

THE UNIVERSITY OF MANITOBA

PREDICTING SUCCESS IN A COMMUNITY
COLLEGE NURSING PROGRAM

by

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ABSTRACT

This study investigated the factors predicting success in a diploma nursing program in a community college, using data routinely collected on all students enrolled in the program. A comprehensive review of the literature included topics such as recent trends in nursing education, characteristics of community college students compared to other post-secondary students, and methods of assessing characteristics useful in the prediction of success.

The study showed a high degree of relationship among scores in the program, but a low degree of relationship among pre-admission scores and scores achieved in the program. Grade point averages, scores in nursing tests, and scores in science tests were the best predictors, as measured by final grade point averages.

It was concluded that post-admission factors predicted success more accurately than did pre-admission factors.

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TABLE OF CONTENTS

	Page
ABSTRACT	iii
ACKNOWLEDGEMENTS	iv
LIST OF TABLES	ix
FIGURE	xi
Chapter	
1 INTRODUCTION	1
A. GLOSSARY OF TERMS	4
B. HISTORY AND BACKGROUND	6
Traditional nursing education	6
Current trends in nursing education	7
Trends towards education	7
Trends towards diversity	7
Trends towards individualization	7
Significance of trends	8
C. PRESENT STUDY	8
Data	9
Justification	9
D. PRESENT PROGRAMS IN MANITOBA	9
E. MARN RECOMMENDATIONS	11
F. SUMMARY	14
2 REVIEW OF THE LITERATURE	16
A. TRENDS IN NURSING	16
Ladder concept	16
Multiple exit programs	16
Licensure based programs	18
vocational to technical	18

Chapter		Page
	technical to professional	21
	Advanced placement	24
	Open curricula	27
	Individualization	30
	Types of programs	31
	Move to educational institutions	36
	Reports advocating college education	36
	Examples of college programs	37
	Situation in Manitoba	40
B.	COMMUNITY COLLEGES	41
	Purpose	41
	Students	41
C.	PREDICTION OF SUCCESS	48
	Problem	48
	Criteria	50
	Knowledge of career	50
	Interest inventories	51
	Academic achievement	52
	Culture and language tests	53
	Reading and study skills tests	56
	Multiple criteria	64
D.	MATCHING STUDENT CHARACTERISTICS AND TEACHING METHODS	70
	Purpose	70
	Survey of the literature	70
3	THE INVESTIGATION	76

Chapter	Page
Problem	76
Setting	76
Population	77
Sample	77
Types of data	78
Groups	78
Variables	79
Group I	80
Group II	81
Group III	84
Group IV	85
4 ANALYSIS	86
Statistics chosen	87
Statistical hypotheses	87
Group I	87
Group II	88
Group III	89
Group IV	89
5 RESULTS	92
6 DISCUSSION AND CONCLUSIONS	125
Group I	126
Group II	128
Group III	130
Group IV	132
REFERENCES	135
	142

Chapter	Page
APPENDICES	
APPENDIX	
A	Learning Activities Opinionnaire 150
	Summary of Student responses and Scattergrams for Class 1976 and 1977
B	Author's Description of SPSS Multiple Regression 157
	Program

LIST OF TABLES

Table	Page
1 Teachers in Schools of Nursing	13
2 Summary of Characteristics of Students Enrolled in Nursing at RRCC in 1975	46
3 Comparison between the results of Dr. Neil Russel's study in 1975 of over 6000 students and the students enrolled in nursing in 1975.	47
4 Summary of Hypotheses for the Four Groups.	91
5 Summary of Data for Four Groups Listed in Descending order of Significance	94
6 Mean, Standard Deviation, and Number of Cases for Group I	95
7 Correlation Co-efficients for Variables for Group I	96
8 Statistically Significant Correlations in Order of Magnitude Group I	97
9 Summary of the Multiple Regression Analysis of Factors Predicting GPA4 Group I	98
10 Summary of the Multiple Regression Analysis of Factors Predicting RN's Group I	99
11 Mean, Standard Deviation and Number of Cases for Group II	101
12 Correlation Co-efficients for Variables for Group II	102
13 Correlations in order of Magnitude Group II	104
14 Summary of Multiple Regression Analysis for the Prediction of GPAT1 Group II	107

15	Summary of Multiple Regression Analysis for the Prediction of GPAT2.. Group II	108
16	Summary of Multiple Regression Analysis for the Prediction of GPAT3 Group II	109
17	Means, Standard Deviation, and Numbers of Cases for Variables for Group III	112
18	Correlation co-efficients for Variables for Group III	113
19	Statistically Significant Correlations in order of Magnitude Group III	115
20	Summary of Multiple Regression Analysis for the Prediction of GPAT1 Group III	116
21	Summary of Multiple Regression Analysis for the Prediction of GPAT2 Group III	117
22	Means, Standard Deviations, and Numbers of Cases for Variables for Group IV	119
23	Correlation Co-efficients for Variables for Group IV	120
24	Statistically Significant Correlations in Order of Magnitude Group IV	122
25	Summary of Multiple Regression Analysis for the Prediction of GPAT1 Group IV	123
26	Summary of Multiple Regression Analysis for the Prediction of GPAT2 Group II	124

FIGURE

Figure		Page
1	Selection Procedure Proposed by Mrs. V. Wood.	65

CHAPTER 1

INTRODUCTION

Nursing education has undergone many changes over the years. There have been changes in purpose, changes in method and changes in personnel. The problem of determining who is likely to succeed in a nursing program has not been solved.

The purpose of this study is to determine what conclusions can be drawn from previous research in the area of prediction of success in educational programs, then to see which information routinely gathered on nursing students is useful in predicting success at a community college.

At present a great deal of time and money is spent on collecting this information and no one is systematically using it, either to predict success, or to indicate which students will probably require early remediation. If data routinely collected is an accurate predictor of success it would be advantageous to both the student and the college to use it for this purpose. If it is not an accurate predictor, other data which does predict success, should be gathered.

The review of the literature includes studies of schools of nursing which have undergone major changes. Included in these reports are summaries of social forces that prompted the changes, descriptions of programs, methods of evaluation, and where available, factors used to predict success. These studies were included in the present study for two reasons:

1. They provide background information for the interpretation of changes occurring at Red River Community College (RRCC), the setting for the present study.

2. They provide information on prediction of success in other programs. Methods found effective in other programs might be used, or modified, to predict success in the nursing programs at RRCC.

The review of the literature suggested a variety of ways of predicting success in nursing. These suggestions formed the basis for the formulation of the research hypotheses.

These are the basic questions to be asked in this study.

1. Can data routinely collected about students be used to predict success in the course?
2. Are pre-admission data good predictors of success?
3. Are post-admission data good predictors of success?
4. Does the Learning Preference Inventory add to the accuracy of prediction?
5. Is there a degree of relationship among the various types of information?

It was the writer's expectation that these questions would be answered positively.

Three consecutive groups of students enrolled in the nursing program at RRCC served as the population for this study. Variables analyzed included pre-admission scores, post-admission scores, and a Learning Preference Inventory.

LIMITATIONS OF THE STUDY

1. Data were obtained at one community college hence

application should be made with caution in other areas.

2. The entire class was the sample in each group thus was subject to the same admission policies, program of studies and method of evaluation. As only the students who completed the term were included in the study, there was no evaluation made of the students who withdrew from the program prior to the end of the term.

3. There was no uniformity in the reported school grades as each school had the authority to grade according to its own policies.

4. Limited data were available for comparison of all three groups as admission policies, programs of study and methods of evaluation changed slightly each year. It would be preferable to have no change in admission policy, program or evaluation for a number of years so that a longitudinal study could be made. All students within a group were subject to the same conditions, thus can serve as their own control.

Throughout this paper certain terms will be used which are unique to nursing or to general education, but which may be interpreted in a variety of ways. To avoid confusion, the meanings intended by this author are outlined in a glossary. Terms are listed not in alphabetical order, but in natural groupings.

GLOSSARY OF TERMS

- 1 COMMUNITY COLLEGE--A post-secondary educational institution which has as its primary function the teaching of technical skills rather than the preparation for advanced studies.
- 2 SEQUENTIAL STUDENT--A student who entered post-secondary education directly from high school.
- 3 NON-SEQUENTIAL STUDENT--A student who did not enter post-secondary education directly from High School but engaged in some other activity such as employment, travel, raising a family, or whatever and then entered a post-secondary education program.
- 4 REGISTERED NURSE (RN)--A person who has successfully completed the registration examinations and is in good standing with the provincial nurses association. The RN may be a graduate of a diploma program in a hospital or college or a graduate of a baccalaureate program at a university.
- 5 LICENSED PRACTICAL NURSE (LPN)--A person who has successfully completed the LPN examinations and is in good standing with the provincial association. The LPN is a graduate of a one-year certificate program. Some areas refer to the LPN as a Licensed Vocational Nurse (LVN) or as a Certified Nursing Assistant (CNA).
- 6 PROFESSIONAL NURSE--In this paper the term is used to indicate a nurse who has earned a university degree. No reference is made to competency or membership in a

professional association.

- 7 TECHNICAL NURSE--is a RN who has a diploma in nursing but not a degree. No reference is made to competency or to membership in a professional association.

A HISTORY AND BACKGROUND

In its report "Nursing Education: a Challenge and a Change" the Manitoba Association of Registered Nurses (MARN) (1976) outlines factors to be considered in nursing education. It refers to the responsibility of a professional group to a community in this way:

Any professional group providing a service to society must continuously assess the total milieu in which it practices if its educational programs are to continue to be relevant to the needs and desires of the population to be served. (p. 27)

The report analyzes several aspects of life in Manitoba and concludes that we live in a rapidly changing technological society which requires new skills and new organizations which demand interdependence in a horizontal structure rather than compliance in a hierarchial structure. The implication of these statements is that people will have to be prepared to function in new ways. This in turn will mean changes in the educational programs used to prepare them for their functions in the new organizations.

Traditional Nursing Education

Historically, hospitals, organized as a military hierarchy, conducted their own schools to provide nurses for their own staff. The MARN report summarizes this practice as follows:

With respect to education, the apprenticeship system was the mode and the quality or degree of excellence of the program depended on the school's and the hospital's

teaching and clinical resources, the goals of the program depended on the hospital's institutional needs and the philosophy upon the set of beliefs and assumptions congruent with and stemming from the unique, small society. (p 101)

Thus each institution prepared its nurses in its own way with little regard for quality control or common purpose. This situation was not unique to Manitoba but was common practice in North America.

B Current Trends in Nursing Education

There are three trends occurring in nursing education at the present time.

Trend Towards Education

The first trend is an emphasis on education rather than on training. This trend is manifested in two ways: the movement of schools of nursing into educational institutions from health care institutions and an increased emphasis on career mobility within the health field.

Trend Towards Diversity

The second trend is towards an increased diversity of student. An increasing number of non-sequential students with a variety of life experiences are entering nursing programs; furthermore, these students are entering with a wide variety of admission credentials.

Trend Towards Individualization

The third trend is towards the individualization of courses in terms of content, length, and method of presenta-

tion. Students have options on courses they take, especially if they enrol in colleges or universities. Some are part-time students who work or care for their families while they study, hence take a longer time to complete the program of studies. Some courses are set up to offer flexibility in time and approach.

Significance of trends

What is the significance of these changes to nursing educators? They must provide a diverse student population with the opportunity to learn skills required to become effective practitioners, and to do so with minimum waste of human and material resources. The prediction of probability of success in a particular field of endeavour is of interest and importance not only to the individual contemplating the career, but also the group providing the training or education, and the consumer--the society that benefits from his skills and pays the bills. Payne (1967) claims that while society must limit the number of people assigned to any one activity it must do so in such a way that the overall needs of both the group and the individual are met. What, then, is the best way of selecting nursing students?

C. PRESENT STUDY

This study will look at three groups of nursing students enrolled in the diploma program at Red River Community College (RRCC) to determine which data routinely collected are most useful in predicting success in the program as measured by end-of-term test scores.

Data

Three categories of data were collected.

1. Data obtained from the standard admission form sent to all applicants. This includes name, age, address and part-time or full-time status.
2. Supplementary data requested by the department of nursing prior to admission. This included information about education, length of time out of school, employment, and reading scores.
3. Data collected by the school subsequent to admission, such as test scores, grade point averages, and Learning Preference Inventory scores.

Justification of study

If data routinely collected are useful in predicting success or in identifying areas requiring remediation it could be used for that purpose. If not, data that are useful should be collected and the present admission requirements altered. Traditionally, high school grades have been the major determinant of both admission and prediction. However many non-sequential students have not completed high school or have done so many years ago. Is any of the data we routinely collect useful in predicting success for these students?

A number of studies have been done in Manitoba which have identified characteristics of nonsequential students, but none based on data routinely collected.

D PRESENT PROGRAMS IN MANITOBA

Four types of nursing programs are in existence in

Manitoba today.

