11	WR 11							TH 11	ST 12
PSY 11									
SC 11									
SP 11B									

APPENDIX III

A LISTING OF NWSS AND DC COURSES BY CLUSTERS

Art (visual and performing): ART

applied design (ceramics, fabric arts, jewellry, photography, sculpture)
drawing and painting
film
music
theatre arts
writing and directing

Fashion and Interior Design: FAS

clothing and textiles
fashion design
fashion illustration
home management
interior design
pattern drafting

Business: BUS

accounting
advertising
bookkeeping
business machines
business management
consumer economics
economics
general business
housing management
marketing
recordkeeping
sales
secretarial

Humanities: HUM

history
languages
literature
philosophy
poetry
prose
religion
social studies

Early Childhood Education: FAM

child care
community services
daycare
foods and nutrition
health services
human and family development

Industrial Arts: IND

automotive
construction
drafting
electricity
electronics
mechanics
metalwork
plastic
welding
woodwork

English/Communications: ENG

communications
creative writing
English
expository writing
journalism

Recreation: REC

community recreation
physical education

(Appendix continued on next page)

Science: SCI

biology
chemistry
computer science
dentistry
earth science
fire science
geography
geology
mathematics
nursing
physics

Social Science: SSC

anthropology
criminology
law
political science
psychology
sociology

APPENDIX IV

NWSS AND DC GRADING SYSTEMS

New Westminster Secondary School

The grades and related percentage ranges given by NWSS teachers are quite close to those suggested by the B.C. Department of Education. This researcher assumes, therefore, that the range of grades that the following grade points represent have remained relatively stable over the past ten years.

Grade	Grade Point	NWSS Percentage Range	Percentage Range Suggested by B.C. Dept. of Education
A	4.0	86 - 100	86 - 100
B	3.0	72 - 85	73 - 85
C+	2.5	67 - 71	67 - 72
C	2.0	60 - 66	60 - 66
P (C-,D)	1.0	40 - 59	40 - 59
E	0.0	0 - 39	0 - 39

By far the majority of teachers at NWSS indicated they they did not use the normal curve to determine grades.

Douglas College[a]

Grade	Grade Point	Explanation
A	4.0	
B	3.0	
C	2.0	
P	1.0	
N	0.0	
W	Not calculated.	Withdrawn.
I	Not calculated.	Incomplete.

Instructors at DC are asked not to use a normal curve to determine the distribution of student grades.

[a]Douglas College Student Handbook 1977/78, page 20.

APPENDIX V

MULTIPLE REGRESSION ANALYSIS

The predictors for the first regression analysis were "high school cluster GPA", "number of courses taken in the cluster in high school", "age", "sex", "enrolment status", "high school leaving date" (pre- or post-September 1972) and "high school graduation". The first two variables were forced into the regression because they were the basis for the hypothesis. The other variables were entered, one at a time, according to which had the highest correlation with college cluster GPA. The amount of variance added to the total multiple correlation by each new variable was computed, thus it was possible to identify at which step adding additional variables contributed little to the total multiple correlation coefficient. The stepwise procedure identified the specific variables which contributed the highest amount of variance to the predictive equation. The "F to enter" and "F to remove" were set at the .95 level.

The second analysis was completed by the same procedure, except no variables were forced. High school GPA was added to the predictor variables in the third analysis with no forcing of variables.

Regression equations were developed to express the relationship between the variables. The equations were stated in the form: $Y' = b_1X_1 + ... + b_kX_k + a$, where Y' represented the predicted college cluster GPA, X represented the scores of the predictors, "a" was an intercept constant and "b" was the regression coefficient for each predictor. Regressions were checked for homoscedacicity by

(Appendix continued on next page)

producing scatterplots.

The accuracy of the predictions was reflected in the "errors of estimate" which were squared, totalled, then averaged to determine the variance. The square root of the variance was computed to determine the standard deviation which indicated how much confidence could be placed in the predictions.

The success of the various predictions was evaluated by correlating the predicted college cluster GPA's with the actual college cluster GPA's. The resulting number which was computed for each cluster is called R: the multiple correlation coefficient. R^2 is an estimate of the proportion of the variance of the college cluster GPA's accounted for by the independent variables/predictors.

The actual usefulness of the relationships was best indicated by the standard errors of the estimates and the absolute sizes of the multiple correlation coefficients.