1. A four year university program leads to a baccalaureate degree. In this paper this graduate is referred to as a professional nurse. On completion of the program she is eligible to write registration examinations (RNs) and practise as a registered nurse.
2. The technical nurse is prepared in a two year program conducted in either a community college or in a hospital-based school. Graduates from these programs are also eligible to write RNs and to practise as registered nurses. This is the present version of the traditional nurses training program.
3. Registered Psychiatric nurses complete a two-year program in one of the three large mental health care institutions in Manitoba. These programs, unique to Western Canada, were designed to meet the staffing needs of the large custodial care institutions for the mentally ill and the retarded. At the completion of the program the graduate is eligible to write provincial registration examinations and work in mental health areas. These graduates may be accepted into a diploma program for registered nurses with either challenge options or advance placement, to complete requirements for registration in about one year.
4. Licensed Practical nurses enrol in a one year program sponsored jointly by the Department of Education and Health. Graduates are eligible to write licensure examinations and practise as LPNs. Graduates from these programs may also

receive some credit should they enrol in a diploma program.

Functions of Nurses

The professional nurse is prepared to work independently and interdependently in a variety of settings either in institutions or elsewhere in the community. The technical nurse, primarily an employee of an institution, is prepared to function in a more structured setting. RPNs are employed in mental health care settings either in an institution or in the community, while the LPN must work under the supervision of an RN or a doctor. While in theory the categories are clearly defined, in practice there is less clarity with nurses either under employed or required to function well beyond their knowledge and skills.

Numerous health workers receive on-the-job training to enable them to perform specific skills. Recently a program has been devised for nurses aides and home-care workers. Most on-the-job training is unique to the area, hence does not receive recognition elsewhere.

There is at the time of this thesis' defence no masters program in nursing in Manitoba although one is in the planning stage.

E MARN RECOMMENDATION 1968.

MARN (1968) advocated that both professional and technical nurses be prepared. As the community colleges were not yet firmly established it was recommended that hospital based programs be shortened and improved. Methods recommended included the removal of the service component,

pooling of resources, and the encouragement of teachers to improve their credentials. The recommended pooling of resources did not materialize. The programs, however, were shortened and improved to emphasize education rather than service. The qualification of teachers has changed as is shown by Table I.

The qualifications of teachers had changed as is shown in Table I (p.13). In 1968 MARN recommended that all teachers in schools of nursing in Manitoba have a degree by 1972. In 1973 sixty-five teachers had only a diploma. Table I indicates the numbers of teachers with degrees in 1968, the proposed number for 1973, and the actual number for 1973. The number of teachers with a baccalaureate degree in 1973 was approximately double the proposed figure. One reason for this was the increased enrolment in the baccalaureate nursing program in Manitoba. The number of teachers holding a masters degree was much smaller than proposed, as no masters program in nursing was available in Manitoba. Teachers were compelled to resign their positions and seek education elsewhere. While nurses were encouraged to seek more education, sabbatical leaves were not available. Most nurses prepared at the masters or doctorate level were employed by the university.

Need for Change

The MARN report (1976) summarizes traditional nursing education as

the hospital apprenticeship program which prepared practitioners to function in a dependent role in an

TABLE 1
TEACHERS IN SCHOOLS OF NURSING

Criterion	1968	1973	
		proposed	actual
Bachelors degree	33	77	145
Masters degree	4	11	2

institutional setting....The major focus in such a traditional setting was the provision of care in episodes of illness. (p.138)

The report goes on to outline changes in the community that make the preparation of a more flexible practitioner mandatory. This same sentiment is expressed by Lalonde (1974) and the Manitoba Health Organizations (1978). The spiralling cost of health care is a major factor in the search for better ways to keep the population healthy.

F SUMMARY OF FACTORS AFFECTING NURSING EDUCATION

Lenberg (1975) outlines events in the history of education that lead to changes in educational format and requirements. She notes that Charles Eliot in 1874 introduced the concept of student choice in curriculum, with the subsequent development of the major-minor system. The trend toward part-time and adult studies gained impetus following the Second World War, when veterans, now students, demanded more meaningful programs of study. Attitudes toward minority groups, including women, gradually changed. She cites authors (p.6) who emphasize the trend towards "teaching problem solving rather than facts and theories." The advent of technological developments in audio-visual areas has made diverse teaching methods possible.

Factors that have influenced nursing education directly are changes in the attitude of society towards women, helping professions, and students. Availability of increasingly sophisticated equipment and more adequately prepared teachers

has led towards increased flexibility and diversity in this education.

Predicted Student Profile

Lenberg (1975) predicts the enrolment of increasing numbers of older students. She divides them into these three main groups:

1. Students preparing for a second career;
2. Students whose child-rearing duties are diminished to the point where they can attend school;
3. Returning servicemen.

She also points out that declining birth rates will further reduce the number of generic students while changes in job descriptions will send increasing numbers of older students back to college. She warns that colleges will have to adjust to this new clientele with greater diversity of program and approach. She suggests a shift from teacher-centered to student-centered learning, recognition of differences in learning styles, individualization of programs and competency-based evaluation. She quotes Cross (1973)

Education is beginning to face the challenge of measuring education as a quality of the individual rather than as an offering of the institution. (p.18)

There is a definite trend towards extending the definition of education from the traditional practice of assessing the number of credits from an institution to the acknowledgment of serious study wherever it occurs.

CHAPTER 2

REVIEW OF THE LITERATURE

A TRENDS IN NURSING

Lenberg (1975) has compiled abstracts of changes in curricula in schools of nursing in the United States. Two trends predominate--ladder concept and individualization. As Canadian schools are following the American example an examination of these trends is pertinent to this study.

LADDER CONCEPT

The ladder concept as it applies to nursing means that a student can enter a program at the vocational level, complete the program and be licensed as an LPN, or progress to the technical or professional level. The intent is to prepare people for gainful employment at various levels while providing them with the opportunity to advance their education with a minimum of repetition. Each school has developed its own way of doing this.

EXAMPLES OF LADDER CONCEPT PROGRAMS

A Multiple exit programs

A Multiple exit program is one in which all students enter at the same place but have the option of graduating in one year as vocational nurses or in two years as technical nurses.

1. EVERETT COLLEGE

Everett College in Washington has developed a ladder program whereby all students may be admitted to the course

but only those with an A or B standing are permitted to proceed to the second level. Jeanne Irving (1975) lists the advantages of her program:

1. It provides a more flexible approach to teaching;
2. Evaluations are more objective;
3. The opportunity exists for licensure and gainful employment at the end of one year;
4. The opportunity exists for further study without undue repetition or red tape.

She selects her candidates very carefully, especially on the basis of marks. Mrs. Irving, in her role as an adviser to schools of nursing in Manitoba, was one of the first to introduce the concept of multiple exit programs to Manitoba.

2. FERRIS STATE COLLEGE

Sherrod (1975), at Ferris State College in Michigan, admits all students to the same program, preferring those that have "demonstrated success with college preparatory classes in High School." She teaches nursing in the first year of a two-year program thus enabling students to write licensing examinations then adds science, humanities and leadership skills in the second year. Her statistics indicate that her students do well in the national examinations and receive satisfactory employment records. Her policy of teaching skills in the first year and rationale in the second is a major departure from common practice which tends to combine the two.

3. IOWA STATE

One of the first career-ladder programs was established

at Iowa State. Story (1974) in Iowa also admits all students to the same program where they proceed together for the first three quarters of the year. Students then are streamed into two groups--those who complete the vocational program and those who choose to go on to the technical level. Those who choose to complete the vocational program must complete the fourth quarter of the preparatory term before they can go on to the technical level. The first year of this program emphasizes facts and skills; the second provides rationale for nursing action. The college has an open door policy, hence teachers recommend remedial studies prior to admission but they cannot make them compulsory. They use National League of Nursing tests as screening devices but do not refuse those who fail. They have an extensive challenge system for those with previous education or experience.

B LICENSURE-BASED PROGRAMS--vocational to technical

Licensure based programs have graduation from a previous program as an admission requirement.

1. Helene Fuld School

One of the first to do this was the Helene Fuld School in New York City which established a vocational to technical program in 1964. Ahl (1975) states that the primary motive for the establishment of this school was the need for qualified staff for the hospital. This hospital, located in the heart of Harlem, had a school for vocational nurses but were unable to attract technical or professional nurses.

Interested staff members were chosen on the basis of previous

academic achievement, current licensure, and a satisfactory work record. These prospective students were further screened by means of psychological tests and interviews. Deficiencies noted required remediation prior to admission. Although licensure was mandatory only those nurses who had high scores and a fairly stable home situation were chosen. Attrition rates and examination results compared favorably with other schools in spite of the multiple problems faced by many of the students. Questionnaires sent to graduates and employers indicated satisfaction with the preparation provided by the program. A multisensory laboratory, individualized programs, and a well prepared faculty assisted the students to develop sound study habits to make maximum use of the limited time available to them. This is an example of a school that carefully assessed the characteristics of its students and prepared accordingly.

2. Buck-County-Grandview

Jean McClusky (1975) describes the program at Buck County--Grandview in rural Pennsylvania which developed in response to a need expressed by the community for the advancement of vocational nurses to the technical level, without undue repetition. An analysis of the vocational program revealed deficits in background required to make the type of decisions expected of the technical nurse. This program used audio-visual materials prepared by Telestar Productions in St. Paul, Minn. to provide the science background, and the LEGS (Learning Experience Guide for Student Nurses, Sherwood and Roe (1970)

for the nursing component. A multi-sensory lab, well stocked library, and well prepared staff enabled students to progress individually within a reasonable period of time. Although licensure as a vocational nurse was a prerequisite to admission, only those students with a complete secondary school diploma or its equivalent were admitted. Furthermore, they chose only those students with a high score on the licensure examination. In addition, satisfactory work and health record were required along with satisfactory scores on personality and achievement tests. For those with acceptable scores in all these areas, references and personal interviews completed the admission procedure. Those who did not meet the standards were advised to seek remediation before applying again. McClusky indicated the initial frustration of both student and staff stemmed from a heavy work load, testing for data the teachers thought the student should know instead of that which was included in the objectives, and resistance to self-learning by those used to the lecture method. However, students did well on the registration exams. The frustration experienced by this school is reported by others as well. (Irving (1975), Schmidt (1975), Ahl (1975)).

3. Santa Ana

Nancy Cheng (1975) of Santa Ana College in California describes the program there. As with the previously described programs, this one was devised in response to the needs expressed by the community for technical nurses and the availability of vocational nurses who wished to advance their

education. The college believed in preparing a few well qualified graduates rather than a larger number of "marginal" ones, hence were selective in their candidates. In addition to the requirements outlined by McClusky, Santa Ana required the evidence of a satisfactorily completed college course if the applicant had been out of school for longer than five years. Again licensure was required but only the most able candidates were selected. It is interesting to note here that RRCC requires evidence of recent study for candidates who have been out of school for some time.

The programs described by Ahl, McClusky and Cheng were developed in widely differing settings but had several features in common--an expressed need, an assessment of previous programs and required skills, a carefully selected student body and faculty and a flexible teaching approach based upon multiple teaching methods. Although licensure was required, not every vocational nurse was admitted. The reports of the three multiple-exit programs were among the first read by RRCC personnel, hence have influenced the development of the program at that college.

C. LICENSURE BASED PROGRAMS--TECHNICAL TO PROFESSIONAL

Career mobility has also been provided for the technical nurse who wishes to advance to the professional level.

1. Governors State University

Taylor (1975) describes the program at Governors State University in Illinois designed to meet the expressed need of technical nurses in the area for advanced preparation without

undue repetition. She describes the philosophy of the university thus:

The university and its programs have been deliberately structured with a high degree of flexibility to allow for change, individualization, and involvement. (p. 175)

The college permits the granting of equivalency for life or other educational experiences in place of formal courses at the university. Evaluation is based on demonstrated ability in an area. As there is no fixed curriculum, students have a wide choice of content, sequence, and method of learning. An analysis of student characteristics was included: the mean age was thirty-five, most were married and employed, just under half were full time students and just under half were from "racial minority groups". Most had been out of school for, at least, five years. Acceptance of the program has been slow by the academic community but greeted with enthusiasm by the employers. Nurses in Manitoba have requested easier access to University credit for past experience. To date challenge exams have provided one way to achieve this.

2. Florida International University

Knowles and Thomas (1975) describe the program at Florida International University in Miami which was developed in response to the demands of technical nurses to provide a program whereby they could earn a degree without repeating courses. Admission was restricted to technical nurses. A challenge system was in operation whereby students could

obtain college credit without formally taking a course. Faculty members were chosen on the basis of their expertise and their willingness to be innovative. Input was provided by a community advisory committee, prospective students who were asked for their perceived learning needs, and an analysis of expected outcomes. Teachers were seen as learning catalysts and students as independent thinkers. As 80% of the students were listed as part-time and 90% were employed in nursing while they were studying, a flexible time frame was provided. They planned to have the entire nursing program available on an evening and week-end basis. Courses were offered in three locations to make them more accessible to the students. Evidence of satisfaction had been in the form of satisfactory employer reports and admission of graduates from this program to graduate school. In Manitoba, a more rigid time frame is in effect.