APPENDIX VI

SUMMARY TABLE OF INTERCORRELATION MATRICES[a] OF PREDICTOR AND CRITERION VARIABLES, BY CLUSTERS, EXCLUDING DICHOTOMOUS VARIABLES

BUSINESS (N=100)

	No. of HS CRS	HS CLUST GPA	DC Entry Age	DC CLUST GPA	HS GPA
	1	2	3	4	5
#HS Courses	--	15	16	10	22
HS CLUST GPA		--	-11	25	64
DC Entry Age			--	-01	-19
DC CLUST GPA				--	43
HS GPA					--

ENGLISH/COMMUNICATIONS (N=282)

	1	2	3	4	5
#HS Courses	--	23	-06	06	22
HS CLUST GPA		--	-15	32	71
DC Entry Age			--	17	-17
DC CLUST GPA				--	25
HS GPA					--

HUMANITIES (N=394)

	1	2	3	4	5
#HS Courses	--	09	09	19	10
HS CLUST GPA		--	-06	34	77
DC Entry Age			--	-23	-12
DC CLUST GPA				--	36
HS GPA					--

[a]Numbers have been rounded to two decimal places and no decimals are shown.

(Appendix continued on next page)

Appendix VI. Continued.

	RECREATION (N=77)				
	No. of HS CRS	DC CLUST GPA	DC Entry Age	DC CLUST GPA	HS GPA
	1	2	3	4	5
#HS Courses	--	19	-12	08	09
HS CLUST GPA		--	-01	16	28
DC Entry Age			--	17	-06
DC CLUST GPA				--	31
HS GPA					--

	SCIENCE (N=373)				
	1	2	3	4	5
#HS Courses	--	24	-10	16	23
HS CLUST GPA		--	-12	35	79
DC Entry Age			--	11	-13
DC CLUST GPA				--	39
HS GPA					--

	SOCIAL SCIENCE (N=140)				
	1	2	3	4	5
#HS Courses	--	05	-04	-02	02
HS CLUST GPA		--	-13	20	65
DC Entry Age			--	15	-02
DC CLUST GPA				--	42
HS GPA					--

APPENDIX VII

SIGNIFICANT MULTIPLE PREDICTIONS WITH COLLEGE CLUSTER GPA'S AS CRITERION

Cluster	n	R	R^2	Regression Equation[a]	Correlation With Additional Variables					
					r	Rw/2[b]	Rw/3	Rw/4	Rw/5	Rw/6
Business	100	.31**	.09	1.09+.35CL+.22E	.25	.31				
English/ Comm'ns	282	.41**	.17	1.66+.52CL+.56A -.12S+.1E-.07Y	.32	.38	.40	.404	.41	
Humanities	394	.44**	.20	1.06+.38CL-.14S +.4A+.4G+.11C	.34	.38	.41	.43	.44	
Science	372	.46**	.21	1.24+.51CL+.22E +.53A-.15S+.07C -.1Y	.35	.39	.43	.44	.45	.46
Social Science	140	.36**	.13	2.29+.63G+.85A +.18CL-.12S	.24	.30	.34	.36		

[a]Independent (predictor) variables are denoted with letters: A is age upon entry into college (young adult = -1, mature adult = 1), C is number of courses taken in the cluster in high school, CL is high school cluster GPA, E is enrolment status (part-time = -1, full-time = 1), G is high school graduation (graduate = 1, non-graduate = -1), S is sex (M = 1, F = -1), and Y is high school leaving date (pre-September 1972 = -1, post-September 1972 = 1). The dependent variable is college cluster GPA.

[b]Rw/2 = Multiple correlation coefficient resulting when two variables are included in the equation.

**p<.01

APPENDIX VIII

SUMMARY TABLE OF SECONDARY STATISTICS OF SIGNIFICANT MULTIPLE REGRESSIONS WITH COLLEGE CLUSTER GPA'S AS CRITERION

Cluster	Final F	Degrees of Freedom (df)	First Table of Variables Not in the Equation		
			Variable[a]	Partial Correlations	F to Enter
Business	4.99**	2/97	C	.069	.47
			S	-.059	.34
			E	.175	3.06
			A	.023	.05
			G	.037	.13
			Y	-.075	.53
English/ Communications	11.01**	2/276	C	-.019	.10
			S	-.106	3.17
			E	.058	.95
			A	.228	15.22
			G	.021	.12
			Y	-.101	2.88
Humanities	19.05**	5/388	C	.174	12.22
			S	-.192	14.93
			E	.021	.17
			A	.168	11.29
			G	.137	7.52
			Y	-.067	1.75
Science	15.86**	6/365	C	.083	2.53
			S	-.098	3.60
			E	.197	14.86
			A	.167	10.59
			G	.003	.00
			Y	-.106	4.21
Social Science	4.86**	4/135	C	-.053	.39
			CL	.144	2.89
			S	-.161	3.62
			E	.038	.19
			A	.189	5.09
			Y	.031	.13

(Appendix continued on next page)

Appendix VIII. Continued.

---

[a]Independent (predictor) variables are denoted with letters: A is age upon entry into college, C is number of courses taken in the cluster in high school, CL is high school cluster GPA, E is enrolment status, G is high school graduation, S is sex and Y is high school leaving date. The dependent variable is college cluster GPA.

**p<.01

APPENDIX IX

SIGNIFICANT MULTIPLE PREDICTIONS WITH COLLEGE CLUSTER GPA'S AS CRITERION, INCLUDING HIGH SCHOOL GPA AS A PREDICTOR.

Cluster	n	R	R^2	Regression[a] Equation	Correlation With Additional Variables r	Rw/2[b]	Rw/3	Rw/4	Rw/5	Rw/6
Business	100	.48**	.23	-.07+1.04H-.17Y +.18E+.25A	.43	.46	.47	.48		
English/ Comm'ns	282	.41**	.17	1.46+.41CL+.56A -.12S+.1E-.09Y +.22H	.32	.38	.40	.403	.408	.41
Humanities	394	.46**	.21	.79+.34H+.41A +.1C-.13S+.31G -.22CL-.06Y	.36	.40	.43	.44	.45	.457*
									*Rw/7	.46
Recreation	77	.42**	.18	2.2+.56H-.24S +.57A	.31	.38	.42			
Science	372	.49**	.24	.77+.57H+.2E +.55A-.11Y+.05C -.1S+.16CL	.39	.43	.465	.47	.475	.48*
									*Rw/7	.49
Social Science	140	.42**	.18	1.3+.91H+.63A -.12S-.14CL	.42	.45	.46	.47		

[a]Independent (predictor) variables are denoted with letters: A is age upon entry into DC (young adult = -1, mature adult = 1), C is number of courses taken in the cluster in high school, CL is high school cluster GPA, E is enrolment status (part-time = -1, full-time = 1), G is high school graduation (graduate = 1, non-graduate = -1), H is high school GPA, S is sex (M = 1, F = -1), and Y is high school leaving date (pre-September 1972 = -1, post-September 1972 = 1). The dependent variable is college cluster GPA.

[b]Rw/2 = Multiple correlation coefficient resulting when two variables are included in the equation.

**p<.01

APPENDIX X

SUMMARY TABLE OF SECONDARY STATISTICS OF SIGNIFICANT MULTIPLE REGRESSIONS WITH COLLEGE CLUSTER GPA'S AS CRITERION, INCLUDING HIGH SCHOOL GPA AS A PREDICTOR.

Cluster	Final F	Degrees of Freedom (df)	First Table of Variables Not in the Equation		
			Variable[a]	Partial Correlations	F to Enter
Business	7.18**	4/95	C	.010	.01
			CL	-.031	.09
			S	.054	.28
			E	.122	1.47
			A	.091	.82
			G	-.064	.40
			Y	-.177	3.12
English/ Communications	9.45**	6/275	C	-.019	.10
			S	-.016	3.17
			E	.058	.95
			A	.228	15.22
			G	.021	.12
			Y	-.010	2.88
			H	.043	.52
Humanities	17.04**	7/386	C	.168	11.38
			CL	.013	4.18
			S	-.153	9.41
			E	.016	.10
			A	.193	15.13
			G	.096	3.66
			Y	-.084	2.75
Recreation	5.22**	3/73	C	.051	.19
			CL	.080	.48
			S	-.236	4.36
			E	.084	.52
			A	.194	2.88
			G	-.076	.43
			Y	.086	.55

(Appendix continued on next page)

Appendix X. Continued.

Cluster	Final F	Degrees of Freedom (df)	First Table of Variables Not in the Equation		
			Variable[a]	Partial Correlations	F to Enter
Science	15.98**	7/364	C	.077	2.18
			CL	.062	1.40
			S	-.050	.92
			E	.185	13.12
			A	.178	12.13
			G	-.042	.65
			Y	-.127	6.02
Social Science	9.58**	3/135	C	-.033	.15
			CL	-.111	1.71
			S	-.131	2.38
			E	-.031	.13
			A	.178	4.50
			G	.047	.30
			Y	-.012	.02

[a]Independent (predictor) variables are denoted with letters: A is age upon entry into college, C is number of courses taken in the cluster in high school, CL is high school cluster GPA, E is enrolment status, G is high school graduation, H if high school GPA, S is sex and Y is high school leaving date. The dependent variable is college cluster GPA.

**p<.01