3. C. W. Post College

Monck (1975) in her description of the program in C. W. Post College in New York indicated that the whole program could be completed during the evening and on week-ends. A feasibility study indicated the need for such a program. A proficiency examination indicated basic knowledge had been acquired prior to admission. A course was then designed to provide the knowledge and skills required for professional practice. The only admission criterion specified was current registration. As the program was very new no evaluation was available. Some thought has been given to an evening program

at RRCC, but lack of demand for this service has placed it low on the list of priorities.

D. Advance placement via Challenge examinations.

Another approach to career mobility is advance placement. The usual approach is to have the student write challenging examinations to be eligible for credit. Either teacher-made or standardized tests have been used. At the time of this study, RRCC grants blanket credit for some nursing education and requires the writing of challenge exams for others.

1. Lindsay Hopkins Educational Centre in downtown Miami, Florida, permits advance placement in its vocational program for those who have had some kind of health education or experience. (Botwinik, 1975). They evaluate students on paper-and-pencil tests and on clinical evaluations. Two main problems were encountered: resistance to individualized study by both teachers and students and the students inability to read.

2. Evanston Hospital School of Nursing, Illinois, attempted to teach their students to learn independently. They admitted students with varied backgrounds-generic, vocational nurses, corpsmen, slow students, and rapid learners. The program was carefully set up to allow students maximum choice of sequence, method and time of learning without permitting them to repeat endlessly. All students, regardless of previous experience, were required to complete all units of study but could do so rapidly if they were able. Beyers (1975) comments on the learning methods:

The most important factor in the selection of learning activities seems to be the individual's perception of the most direct route to mastering the objective... Evidence is increasing that personal goals play a more important role in the rate of acceleration than do learning ability or aptitude. (P. 224)

RRCC permits some flexibility of time, but all students complete all the objectives.

3. Hocking Technical College opened in the Appalachian section of Ohio at the time that the closing of the coal mines meant unemployment and poverty for the area. Initially a school for vocational nurses was developed according to the very limiting regulations of the state's association. Later, as restrictions were lifted, a more flexible program which could be expanded to a technical level was devised. A year later they started an associate degree program which included courses required by the state's nurses association as well as those required by the college for a degree. Incentive for the latter program was provided by the demands of vocational nurses in the areas for the opportunity to advance their education, the need for their services in the community and the availability of government money. Students entering the college at this time were given a battery of tests with the option of remedial work in reading, spelling, and arithmetic. Students entering the technical program were also given the opportunity for advance placement by challenging courses. Success of the

project was attributed to careful planning of specific objectives, appropriate testing, and community involvement. Manitoba has progressed through similar stages in the restrictions imposed by licensing bodies.

4. Russell Sage College in New York developed its credit granting process in a different way. (Andruskiw and Koffman, 1975). Technical nurses had been granted blanket credit for a degree for a long time. It was the bright students in the 1960's who advocated a challenge system that would permit students of diverse backgrounds and experiences to receive credit. An extensive counselling service was developed to ensure students were taking the right course sequence as they moved from part-time to full-time status and from the day to the evening division. Because of the extensive challenge system, there was great diversity among the students in terms of age, previous experience, part-time and full-time status, and interest. Faculty tried to keep this in mind. Students at RRCC can move from part-time to full-time status. Credit for past experience is granted where it is deemed appropriate.

5. University of Wisconsin

The University of Wisconsin in Milwaukee had a more positive experience in their attempt to provide a ladder from the technical to the professional to the masters and doctoral degrees in both a research and a practice-oriented program (Hinsvark 1975). They were planning to use available standardized tests to facilitate advance placement, then a variety of teaching methods to permit the students to choose

how they wished to learn. One unique feature was a course available on closed circuit television three times a day in twelve locations in the city so that students who were employed could study at their convenience and still receive credit. This program had not been operating long enough to be properly evaluated. Interest has been expressed by Manitoba nurses for a career ladder from the technical to the professional level. At the time of this writing, there were no plans for this type of program.

The programs mentioned all granted credit for previous learning or experience or both either by a system of challenging tests, or the granting of blanket credit, or a combination of the two. They have all emphasized the need for counselling and diverse teaching methods.

E. Other open curricula

Other versions of open curricula stress multiple entries as well as multiple exits. The programs described by Sherrod (1975) and Story (1974) have been cited.

1. Pasadena City College

Davidson (1975) describes the program at Pasadena City College as a

modular approach to nursing content, based on the admission assessment that permits individuals to begin where they are on the learning continuum with the option of pacing, sequencing or scrambling to different modules. (p.291)

She stresses the difference between an open curriculum

which permits the student to select appropriate learning situations and an open door policy which permits students to enrol in programs for which they are not suited. Standardized tests were used to determine student competency at each level, then those who fail must seek remediation before they proceed to the next module. As a method of interesting new students and orienting those who plan to enter, a one credit course in the history and development of nursing is offered to the community each year. In conclusion, she emphasized the need to know the student, to have faculty and administrative support and to set up a comprehensive plan for the whole project. One advantage of multiple pathways is the distribution of stress on any one facility.

2. Southern Illinois University

The Southern Illinois University at Carbondale had a different approach (Pratt and Rosenbarg, 1975). They admitted students to the technical program only if they had met the requirements of the first year elsewhere. The intent of the program was to provide the poverty stricken area with competent health workers at minimum cost. As their students came with varied backgrounds, they provided a flexible program that permitted students to progress rapidly, or to correct deficiencies by progressing through "modularized, individualized instructional units based on extensive task analysis" placed in the various colleges involved in the program. Early reports were encouraging. This approach would not be feasible at RRCC as no junior college feeds into it. However, some thought

has been given to a pre-nursing course which would serve a number of the following functions:

- (a) Provide an orientation to study for those who have been out of school for some time.
- (b) Provide a time for out-of-town students to become accustomed to the city and to the college.
- (c) Act as a screening process for students not suited to the course for what ever reason.
- (d) Provide background in science and the humanities.

3. Orange County-Long Beach

Wallace, Stroesler and Maples (1975) outline a very comprehensive program whereby a person could progress from a nurses aide program to a doctoral degree with a minimum of repetition. It also provided for work opportunities along the way. The plan also permitted those who started elsewhere to obtain credit through a challenge system. This plan is in the early formulation stage, but gives an indication of what could be done.

The review of studies compiled by Lenberg includes reports from rural, urban and suburban areas, from rich and poor parts of the United States, from private colleges such as Russell Sage, to community colleges and universities. In each study an attempt had been made to meet an expressed need of the community for a particular kind of nurse, to look at the characteristics of students seeking admission, then to set up a program that will do this efficiently and effectively. Many of the programs are too new to have valid assessments made.

At the time of the writing of this paper, RRCC had made limited attempts to provide career mobility in nursing. The certificate program for LPNs and the diploma program for RNs were administered as two separate programs. Students transferring from one program to the other were assessed on an individual basis and granted credit accordingly. Students entering the RN program from other schools were also assessed on an individual basis. A new program was being planned which would qualify the student to write licensing examinations at the end of one year, and registration examinations at the end of the second year. In addition, students with previous nursing education are to be assessed for both academic and technical skills. Credit or remedial instruction is to be given on the basis of this assessment. It is hoped by the planners that this program will provide a greater degree of career mobility.

INDIVIDUALIZATION

The second major trend in nursing education is towards individualization. One reason for this is that classes are becoming increasingly more heterogeneous. Instead of trying to match student characteristics with teaching methods students are presented with a variety of teaching methods from which they may choose. A second reason is the change of strategy in the school system. Although the MARN (1976) position paper points out that it would be naive to "expect students to prefer anything but passive lecturing for the next few years" the trend is for more independent study and access to a variety of educational materials--audio-visual, printed,

and concrete.

The definition of individualization varies. Some use the term to denote a program tailor-made for a specific student. Others refer to "packaged learning" that provides objectives, learning options, and a method of evaluation. Some packages include assumptions about entrance behaviour, others place this at the beginning of the whole course. One of the main advantages of packaged learning is that it forces teachers to look critically at what they are teaching and how they are doing it. It is reported that objectives become more specific, tests are prepared on time, learning resources are explored and the whole is co-ordinated.

TYPES OF PROGRAMS

Cardarelli (1972) calls these packages LAPS--Learning Activity Packages and suggests the following format: Topic, sub-topic, rationale, behavioural objectives, pretest, activities, self-evaluation and post-test. She also recommends teacher inservice on the subject before such a project is undertaken.

Feild and Svenson (1972) call them Unipacs. They add a few components: instructions for the selection of activities, a guide for the student who is having problems, quest or extra activities for the student who would like to explore the topic further, and a field test to see if the student can apply what he has learned.

Easley and Witz (1972) urge caution in the use of packages for young children as the perception of these children,

based on Piagetian interviews, is quite different from that of the adults who constructed the package.

Borg (1972) describes mini-courses intended to teach teachers to use learning packages. These courses are designed especially to teach teachers to be more flexible. The format of the mini-courses is much like that of other packaged learning.

Howell (1972) calls them Tulsa-pacs as he works in Tulsa. Other authors indicate their packages are prepared by teachers but Tulsa-pacs are prepared for teachers by the supervisors. The components of his packages are: curriculum objectives, program content and sequence, means of evaluation and contemporary trends. The purpose of the package is to evaluate the teacher and the teaching. RRCC has a package to teach students how to use the learning packages used at the college.

Fraze (1972) outlines the methodological basis for constructing individualized programs. He cautions that students and teachers must be oriented to the method before the program is initiated. He suggests a variety of teaching material be available, the teacher must be available for personalized instruction and the student be permitted to work at his own pace.

Smith (1972) in his discussion of "Laps" stresses the importance of testing prerequisite material and for providing for self-evaluation as well as teacher evaluation. He also suggests a contract for time for the student who needs more structure.

Bolvin (1972) outlines the goals of individualized instruction. He also outlines, very specifically, steps in the preparation of individualized programs emphasizing the need for adequate pretesting and specific objectives. He feels individualization is a positive step but Nichols (1972) disagrees. He feels it is more important at this time to stress similarities in students rather than differences. His main argument is that the use of programmed material, packages and computers tend to dehumanize teaching which should be spontaneous and personal.

Beyers, Diekelman and Thompson (1972) describe the change in their program from a traditional, fixed-sequence, lecture approach to a flexible program where self-study was the norm. Courses were divided into units and levels. They emphasize that the various auto-tutorial materials were "tools to facilitate learning not ends in themselves." One such tool was a video-tape micro-teaching unit. They selected the medium to reflect the objective to be taught--a movie to study skills requiring motion. They stressed the importance of orientation for both student and teacher. In addition to the use of a variety of audio-visual material, group sessions, clinical practice, and seminars were used.

Stein, Steele, Fuller and Longhoff (1972) report a study undertaken to determine which experience in a multi-media independent study program provided benefit to the student. Rather than employing the descriptive approach of the other authors they tried to be more objective. They

matched students in control and experimental groups, retained large group methods for the control and auto-tutorial methods for the experimental groups. They found the experimental group to be more enthusiastic and involved, however on the final examination both groups scored equally well. There was also no reduction in student teacher hours. It seemed a more pleasant way to learn, but not more effective in improving test scores.

Kapfer (1969) stresses the need for real options in learning methods by assuring equal access to learning materials. He suggests a systems package which includes a pre-test, behavioural objectives, list of available teaching media, self-test, and a post-test based on the objectives. He recommends the availability of advanced study for those who wish to do so. He warns that teachers tend to retain group teaching unless they actively participate in the preparation of the learning packages.

Woodrow (1973) outlines the experience at a community college in Ontario. It was also concluded that individualized instruction had both advantages and disadvantages. Students were evaluated by means of criterion-based rather than norm-based tests; teachers looked more carefully at objectives and test items. Students, particularly those with perception and attention problems could select the media most appropriate for them. He warns that "non-starters" must be spotted early, teacher assistance must be available, and every attempt must be made to avoid depersonalization.

The Diploma Nursing program at RRCC refers to their packages as modules. A typical module has the following components:

1. A statement of rationale--why is this material included in the course.
2. The pre-requisites to the module and the general format.
3. A pretest of pre-requisite material and suggestions for remedial work if necessary.
4. Behavioural objectives.
5. Learning options.
6. Material included only if it is not readily available from texts or the audio-visual department.
7. A criterion-referenced self-test.

The department has set up a multi-sensory laboratory where a variety of materials are available to the student. Students could, for example, read about a skill, view a film, obtain concrete objects with which to practise the skill, video-tape their performance when they thought they had mastered the skill and present the tape for evaluation. Teachers are available in the area to assist as requested but the rate and sequence of learning is left to the student.

Definitions and formats of individualized study differ from one place to the next, but a common trend is evident. The student must have specific objectives, a variety of ways of meeting these objectives and a test based on the same objectives. Repeated warnings are uttered that both teachers and students must be oriented to the method if individualized

instruction is to be effective.

MOVE TO EDUCATIONAL INSTITUTIONS

The present trend in North America is to educate nurses in colleges and universities rather than to train them in health service institutions. Precedence for this can be found in the writings of Florence Nightengale (1859) who advocated a school, financially and administratively independent of a hospital, where the education of the student was the main concern. She outlined a specific curriculum, based largely upon data she had collected about sanitation, hygiene and interpersonal relationships. Nursing leaders in the United States chose not to follow this precedent but to establish apprenticeship programs in hospitals instead. Canada did the same.

Duncanson (1970) traces the development of the diploma nursing program in relation to the demands of society from recorded history to the present, concluding that hospital owned and controlled programs might have served a purpose at one time, but that nursing education now belongs in educational institutions under educational auspices.

REPORTS ADVOCATING COLLEGE EDUCATION

Three Canadian reports advocated the placement of nursing education in educational institutions.

1. Weir report

Weir (1932) published his "Survey of nursing education in Canada" in which he recommended nursing education be placed in educational institutions where education of the nurse rather

than service to the patient was of prime importance. His report was shelved.

2. Lord report

Lord (1952) investigated the Metropolitan School of Nursing in Windsor, the first in Canada to demonstrate that an independent school with control of the students time and education could produce a nurse who could function in society and that this school could do it in less time. Unfortunately, when the funds from the Canadian Nurses Association and the Red Cross were expended, the school was closed as no further financial support was forthcoming.

3. Royal Commission on Health Services

In 1964 this group reiterated the recommendation that nursing education be part of the general stream of education, funded by the Department of Education.

EXAMPLES OF COLLEGE PROGRAMS IN CANADA

The number of nursing programs in colleges has been increasing in the last decade. Some originated in colleges and others were transferred from hospitals.

1. Ryerson Polytechnical Institute

Action has been taken on this recommendation since 1964 when Ryerson Polytechnical Institute started the first diploma nursing program in Canada to be organized within a college. Allen and Reidy (1971) report that the graduate of this program was more independent and responsible for her own actions than the traditional hospital nurse, but was less sure of routines and less willing to do all manner of chores.

They felt the college nurse was able to adapt to change more readily, was more skilled in communication, judgement and application of knowledge. They felt these attributes were essential to the nurse of the future.

2. Humber College

Barras (1975) outlines the transfer of St. Joseph's School of Nursing to Humber College: the first nursing program in Ontario to be moved from a hospital to a community college. They transferred much of the program's philosophy, faculty, curriculum and admission requirements to the college on the understanding that the hospital school would be phased out. She points out that differences in the interpretation of policies between the nursing faculty and the college presented some problems. The college accepted, on a first-come first-served basis, all those who met basic requirements, while the nurses were accustomed to select the best students only. The result of college policy was a high attrition rate and a subsequent change of policy to permit greater selectivity on the basis of personal and academic data, as obtained from high school records and the Kuder Personal Preference Test. A mature student test, previously used in the college, was used to assess those who qualified as mature students. In the evaluation at the end of the first year the faculty recognized the need for identifying the characteristics of students who could achieve success in the program. They correlated high school marks with grades achieved at the college and marks received in the registration examinations. They found high

school marks, especially science marks, to have the greatest degree of positive relationship with success in the program, but found no such relationship between either high school marks or college marks and the RN results, except in senior nursing subjects. They did note the relationship between nursing grades and work assessments, but concluded that factors other than high school grades or college marks influence RN results. They concluded that a review of admission policies as well as methods of teaching and evaluation be made with the intent of reducing the attrition both within the college program and in the RNs. Subsequent changes in the program included increased academic requirements for admission, sharing of courses with other health sciences in the college, a decrease in the general education component, greater affiliation with other colleges and a decreased affiliation with St. Joseph's. Barras attributes the relative ease of transfer to a college setting to the support of administration at the college in meeting the unique needs of the nursing program and the willingness of the nursing faculty to adapt to the college setting.

The movement to the colleges accelerated when the province of Quebec in 1967 opened the first program in the "CEGEPS" (Association of Nurses of the Province of Quebec 1972). In 1972, all nursing programs in Quebec were transferred from hospitals to forty nursing options in the community colleges. By 1972, forty-nine colleges in Canada had nursing courses. This figure took another big jump in 1973 when Ontario transferred all diploma programs, both

regional and hospital, into their Colleges of Applied Arts and Technology. This made the changeover complete in three provinces--Ontario, Quebec and Saskatchewan.

STATUS OF NURSING EDUCATION IN MANITOBA

Nursing educators in Manitoba have also advocated the transfer of Diploma nursing programs to educational institutions. In 1966, the brief presented to the Ministers Committee on the Supply of Nurses by MARN supported the recommendation for the transfer of nursing education to general education. (MARN, 1966). When no action took place following that report, nursing committees were formed to study ways in which that may be done. One reason why the change was not implemented was that community colleges were in their infancy at that time in Manitoba. The nursing program at RRCC was established in 1970 when the Victoria Hospital closed its school. Each hospital school in Manitoba independently revised its program, reducing service components and seeking alternate means of financing. Although this was an improvement, it left nursing divided, with a variety of associations, legal bodies and lines of communication. Another problem is the availability of clinical facilities for practice. The University of Manitoba is presently completing a report on the use of clinical facilities in Manitoba.

A number of reports advocate that nursing education be placed in educational institutions rather than health service institutions. While other provinces have done so completely or to a large extent, in Manitoba diploma schools of nursing

are still largely located in and controlled by hospitals.

B COMMUNITY COLLEGES

Definition: Monroe (1972) reviews the history and development of the community college as an intermediate step between the high school and the university, an institution with the express purpose of providing an educational opportunity for a diverse population. He predicts the increasing cost of education will increase the popularity of the community college. The RRCC calendar for 1977-1979 states as its philosophy that "every individual...has the right to further education in accordance with his aptitudes, abilities and needs." It states that its role in this area is to provide students with the necessary knowledge and skills to earn a living; to develop interpersonal skills and to foster a spirit of responsibility. In the United States, some community colleges provide the first two years of a four-year university program. Most of the courses at RRCC are complete unto themselves. Unlike American community colleges, RRCC is not an intermediary between high school and the universities.

COMMUNITY COLLEGE STUDENTS

Koos (1970) describes the community college student in the United States. He reports the predominant group is in the 17-20 year old range, but a significant minority are older adults, often enrolled as part-time students. He cites studies to refute the argument that mental development ceases at sixteen but rather progresses indefinitely, especially the ability to synthesize data. Hence the provision of adult education

is reasonable. He identifies the two major problems of the community college student as the inability to read, write, and manipulate numbers and the inability to study effectively. He warns that community colleges can expect a wide spread in the abilities of their students as age and background are diverse. He cites reasons for students selecting a community college rather than a university as economic and absence of definite career plans. Most colleges surveyed had counselling both for career and for personal problems and for academic remediation. Koos summarized his findings in this way:

Guidance as a purpose of the junior college... has grown... Among the kinds of evidence (for this need) are the wide variation of aptitude, the larger proportion with academic disabilities, the wider variation in personal attitudes and traits, the need for help in selecting careers and avocational concerns, and the prevalence of problems that spread over the full range of life and living. The need is inherent in the first two years in any institution but is greatly augmented in the comprehensive community college which has the most diversified offering of institutions operating at this level at the same time as its policy of open-dooredness admits students of the widest range of abilities, characteristics and interests. (p. 549)

Prystupa (1969) surveyed and analyzed selected back-



ground factors influencing a student's decision to attend the Manitoba Institute of Technology, the forerunner of RRCC. His analysis of the results of the questionnaire administered to first year technology students revealed that rural youth and girls were under-represented, that teachers, parents and peers subtly erect barriers to "high status educational goals" (including the institute). Furthermore, counsellors and teachers hold negative attitudes towards technical education. Review of the literature revealed few studies in what was then a new field of technical education. No Manitoba study was cited. Prystupa recommended further studies be done in this area.

Beckman (1977) conducted a study of students in Manitoba who had indicated they had planned to pursue post-secondary education, but had, in fact, not done so. He devised a questionnaire which was sent to all non-studying students who could be located. In summary, this is what he found: the largest number came from the rural areas, their fathers were either farmers or blue-collar workers with less than high school education, they tended to be older children in large families with adequate high school grades. Most expected to remain out of school for a year, then return. Students tended to be ambivalent--they were undecided about the future, tired of school, had a job, or needed to earn money. There was no evidence of active discouragement from either teachers or parents. Only slightly greater emphasis was placed on education by those who had enrolled in post-

secondary education and those who did not. They tended to have a job other than the one they had intended hence significant numbers were dissatisfied with their present job. He noted similar results for non-sequential students as for those that failed to return to school. Post-secondary experience did not meet with expectations, hence they were likely to change jobs or go back to school. One half of the students reached indicated possibility of further studies, mostly in the next few years. Almost half indicated they intended to go to RRCC, evenly distributed in all departments. About half the students who indicated they were planning to return to school indicated they would attend remedial classes if they were offered. Most students felt counselling services in the schools had been adequate. On the basis of this study, one could expect a number of students to return to school once they had earned the necessary money and made their choice of career. These students could be expected to be as able as those who entered directly from high school and perhaps more motivated.

Willman (1976) looks at community college nursing students as "the most diverse group with which we have ever had to deal." She emphasizes the change from a conservative, rural, homogeneous group to a heterogeneous group differing widely in age, ability, motivation, background and life style. She points out that students tend to be older, have the responsibility of a home and a job, are more aggressive, creative, and independent. For many nursing is a second career.

Some are returning to school when children are less dependent or when circumstances demand they support a family. Part-time study is the only viable option for some. Willman's observations tend to coincide with the ones made at RRCC.

A computer printout of data collected on all nursing students attending RRCC in 1975 revealed the following information listed in Table 2. One hundred and fifty students were enrolled at the time the data were collected. The summary reveals a heterogeneous group.

Characteristics of the students in the hospital-based school where the writer had previously taught, differed in a number of ways. Most of the students were just under or just over the age of twenty who had enrolled in the program directly from high school. About half came from Winnipeg, the rest from rural Manitoba. No more than 10% of the students were in the so-called "high risk" category which included older students, those with financial and personal problems, and those with border-line academic or linguistic achievements. This student body was a much more homogeneous group. The computer does not store data on financial status or academic achievement so no direct comparison can be made on those characteristics.

An abstract of a report prepared by Dr. Neil Russel in 1975 included information on sequential and non-sequential students. Table 3 shows a comparison between the results of his study of over 6000 students and the students enrolled in nursing in 1975.

TABLE 2

Summary of Characteristics of Students Enrolled in
Nursing at RRCC in 1975

SCHOOL ATTENDANCE

63 attended school the year prior to admission
58 had been out of school for less than five years
29 had been out of school for more than five years;
of these 10 had been out for more than ten years
and six had been out for more than twenty years.

AGE

43 were under twenty
107 were over twenty. Of these 9 were over forty.

GEOGRAPHIC DISTRIBUTION

124 were from Winnipeg
26 other than Winnipeg, mostly rural Manitoba.

MARITAL STATUS

110 were single
28 were married
1 was widowed
11 were separated or divorced

TABLE 3

Comparison between the results of Dr. Neil Russel's study in 1975 of over 6000 students and the students enrolled in nursing in 1975

CRITERION	RUSSEL	NURSES
Age	61% of non-sequential were 20-24 years old	61% of non-sequential were 24 years or less
Sex	65% of non-sequential were male	6 males altogether or 10%
Marital Status	70% non-sequential were single	61% non-sequential were single

The results were similar for age and marital status. Very few males enrol in nursing, as this was traditionally considered a feminine career. Dr. Russel presented other data for which no data were readily available for comparison. He stated 80% were full-time students, which was a figure similar to nursing. He stated 77% had completed Grade XII. The entrance requirement for nursing was Grade XII or qualification as a mature student. Although exact data on the educational achievement of the mature student were not available, conversation with the students revealed that many of them did not complete high school, or completed it a long time ago. Further he stated that the average parental income was about \$8,000.00 annually. A number of the mature students were the heads of single parent families whose only income was welfare. Russel stated half the students apply for student aid and 60% were sponsored by Manpower. As students enrolled in nursing were largely women who had not previously been in the labour force, and as nursing was a two-year program, there were no Manpower students enrolled. The one area of agreement was that females between the ages of 20-29 were uncertain about financing their education. In essence the data compiled by Russel supported the work of Koos, and as far as data were available, were similar to nursing at RRCC.

C PREDICTION OF SUCCESS

THE PROBLEM

Attempts to predict success in an area have varied with time, the researcher and the task to be done. Success in a

field is rewarding in terms of approval of the group, a feeling of accomplishment, and often financial reward. Failure means rejection, loss of self esteem, time, and money. A number of studies have been made on the prediction of success both in the community colleges and in nursing schools. Some will be cited here.

In his analysis of the characteristics of community college students Monroe (1972) cites studies on predictions of success and attributes of students. He states that three main factors influence students to drop out: academic ability, degree of motivation, and money. He concludes that mental ability scores, unless very low, have no predictive value, as lack of academic ability accounts for only one-third of the drop-outs. Lack of goals and the need for status account for the rest. He quotes Trent and Medsker (1968) who say authoritarian students respond best to encouragement, and Katz (1968) and Sommerskill (1967) who stress compatibility between the goals of the student and the goals of the institution, with less conventional students tending to drop out. Monroe also quotes a study by Chickering (1968) who suggests students who drop out are not unmotivated, they are just motivated to do something else.

A number of studies on the prediction of success in nursing have been done. Owen and Feldhusen (1970) state "there is an urgent need to improve the prediction of academic achievement on nursing education." They state screening should be done both to improve selection and to provide

early remediation. Lavin (1965) speaks of the problems of admission officers who must make sure that the "students they select will do better than the ones they exclude." Increasing numbers of applicants make this an increasingly difficult task, as not only are numbers increasing, but qualifications are as well. While authorities agree that prediction is imperative there is no agreement on which tools give the most reliable results. Lavin speaks to one problem:

Much of the present inconsistency in findings may be due to the possibility that measures with the same conceptual label are really dissimilar...Clearly what is needed is a greater standardization in the use of predictor measures. (p. 36)

CRITERIA

A variety of criteria have been used as predictors of success. The ones most frequently cited in the literature will be reviewed.

1. Knowledge of the career

One criterion that has been used is the reason why the student chose the career and how much he knows about it.

Henry Ford, as quoted by Lowe and Childers (1962) states

Still a young man trying to decide on a career needs help. And some of the most practical help he can get when he is in this period of indecision comes from the experienced man in the different career fields he is considering.

Students come to us with a varying degree of knowledge of what they are getting into. Some have worked in health agencies such as hospitals hence know the practical aspects of the career. Others have spoken to nurses in various fields, coming to us with their various views. Others speak to students presently enrolled in the course, where they are persuaded that a great amount of study is required. This is often in contrast to the information presented by teachers and school counsellors who tend to give the students the impression that relatively little study is involved. Harlequin romance books are the authority for some. Dislike for the program, usually by those with limited knowledge of the career prior to admission, is a major cause for withdrawal in our school.

2. Use of Preference and Interest Inventories

Mowbray and Taylor (1967) used the Kuder Preference Record and Strong Vocational Interest Blank to determine trends in reasons for withdrawal other than academic failure. They found a high interest in science in those who succeeded. The Strong test differentiated between success and failure but the Kuder Social Services index was the strongest single factor. They summed it up this way:

This finding suggests that even though a scientific interest may be helpful to the student in terms of her academic work, the over-riding determinant of adjustment to nursing schools is the social service orientation. (p. 78)

They found using both the Strong and the Kuder was a duplication, hence dropped the Strong and retained the Kuder which was useful as well for remediation. It was also helpful in counselling students unsuited to nursing. Ruiz (1967) found no positive degree of relationship between MMPI and RN results. The biographical data sheet was not significant except for those who ranked themselves in the top quarter in high school. These students had higher scores in the final examinations. Further he found no positive degree of relationship between rank in class and RN results. He did find that measures of intellectual potential were the best predictor.

Payne (1968) quotes Sarbin:

Factors such as interest, inferred level of aspiration, and personality traits, as measured in this experiment appear not to be related to achievement in college. As a complement to actuarial predictions the clinical predictions add nothing. (p. 245)

He goes on to say that statistical methods are easier to use and are, at least, as reliable.

3. Academic achievement

School grades, both at the high school and post-secondary level, have been used as predictors of success. Papcum (1971) found a high degree of relationship between National League of Nursing Achievement Tests which were written at the end of a course, and the State Board Registration Examinations. They found this information particularly

helpful for remediation and as a motivation for study. Sarbin noted that the final high school mark was the best predictor for RN results. Payne (1968) sums up the conclusions of studies reviewed:

From the standpoint of the admission officers of the colleges and graduate school the value of the traditional criterion, grades, is clear, since, to them it is of practical importance to screen out candidates who would be unable to satisfactorily complete a program of studies. (p. 11)

Zegil (1973) states that in Manitoba school marks are as good a predictor of success at the University of Manitoba as were the provincial board results.

4. Culture and Language Tests.

We have within our school a small number of students who could be classified as belonging to groups significantly different from the "average", Canadian student. They are usually either native Canadian students or students who have come from overseas. In common is a certain amount of "culture shock" and a lack of fluency in the English language. A number of studies have been done to determine the ability of those to whom English is not the mother tongue. One of the earliest was Knox, in 1914, who used a performance type test to assess immigrants to the United States. Anastasi (1968) reviews some of these studies. The Porteus Maze test of 1914, 1924, 1950 and 1959 is described as a measure of "foresight and planning capacity which excels verbal tests in measuring

those aspects of intelligence most important in practical social sufficiency." (p. 239). Anastasi goes on to say that cross cultural tests endeavour to rule out one or more parameters along which cultures vary. The Army Examination Beta set up in 1921 and revised in 1946 used no language. Anastasi warns "It cannot be generally assumed that individuals can be adequately measured with a verbal test, despite their apparent mastery of English" (p. 241).

Edwards (1976) speaks of the problems encountered by foreign nursing students in England who are fairly proficient in written English but are unable to differentiate terms used in colloquial English. She suggests all foreign students be tested for spoken English before they begin work in the hospital. Dhillon (1976) outlines the problems of foreign nurses in the United States who are preparing to write RNs but lack fluency in the English language and American customs. She recommends special tuition for students in these two areas before they attempt registration examinations.

As a culture-free test is almost impossible to construct, "culture-fair" tests were developed. These were designed to rule out several cultural parameters by using pencil and paper, concrete objects, verbal instructions, and gestures as well as the written word. They indicate norms in related cultures which may, however, be totally different in other cultures. The Culture-Fair Intelligence test is a paper-and-pencil test in which the progressive matrices check for correlation. (Anastasi 1968 p. 245). Anastasi then describes the

influence of culture:

For man culture permeates nearly all environmental contacts. Tests cannot be equally fair to all cultures, they tend to favor persons from the culture in which they were developed...Intrinsic interest in test content, rapport with the examiner, drive to do well on a test, desire to excel others, past habits to solve problems (affect results)... The major approach is to ascertain certain differences between groups as well as the individual's degree of acculturalization and readiness for an education that is culturally specific. (p. 251)

Klassen, in his study of ethno-linguistic communities in Manitoba in 1969 found that differences were not due primarily to the nature of the language but due to "the cultural milieu within which such variables as the quality of adult communication in English could help to account for the differential in linguistic maturity..." He found a significant difference in the maturity of language usage in children in this province; it would be interesting to compare this with children from other countries whose mother tongue was other than English or to compare the scores of these children on either standard tests or on "culture-fair" tests.

Payne (1968) reports three difficulties in testing minority group children.

1. They may not provide differentiation in the range of the minority group scores.

2. Their predictive validity may be quite different from the group which was used to standardize the tests.

3. The validity of the interpretation could be questioned if the culture was not well understood.

He goes on to say that tests usually do not state minority group validity, nor do they consider motivation, speed or testing skills. Interest and personality scores may be lower in a child who has had limited exposure to the situations being tested. The complexity of the test may also be a factor if the child has had limited opportunity to learn these skills or if materials similar to the ones used in the test have not been available to him. The third major factor is the time lag as disadvantaged children perform progressively more poorly as they remain farther and farther behind. He sums up the advantages and disadvantages of "culture-fair" tests:

Making a test culture-fair may decrease its bias, but may also decrease its criterion validity.... Culturally unfair tests may be valid predictors of culturally unfair but none-the-less highly important criteria....The most important consideration of all is the one that applies to the use of tests in general, namely that test results should be interpreted by competently trained and knowledgeable persons whenever important decisions or issues are at stake. (p. 310)

5. READING AND STUDY SKILLS TESTS

Many of the studies of attrition in schools of nursing

include a comment about reading skills although most do not indicate which test they use nor how high an acceptable score must be. RRCC is using the diagnostic test devised by the Committee on Diagnostic Reading Tests Incorporated, Upper level section, commonly known as the Triggs test as it was compiled under the chairmanship of Francis O. Triggs. (1953) The test states it has a reliability of .90 if both sections are used--reading and vocabulary. No statement of validity is included. The evaluators report (Buros, 1953) states that this test is a useful tool for teachers, but that there are disadvantages to its use. Format and instructions are satisfactory, as is general interest. Validity, although based on subjective judgement, was satisfactory. Reliability, however, was questioned as methods of assessing reliability were not consistent. The list states the reliability for the comprehension section is 0.80, for the vocabulary section is 0.85, and for the total it is 0.90. The evaluators point out that norms were not provided, probably because of the expense involved in establishing them. Because of the absence of norms and the questionable reliability of some of the subsections, the evaluators cautioned against the use of the test as a diagnostic tool in the development of individual remedial reading programs for students. Applicants with a score lower than Grade XI are required to complete a reading program offered at the college prior to admission. This test was the choice of the remedial reading department who claim it gives them satisfactory results.

Conklin (1970) studied the characteristics of three groups of students at the University of Calgary--those that enrolled and passed, those that enrolled and dropped out, and those that applied but did not enrol. Tests used were Co-operative Academic Ability Test, Iowa test of Educational Development and Student Biographical Inventory. All tests were administered to "persons hopeful of beginning course work" but who had less than senior matriculation credentials. He found students tended to succeed if they excelled in reading ability, verbal aptitude and had effective study habits. He repeated the study on only those students who succeeded and found the same characteristics correlated positively with GPA. Other conclusions reached were that successful students had dropped out of school for other than academic failure, had the support of family and spouse and that they tended to be extroverts...Conklin felt further studies should be made to determine the difference between part-time and full-time students.

Belcher (1971) on the other hand, found no such relationship in the students he studied. He assumed that an increase in reading and study skills would lead to a corresponding increase in GPA, but found that the thirty students who took a credit course in reading and study skills because they wanted to, and the eleven who took it because they were advised to, improved their score on reading and study skills but not their GPA. Ritter (1971) set up a remedial program at the University of Manitoba in response to a request for

such a program. This program dealt with study skills only, not with reading. The students found the course helpful and it did improve their GPA.

Janzen (1970) used reading tests for entrance screening and placement in a community college in Calgary as part of a counselling service to students. He found a very low relationship between test results and GPA on English grades. He felt more work must be done to develop local norms for American tests.

Silverman and Riordan (1971) agreed with Janzen and Belcher when they tested students who had completed a study skills lab. They found study skills had improved but GPA had not. They suggested offering the course for credit to motivate the student and avoid time-table and work conflict. They felt they were reaching the students who needed it least as theirs was a voluntary program.

Pedrini and Pedrini (1973) correlated reading, achievement, aptitude and predictions of success, failure and attrition in the students on the University of Nebraska in Omaha. From their survey of the literature, they concluded that reading skills were of primary importance to academic success, but other factors such as sex, race and poverty must also be considered. They quoted studies that used scores in English, Chemistry, Mathematics, motivation, mental health or a battery of tests to predict success. They quoted Preas (1969) who found that "high school records were generally the best predictors of college GPA, English GPA and Math GPA," and

Astin (1970) who found no correlation and suggested a lottery would serve as well as present admission criteria. They list studies indicating reading scores are effective predictors of success in college, then show an equal number that show no correlation. They then take a different approach and look at failure in college beginning with poor reading skills. A study by Breen (1951) indicated poor reading skills lead to failure in college freshmen. They also quoted a study by Wellington (1953) which confirmed this. A study by Mitchel (1962) indicated high school grades are better predictors for women than for men. Cherlock (1971) agrees as does Jellison (1966) while Flora (1967) found the reverse. Pedrini then quotes a number of studies on the prediction of success in minority groups and disadvantaged students, concluding test scores tend to be lower in these groups but motivation is not. They also state that few universities have changed admission policies sufficiently to admit students whose test scores indicate maturity, motivation and aptitude but who do not have the usual academic credentials. Those that attend feel alienated from teachers, administrators and fellow students. Pedrini then surveys special programs set up to prevent attrition due to poor reading and study skills. While a number of studies indicate improved scores following the program, few indicate improvement in GPA. Pedrini concludes factors other than reading and study skills should be investigated.

Weinstein and Gipple (1974) looked at a group of

students assumed to be of superior academic ability: medical students. The reason for the study was that it was felt the rising costs of education, the limited number of openings in medical schools and the need to assist disadvantaged students called for an investigation of study skills. They found that pre-medical GPA was the best predictor of success but that study skills scores added to the predictive accuracy. The ability to synthesize and organize data and the ability to distinguish between what was required and what was not was especially important for freshmen, hence study skills should be taught early in the course. They summarized their position thus:

In the final analysis it is the student who sets the standard of his education and determines what he will and what he will not master. (p. 902)

Corlett (1970) used the Library Orientation test which was found to be a valid predictor of GPA with a group of college freshmen. She found adding study skills tests did not improve prediction. She, too, found prediction better for women than for men.

Pare and Butzow (1972) approached it from the point of view of assessing independence of work habits, as their college had changed to Auto-Tutorial teaching methods. They felt a "measure of student ability to organize and to carry out work in an independent fashion would be an appropriate predictor of success in an AT course." However they found available measures of independence to be too time consuming

to use routinely and that they measured independence of personality development rather than independence of study, so they constructed their own test. This test was validated by consultation with experts in the field. Field tests and subsequent elimination of items with low correlation finally yielded a test with reliability of .88. The authors concluded that this test was reliable, valid, available and easy to use, hence should be considered by anyone using independent study as a major teaching approach.

The literature in the area of reading and study skills scores as predictors of success in college shows conflicting results as do studies on remedial programs. Several studies indicate that factors other than those studies influence success; factors such as age, sex, race, and money. As we have a heterogeneous student body and are entering an independent-study approach to teaching, the test prepared by Pare and Butzow could be of interest to us.

McCausland and Steward (1974) reported a different relationship between study skills, aptitude, and GPA. They found high school grades and American College Testing Composite scores to be the best predictor of college grades and that adding other factors such as study skills and academic aptitude scores added little to prediction but were useful for remediation. They identified four groups of students, two sets of achievers--those with low scores who had been obliged to learn to study to achieve minimal grades and those with medium scores who had learned the same skills

in order to achieve better than average grades. They then identified two groups of under-achievers--those with moderate scores who had managed to pass minimally without working, and those with high scores who had managed to obtain better than average scores without working. They felt this latter group will run into difficulty when they attempt advanced study as they have not developed the necessary skills. They summarize their position thus:

Even though the high school score was found to be the best single predictor of college success the high school average does not indicate specific strengths and weaknesses. Thus high school average has little use for diagnostic or counselling purposes. The results of the present study suggest that academic aptitude, study skills and attitudes are important components of college success.

However the relationship among these factors is quite complex. (p. 357)

Goldman and Hudson (1973) compared successful and unsuccessful students in terms of major field of study, sex and GPA using ability and study skills scores. They found significant correlation in various fields of study and learning strategies, concluding it was probably the inherent nature of tasks to be accomplished in each field that matched the learning strategies of the student. They quote studies indicating engineering students to be hard-working, energetic and conforming, science students intrinsically motivated and

dogmatic while liberal arts students are more tolerant and dependent. They suggest the use of a multivariate "map" for a major field then match students accordingly! They concluded learning strategies were more important than abilities in the determination of GPA and that strategies were consistent across major fields.

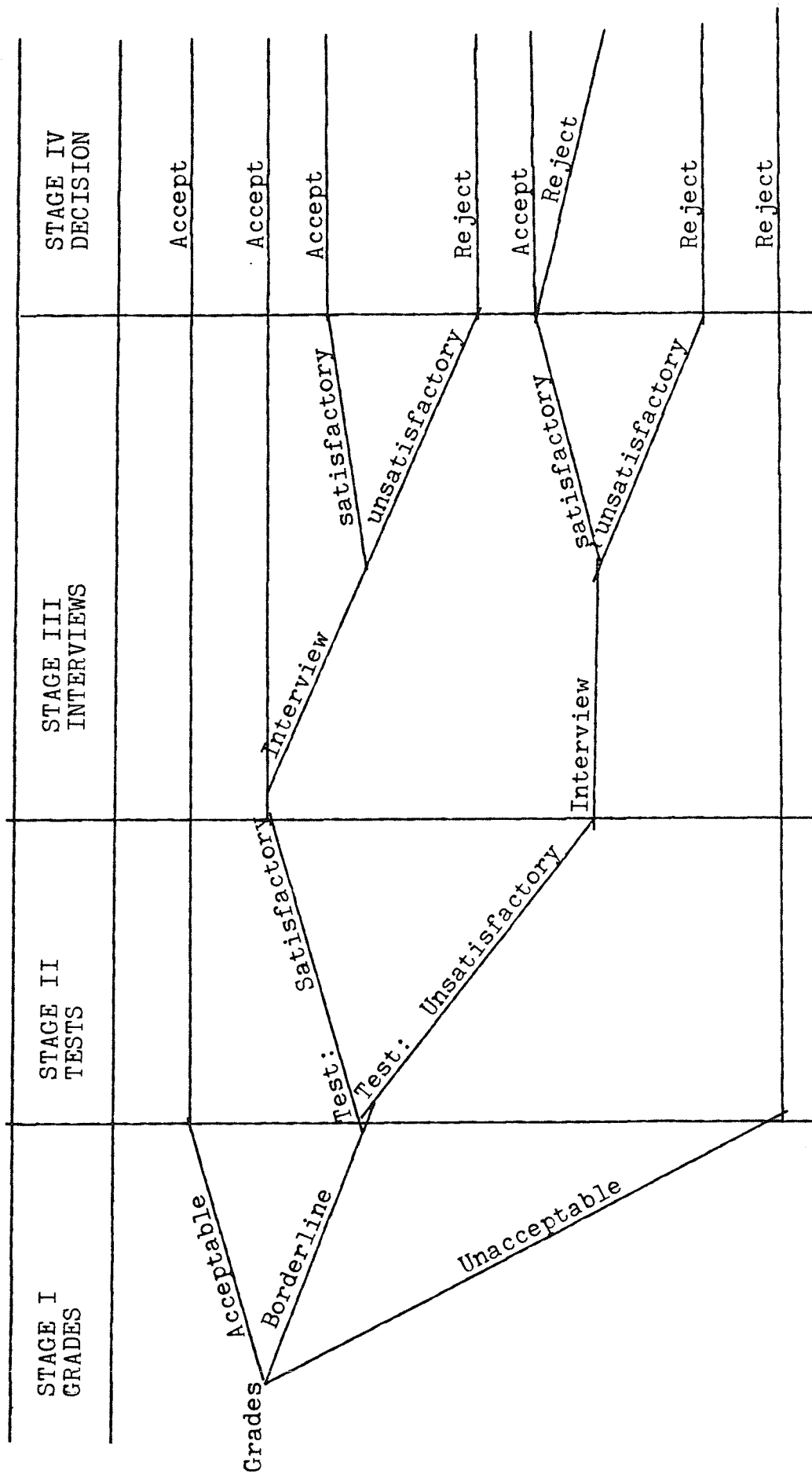
Fincher (1976) outlines differences in male-female intelligence, suggesting differences cited are probably due to environmental factors. He states females tend to be more vocal, mature earlier, are more thoughtful and less analytical. These findings are one explanation why so many studies found high school grades and reading scores to be better predictors of success for women than for men.

6. USE OF MULTIPLE CRITERIA

Payne (1968) quotes Horst who feels that "wide band" procedures such as interviewing and administration of aptitude and achievement tests are very time-consuming if done properly, as they "tend to be unsatisfactory when judged by conventional standards of prediction efficiency and dependability." He finds them useful in making subsequent divisions regarding student placement and as an initial test to determine which specific test to use for a student.

Owen and Feldhusen (1970) compared the predictive efficiency of three models. They used a multivariate approach, eliminating those variables which did not add to the accuracy of prediction. Model I used pre-admission data-high school marks, biography, personality and interest

FIGURE I Wood's format



inventory scores. These data were used to predict success in the first trimester and in the total program. Model II used the same data but added marks of the first semester, while Model III added marks of each subsequent semester to the total to predict success in the program. Model III was found to be the most effective. The study did not state the rate of attrition before Model III was reached. It would seem that those not interested or unsuited to the program would have left before Model III was reached, hence prediction of success in those students remaining could be more accurately made.

Mrs. Vivian Wood (1971) suggests the format as per Figure I. She feels that by using this format much time, money, and effort can be saved. Students with good grade will probably be accepted and those with poor grades will be refused, hence no useful purpose is served with lengthy tests and interviews. The borderline student, however, is evaluated by a battery of tests and interviews with the option of acceptance or rejection at several points. Since the borderline student is the one most likely to be in difficulty later in the program, this method of selection secures information useful in counselling.

What are the characteristics of a candidate successful in nursing? S. P. Farr as quoted by Payne (1968) says this about candidates for teacher training

If limited numbers are to be admitted, use known predictors for academic success. This last point

depends on our lack of a good criterion measure of effective teaching...(We) fall back on criterion which is defined by graduation from our institution, certification by appropriate agencies and placement in a beginning teaching job. (p. 284)

He goes on to say that strict selection will eliminate many potentially successful candidates. **This also applies to nursing.**

Black (1965) speaks of admission procedures and criteria used at the University of Alberta concluding that at present the standard criteria of academic achievement and aptitude testing offer as much assistance in the prediction of success as does a more extensive battery of tests. He does warn, however, that these criteria discriminate against the students with diverse backgrounds who could, given the opportunity, succeed in a university program.

Bradshaw (1973) related her experience with an open-door policy in a college in Florida. Accustomed to a myriad of entrance requirements the faculty was asked to enrol anyone who was interested. Their response was to set up a core program for a number of health sciences so students could readily move from one area to another without being labelled a failure. Once enrolled, students were tested for reading and mathematics skills. Remediation was required for those who needed it. They have since changed the program to test all applicants prior to admission, then set up a study plan for each student to include remediation if needed, suggesting courses, sequence and a time frame. They feel that in this

way all who are interested are admitted but not before they have completed a remedial program if this is needed. They also counsel brighter students to the more challenging courses and the less able to the less demanding programs.

Cohen and Genser (1972) feel the students' personal problems and poor study habits are a greater source of attrition than lack of academic ability. They quote statistics that indicate one third of all nursing students drop out before graduation. They also maintain the NLN admission tests are of no value in the Chicago school they studied where most of the students were young, unmarried, female and from outside of Chicago. Many had completed several years at college yet the attrition rate was 50%. They set up a crisis centre for students with emotional problems, remedial programs for those with deficient reading, mathematics or study skills, and general sensitivity sessions for everyone--students and teachers. Results were encouraging. So instead of screening students prior to admission they provided intervention for those perceived by themselves or by the faculty to be in difficulty.

Levin, Lubin and DeWitt (1971) estimate one third of the students enrolled in schools of nursing do not graduate. They set up a study to determine which factors other than intelligence and "academic inadequacies" added to this drop-out rate. They indicated many of the tools available for testing are either too expensive or too time consuming to be used as screening devices. Of six tests used, only four

units from these tests were chosen for multiple regression analysis: Kuder Outdoor scale and Social service scale, MMPI F scale and Edwards Personal Preference Succorance scale as these were the only units to show significant differences between drop-outs and graduates. They suggested their method be used not as a screen but only for borderline students in conjunction with other data.

Liddle, Heywood, Hankey and Norman (1971) approached prediction from a different point of view in their assessment of Baccalaureate students when they devised a personality-measuring test which they called TAV. They measured the tendency of students to move towards others (T), away from others (A) or antagonistically (V). They found this to be of little predictive value.

The selection of students may be left to a committee or be determined by administrative decree. In the Second Handbook of Research and Teaching (1973) Schaeffer and Law report on a variety of research in this area, including the conclusion of Miller (1968) that a reduced number of variables in a pre-selection battery of tests is almost as good a predictor of success as is a larger number. They also state that school grades are the best single predictor. The same handbook reported a study by the Ohio Trade and Industrial Education Service that showed it was not student characteristics that determined success but the personality of the teacher.

A review of the literature on the prediction of success included studies from a variety of settings, both American

and Canadian, from general education and from nursing education. The review also included a variety of approaches. While high school grades were most frequently found to be the best single factor in the prediction of success in post-secondary education, other factors were also considered. Most frequently mentioned were study and reading skills, personality and motivation. A number of studies suggested practical approaches to screening and remediation.

D. MATCHING STUDENT CHARACTERISTICS AND TEACHING METHODS PURPOSE

Matching student characteristics and teaching methods for optimum results has been the goal of educators for some time. Hunt and Sullivan (1974) survey the literature on this subject. They quote Cronbach thus:

We require a measure of aptitude which predicts who will learn better from one curriculum than another; but this aptitude remains to be discovered. Ultimately, we should design treatments, not to fit the average person, but to fit groups of people with particular aptitude patterns. Conversely we should seek out the aptitudes which correspond to modifiable aspects of treatment. (p. 47)

SURVEY OF THE LITERATURE

Their initial position is that most tests do not provide useful information on the correlation of student characteristics and study methods and in practice not much can be done about it anyway. They warn of the danger of stereotyping if data

were not used carefully. Shawn and Oliver as quoted by Hunt and Sullivan, (1974) found persons high in authoritarianism profited more from a lecture approach while those low in this characteristic profited more from independent study. Before they presented their own point of view Hunt and Sullivan summed up past attempts to correlate student characteristics and teaching methods in this way:

It is reasonable yet regrettable, that predicting to a fixed criterion in a fixed environment has been the most successful as well as the most accepted procedure for measuring individual differences...It is regrettable because it represents another case in which psychologists have implicitly provided the basis for continuing in education the practice of forcing the individual to adapt to fixed environments rather than focussing efforts to adapt the environment to the individual or equipping the individual to adapt to the changing environment. (p. 52)

They then go on to suggest a different point of view-- that of conceptual level or ability to manipulate data. They claim the lower the conceptual level of a student the more structured the learning situation must be. While this sounds straight forward, the method of determining conceptual level is more complex.

CONCEPTUAL LEVELS

Hill and Nunney (1971) have devised a very complex method of determining conceptual level, taking into account all avenues of sensory input--auditory, visual, tactile, and combinations of these--then drawing a map to illustrate the most promising avenue to reach each student. While proponents claim this to be very accurate, it is also very complex, time-consuming and expensive. The four factors they use are

1. Theoretical auditory linguistic--the sound of a word
2. Theoretical auditory quantitative--the sound of a number
3. Theoretical visual linguistic--the written word
4. Theoretical visual quantitative--the written number

They use the data collected on this aspect of a student's preference, combine it with information on his background, hopes, goals and abilities and produce a "map" of the student's learning style. This map is then used to assign study methods or to counsel a student towards realistic career goals.

COGNITIVE STYLE

Banks (1973) developed a questionnaire following a survey of the literature under the headings of cognitive style, cognitive style mapping, and learning styles. He lists definitions of the term "learning style".

1. Modes of thought persistently used
2. Characteristic problem solving approach
3. Ways in which the student interacts with his environment.

His own version is this:

Consistent patterns of behaviour or activity preferred and employed by an individual to effectively and efficiently acquire knowledge skills and attitudes. Learning style is a significant aspect of an individual's capacity to learn. Methods of evaluation should be developed to assess an individual's learning style (p. I-7)

In general, studies suggest there are differences in the ways students perceive problems, the way they organize their work and in the strategies they use to solve their problems. He quotes Frederick and Klausmeier (1970) who say that "differences in students in styles of perceiving, cognizing and conceptualizing are probably as real as are differences in general cognitive ability and educational achievement." The study by Siegel and Siegel as quoted by Banks indicated that learners with certain cognitive styles not only learn better under certain circumstances but the style also determines what he will learn and what he will try to avoid. Banks quotes Bruner (1966) who feels a child learns to perceive his environment in a certain way and if the teacher can present material in this way the student will be more likely to learn. Bruner sees learning as a process rather than as a product.

OTHER APPROACHES

Banks goes on to quote Osipow (1969) who speaks of field dependent and field independent students, Kagan who used the

terms reflective and impulsive to signify the interaction between a student and his environment and Johansson who lists cognitive styles and relates them to career choices. Johansson assumes people choose careers for which they can most closely approximate learning styles and interest. He then prepared a long list of vocations that emphasize each learning style. For instance, he sees realistic persons preferring motor skills yet avoiding leadership roles. The investigative person excels in research but makes a poor leader. The artistic types are creative but avoid hard work and people while the social person makes a good leader but avoids motor skills. Those with an enterprising style are persuasive but not persistent while the conventional person does well on rule-oriented areas but avoids conflict. It is of note that nurses are expected to be technically competent, leaders in a group, able to communicate, to be involved in research, creative in their approach, to work diligently and keep meticulous records. Johansson lists these characteristics as mutually exclusive. He also does not list nursing as a career option.

Banks quotes Dunn and Dunn (1972) who claim teachers do not use the teaching methods available to them to determine which way a child works best. They strongly recommend that this be done and list factors such as time and place, schedule, pressure, and environment as well as the other factors mentioned in previous studies. They are supported by Hester and Tagatz (1971) who claim that individuals instructed

according to their style can achieve greater success both inside and outside the classroom. Tallmadge and Shearer (1969) survey the whole field of learning styles and at the end of their research ask many questions about the usefulness of the whole enterprise, yet conclude that efforts should not be abandoned.

The questionnaire developed by Banks will be discussed in detail in Chapter 3.

SUMMARY OF THE SURVEY OF THE LITERATURE

In summary three trends are evident in nursing education:

1. The move to educational institutions
2. The increasing divergence of student population
3. Individualizing of learning

The implications are that students can now spend their time learning while teachers who now have greater access to support services can offer a variety of teaching approaches to a diverse student population. It also means that traditional means of prediction are no longer valid as many students no longer fall into traditional categories. The review of the literature included studies in nursing education, the development of community colleges, characteristics of community college students, predictors of success in education and the matching of student characteristics, and teaching method. Although there is general consensus that prediction of success is necessary there is no consensus on the value of any one predictor.

CHAPTER III

THE INVESTIGATION

THE PROBLEM

A considerable amount of time and money is spent by the college in collecting data about students prior to their admission. No study has been undertaken to see which data routinely collected will predict success in the program. Nor has it been ascertained if there is a correlation between each of the various categories of data. The basic questions to be answered are:

1. Is there a correlation between each of the categories of data routinely collected?
2. Can data routinely collected about students be used to predict success as measured by end of term test scores?
3. Can data routinely collected be used to measure success as measured by scores on registration examinations?

THE SETTING

The study took place at Red River Community College (RRCC), a community college situated on the outskirts of Winnipeg, Manitoba, a city with a population of 550,000. The college offers two year diploma programs, one year certificate programs and short courses especially designed to meet the needs of specific groups within the community. At the time of the study two unrelated nursing programs were offered at the college. One, a two year diploma program, prepared students to function as registered nurses. The other, a one

year program, prepared students to function as licensed practical nurses. Each year was divided into two terms.

THE STUDENTS

While most of the students came from Winnipeg some were drawn from the surrounding rural areas and a few from northern Manitoba and other provinces. Students ranged in age from those just out of High School to mature students who were returning to their studies after an absence of many years. Within the college student body academic competence range from bare literacy in students in the up-grading courses to those with university degrees. The diploma nursing division requires a High School certificate or its equivalent.

THE SAMPLE

Three classes of nursing students were chosen as the population to be studied. The sample in each case was the entire class. The population from which the sample was taken was the Diploma Nursing Department, a subdivision of the Health Sciences Division of RRCC. These three classes were chosen for two reasons:

1. Their files were readily available in the department or from the registrar.
2. If the files were incomplete the student could be interviewed to obtain the required data.

With the exception of the Learning Preference Inventory all data compiled was routinely collected on all students enrolled in nursing. The inventory was administered to two classes of students subsequent to their enrolment in the

program.

TYPES OF DATA

Perusal of the files revealed three types of data:

1. Basic information obtained from all students enrolled in the college. This included name, birthdate, address, phone number and course.
2. Data specifically requested by the department of nursing
 - (a) High School grades or the equivalent
 - (b) Additional education or employment
 - (c) Time of last regular school attendance
 - (d) Scores on reading comprehension and vocabulary tests
3. Test results subsequent to enrolment.

MASTER CHART

A master chart was prepared for each of the three classes. A profile of the characteristics of each student was thus obtained, as well as a profile of the group as a whole, based upon data routinely collected.

The purpose of this study is to determine which of these characteristics or combination of characteristics are the best predictors of success in the program.

GROUPS

Three classes of nursing students were the subjects of this study. For purposes of data analysis they were divided into four groups.

GROUP I

This group of 57 students had completed the two-year

program one year prior to the study, thus their final scores were available, but scores on characteristics such as age, High School grades, length of time out of school and Learning Preference inventory scores were not available. As this class had entered the program before reading tests were required no scores were available on reading vocabulary or comprehension.

GROUP II

This group consisted of a class of students who had completed four terms at the college at the time of the study, but had not yet written the registration examinations. Of 74 students 24 were eliminated by the computer on the basis of missing values leaving 50 students in the group. All three types of data were available for these students.

GROUP III

This group of students had completed only the first two terms at the time of the study. Of the original 86 students 19 were eliminated because of missing values. The amount of data collected subsequent to enrolment was limited to the first year of the program.

GROUP IV

Group II and Group III were combined to form a large group for the analysis of first-year data only. Of 160 original subjects 117 were included in the group as the others were eliminated on the basis of missing values.

THE VARIABLES

The variables in this study were the characteristics of students as determined by data routinely collected. The

variables will be described in the order in which they were arranged for programming. As the variables for Group I were inconsistent with that of the other groups these variables will be discussed first.

VARIABLES GROUP I

Five variables were included in the analysis.

1. High School Average (HSA) - the arithmetic mean of all available high school grades as submitted by the schools. High school marks were used as submitted if numerical grades were available. If letter grades were submitted the scale accompanying the marks was used to convert letter grades to numerical scores. If no scale accompanied the letter grades, the scale used by the writer was used. A perusal of scales indicated a difference in value of letter grades from one school to the next, thus the use of the writer's scale could be a source of error in the compilation of HSA.
2. Science Term I (ScTI). Science marks were scores awarded by the teacher of biological sciences in the college. Marks were a combination of term and final teacher-made tests. Although these tests were not standardized, it was the general opinion of the teachers in the area that the tests were representative samples of courses in the biological sciences.
3. Science Term II (ScT2). This subject was a continuation of ScTI, taught and evaluated by the same teacher as ScTI.
4. Grade Point Average Term 4 (GPAT4) was composed of scores attained in the final term at the college. Assessment was by teacher made tests and by assignments.

5. Registration examinations (RN's). RN scores represent the results of standardized national examinations. Students must pass these examinations prior to their practice as registered nurses.

VARIABLES GROUP II

This group of students had completed four terms at the college but had not yet written RNs, thus RN scores could not be used as a variable. However pre-admission scores were available.

Prior to admission applicants were required to write the vocabulary and comprehension sections of the test devised by the Committee on Diagnostic Reading Tests Incorporated, Upper section, commonly known as the Triggs test, which has been standardized on American college students. The remedial reading department of the college, who chose and administered the test, judged the test to be satisfactory although no local standardization was available.

1. Vocabulary (vocab) was the score on the vocabulary section of the test.
2. Comprehension (Comp) was the score on the reading comprehension section of the Triggs test.
3. High school English (HSEng) marks used as submitted if in numerical grades or converted as for the previous group if submitted as letter grades.
4. High school science (HSSc) scores, again used as submitted or converted to numerical scores if submitted as letter grades.

5. ScTI - compared to ScTI of the previous group.
6. Nursing Term I (NurTI) is composed of scores on teacher made tests in nursing theory at the college. Nursing practice was evaluated separately on a pass-fail basis and not included in this study.
7. Grade Point Average Term I (GPATI) composed of scores on all the subjects taken in Term I at the college, each weighted according to the number of teaching hours.
8. Science Term II (ScT2) compares with the same variable in the previous group.
9. Nursing Term II (NurT2) is a continuation of Nursing Term I. It was evaluated by means of teacher made tests and assignments.
10. Grade Point Average Term II (GPAT2) is calculated in the same way as GPAT1 using Term II marks.

Variables 11 and 12 were scores on Bank's Learning Preference Inventory. Banks (1973) developed a questionnaire to determine the interaction of "Learning styles and types of learning experiences in technical vocational education." This questionnaire was designed to measure two attributes: the student's place on a continuum between concrete and symbolic study preferences and the degree of structure he preferred. The validity was established by consultation of experts in the field and by a survey of the literature. A pilot study was completed which revealed a reliability of only .29 on items designed to measure symbolic-concrete preferences but a reliability of .80 for items designed to

measure the degree of structure preferred. Minor changes improved the reliability. The author presumed factors other than those he was measuring played a role in the termination of the symbolic-concrete continuum but that the structured-unstructured portion was reliable enough to use. The population used to establish reliability was a group of first-year community college students in two north central American cities. Classes were chosen on the basis of perceived differences such as auto-body and creative communications. Questionnaires were distributed in the classroom thus assuring a complete return. The results of the survey were intended to be used in two ways to determine if the preferred learning style of the student was compatible with the teaching style in the area and to provide the classroom teacher with data on widely divergent students so she might modify her approach accordingly.

PILOT STUDY

This questionnaire had been administered to a group of nursing instructors at the college and yielded the expected results, namely, that nursing instructors were a fairly homogeneous group preferring a somewhat structured, concrete situation. No reliability indices were available.

ADMINISTRATION TO STUDENTS

The questionnaire was administered to this group of students during a class hour to assure a complete return and to provide conditions as close as possible to those used by Banks in his original study.

SCORING THE TEST

As the original computer program for the analysis of the test data was not available locally two computer programs were used instead. The first was a five point rating scale which could be readily modified to compute totals and percentages of responses. The second was a program designed by Mr. Rodkin of the Computer Development section, which calculated for each student his position on the symbolic-concrete and structured-unstructured continuum.

11. Learning Preference I (LPI) was the score on the symbolic-concrete continuum.
12. Learning Preference II (LP2) was the score on the structured-unstructured continuum.
13. Grade Point Average Term III (GPAT3) was composed of all the subject marks weighted according to teaching hours. As with previous GPA scores this was composed of scores on teacher made tests and assignments.
14. Grade Point Average Term IV (GPAT4) was calculated as the other GPA scores.
15. Years--represents the number of years since the student attended High school. No attempt was made to classify the activities of students from the time they left High school until the time they entered the college.

VARIABLES GROUP III

As this group of students had completed only the first two terms at the college at the time of the study, variables 13 and 14 were omitted from the analysis. All other variables

were the same as those for Group II.

VARIABLES GROUP IV

Group II and Group III were combined to form one large group for the analysis of first-year data only. The variables were the same as those for Group III.

CHAPTER IV

THE ANALYSIS

For each group the data compiled on the master chart was analyzed by the SPSS multiple regression program run on the IBM-370-168 computer at the University of Manitoba. This program is described by Nie et al: (1970)

Multiple regression is a general statistical technique through which one can analyze the relationship between a dependent or criterion variable and a set of independent or predictor variables. Multiple regression may be viewed either as a descriptive tool by which the linear dependence of one variable on others is summarized and decomposed, or as an inferential tool by which the relationships in the population are evaluated from the examination of sample data...The most important uses of the technique as a descriptive tool are:

- (1) to find the best linear prediction equation and evaluate its prediction accuracy;
- (2) to control for other confounding factors in order to evaluate the contribution of a specific variable or set of variables...For every question of regression as a descriptive tool, there is usually a corresponding question of inference... estimation and hypothesis testing. (P. 321)

Multiple regression requires variables to be measured in interval or ratio scales and the relationship to be linear and additive. The data used in this study meets these requirements. One of the main advantages of the SPSS program is its flexibility. Not only does the package contain programs for the most frequently used statistical analyses, but provides for options within the programs.

The missing values option was selected for this study as the files were incomplete for a number of the students. By using this option missing values were not confused with zeros, the use of which would have lead to inaccurate results. The computer removed from the study those students whose files were incomplete.

STATISTICS CHOSEN

1. Simple correlation which indicates whether there is a relationship between the variables.
2. Mean and Standard deviation of each variable and number of cases included in the analysis.
3. Step-wise multiple regression analysis which lists in descending order of magnitude the independent variables contributing to the accuracy of prediction. The data was listed as a correlation matrix.
4. Standardized residuals against sequence of scores.

STATISTICAL HYPOTHESES

GROUP I

The following are the statistical hypotheses for Group I.

Null hypothesis I:

There is no statistically significant correlation between the variables listed for this group.

Alternate hypothesis:

There will be a significant relationship between the variables listed for this group.

Null hypothesis II:

No single factor or group of factors is a significant predictor of GPAT IV.

Alternate hypothesis:

Single factors and groups of factors are significant predictors of GPAT IV.

Null hypothesis III:

No single factor or group of factors is a significant predictor of RN scores.

Alternate hypothesis:

Single factors or groups of factors are significant predictors of RN scores.

The results of the analyses are listed in Table 7 to 10. The discussion of the results is in Chapter 6.

GROUP II

The following are the statistical hypothesis for the variables for Group II.

Null hypothesis I:

There is no significant correlation between the variables listed.

Alternate hypothesis:

There is a significant correlation between the variables listed.

Null hypothesis II:

No single factor or group of factors is significant in the prediction of GPAT1.

Alternate hypothesis:

A single factor or group of factors is significant in the prediction of GPAT1.

Null hypothesis III:

No single factor or group of factors is significant in the prediction of GPAT2.

Alternate hypothesis:

A single factor or group of factors is significant in the prediction of GPAT2.

Null hypothesis IV:

No single factor or group of factors is significant in the prediction of GPAT3.

Alternate hypothesis:

A single factor or group of factors is significant in the prediction of GPAT3.

The results of the analysis are listed in Tables 12 to 16. The discussion is in Chapter 6.

GROUP III

The following are the statistical hypothesis for the variables listed for this group.

Null hypothesis I:

There will be no statistically significant correlation

between the variables listed for this group.

Alternate hypothesis I:

There will be a statistically significant correlation between the variables listed for Group III.

Null hypothesis II:

No single factor or group of factors is significant in the prediction of GPAT1.

Alternate Hypothesis II:

A single factor or group of factors is significant in the prediction of GPAT1.

Null Hypothesis III:

No single factor or group of factors is significant in the prediction of GPAT2.

Alternate Hypothesis III:

A single factor or group of factors is significant in the prediction of GPAT2.

The results of the analysis are listed in Tables 17 - 21 and discussed in Chapter 6.

GROUP IV

The hypothesis for this group are the same as those for Group III as Group IV is a combination of Groups II and Group III.

The results of the analysis are listed in Tables 22 - 27 and discussed in Chapter 6.

A summary of the hypotheses for the four groups is found in Table 4, page 91.

TABLE 4
Summary of Hypotheses selected
for the Four Groups

Hypotheses	GROUP			
	I	II	III	IV
Correlation between variables	x	x	x	x
Prediction of GPAT1		x	x	x
Prediction of GPAT2		x	x	x
Prediction of GPAT3		x		
Prediction of GPAT4	x			
RN	x			

CHAPTER 5

RESULTS

The previous chapter outlined the hypotheses to be tested. This chapter will present the results. A discussion of these results will be found in Chapter 6. As an overview, a summary will be presented, followed by the data for each group.

SUMMARY OF FINDINGS

For each group the null hypothesis was rejected and the alternate hypothesis was accepted. Although the sequence of factors was not always consistent the same factors showed greatest relationship. These same factors, if present for the group, were also the best predictors for the group. Table 5 summarizes this.

A GROUP I:

The data for this group includes the results of the analysis of simple correlation of all the variables and two analyses of multiple regression. Included as well are the means and standard deviations of the variables.

Table 6 lists the mean, standard deviation and number of cases for each of the variables for Group I.

Null Hypothesis I:

Table 7 lists the variables and correlations for the analysis of simple correlation. For $N - 1$ df significance at the 0.05 level of confidence was .255 and for 0.01 level of confidence it was .339 (Ferguson 1971 p.457). For the

convenience of the reader, correlations significant at the 0.01 level have been underlined.

Table lists the statistically significant correlations in order of magnitude.

Null Hypothesis II:

The summary of the step-wise multiple regression analysis is listed in Table 9. Significance was determined by Critical Values Table D (Ferguson 1971 p. 452). All values were noted to be significant at the .01 level of confidence.

Null Hypothesis III:

The summary of the step-wise multiple regression analysis is listed in Table 10. Significance was determined as for Null Hypothesis II. All calculated values were found to be significant at the .01 level of confidence. A table displays the computer printout of standardized residuals against sequence of scores for var 005 (RN's) for the 57 subjects in Group I. It also lists the observed and predicted values for this variable.

This completes the data for Group I. The results for the other three groups will be presented in a similar way.

B GROUP II:

As for Group I, the data for Group II consists of an analysis of simple correlation and two multiple regression analyses as well as a listing of means and standard deviations for each variable. The data will be presented in the same sequence as it was for Group I.

TABLE 5

Summary of Data for Four Groups Listed in
Descending order of Significance

GROUP I		GROUP II		GROUP III		GROUP IV	
GPAT4	RN	NurT2	ScT2	NurT2	ScT2	NurT2	ScT2
GPAT4	ScT2	ScT1	ScT2	HSSc	ScT1	NurT2	GPAT2
GPAT4	ScT1	ScT1	NurT2	GPAT2	NurT2	ScT1	GPAT1
ScT1	ScT2	NurT2	GPAT2	GPAT2	ScT2	GPAT2	GPAT1
RN	ScT1			GPAT1	ScT1	NurT2	GPAT1
RN	ScT2			GPAT1	GPAT2		
<u>Criterion</u>		<u>Criterion</u>	<u>Predictor</u>	<u>Criterion</u>	<u>Predictor</u>	<u>Criterion</u>	<u>Predictor</u>
GPAT4	ScT2	GPAT2	GPAT1	GPAT1	ScT1	GPAT1	ScT1
	ScT1		ScT1		NurT1		NurT1
	GPAT4	GPAT3	vocab	GPAT2	comp	GPAT2	LP1
	ScT1		GPAT2		NurT1		NurT2
			HSSc		GPAT1		GPAT1
			NurT1		ScT1		ScT1

correlation

predictor

TABLE 6

Mean, Standard Deviation and Number of Cases
for Group I

VARIABLE	MEAN	STANDARD DEV.	CASES
VAROO1	64.228	6.663	57
VAROO2	68.771	9.62	57
VAROO3	65.088	16.040	57
VAROO4	2.706	0.462	57
VAROO5	483.456	81.209	57

TABLE 7

Correlation Co-efficients for
Variables for Group I

	VAR001	VAR002	VAR003	VAR004	VAR005
VAR001	1.000	0. <u>400</u>	0. <u>353</u>	0.237	0.276
VAR002	0. <u>400</u>	1.000	0. <u>511</u>	0. <u>628</u>	0. <u>596</u>
VAR003	0. <u>353</u>	0. <u>511</u>	1.000	0. <u>647</u>	0. <u>488</u>
VAR004	0.237	0. <u>628</u>	0. <u>647</u>	1.000	0. <u>711</u>
VAR005	0.276	0. <u>596</u>	0. <u>488</u>	0. <u>711</u>	1.000

Note: Correlations significant at the 0.01 level
of confidence are underlined.

TABLE 8
 Statistically Significant Correlations
 in Order of Magnitude Group I

VARIABLE	VARIABLE	CORRELATION
004 (GPA4)	005 (RN)	0.711
004 (GPA4)	003 (ScT2)	0.647
004 (GPA4)	002 (ScT1)	0.628
005 (RN)	002 (ScT1)	0.596
003 (ScT2)	002 (ScT1)	0.511
005 (RN)	003 (ScT2)	0.488
001 (HSA)	002 (ScT1)	0.400
001 (HSA)	003 (ScT2)	0.353

TABLE 9
Summary of the Multiple Regression
Analysis of Factors Predicting
GPA4 Group I

VARIABLE	MULTIPLE R	R SQUARE	RSQ CHANGE	SIMPLE R	B	BETA	F	df
VAR003 SCT2	0.647	0.418	0.418	0.647	0.133	0.461	39.580**	1,55
VAR002 SCT1	0.733	0.538	0.120	0.628	0.207	0.431	31.440**	2,54
VAR001 HSA	0.739	0.546	0.008	0.237	-0.680	-0.09	21.227**	3,53
(CONSTANT)					0.852			

* P .05

** P .01

TABLE 10

Summary of the Multiple Regression
Analysis of Factors Predicting
RN's Group I

VARIABLE	MULTIPLE R	R SQUARE	RSQ CHANGE	SIMPLE R	B	BETA	F	df	
VAR004	GPA4	0.711	0.506	0.506	0.711	97.834	0.557	56.276**	1,55
VAR002	SCT1	0.737	0.543	0.037	0.596	1.903	0.225	32.060**	2,54
VAR001	HSA	0.738	0.545	0.002	0.276	0.648	0.053	21.179**	3,53
(CONSTANT)						46.214			

* P .05

** P .01

Table 11 lists the mean, standard deviation and number of cases for each of the variables for this group.

Table 12 lists the variables and correlation co-efficients for the analysis of simple correlation. Significance at $N - 1$ df (Ferguson 1971 p. 457) was

.01 -- .354

.05 -- .273

For the convenience of the reader, correlations significant at the .01 level of confidence are underlined.

Correlations in order of magnitude are listed in Table 13.

Null Hypothesis II:

The summary of the step-wise multiple regression analysis for the prediction of GPAT1 is listed in Table 14. Significance was determined as for Group I (p93) No variables were significant predictors at either the .01 or the .05 level of confidence.

Null Hypothesis III:

The summary of the step-wise multiple regression analysis for the prediction of GPAT2 is listed in Table 15. Significance was determined as for the previous hypothesis. Six variables were noted to be significant at the .01 level of confidence while two were significant at the .05 level.

Null Hypothesis IV:

The summary of the step-wise multiple regression analysis for the prediction of GPAT3 is listed in Table 16. Significance was determined as for the previous two groups.

TABLE 11
Mean, Standard Deviation
and Number of Cases
for Group II

VARIABLE	MEAN	STANDARD DEV	CASES
VAR001 (Vocab)	11.588	2.340	50
VAR002 (Comp)	11.636	2.455	50
VAR003 (HSEng)	64.000	14.701	50
VAR004 (HSSc)	64.140	16.797	50
VAR005 (ScT1)	66.700	13.836	50
VAR006 (NurT1)	70.220	16.788	50
VAR007 (GPAT1)	5.961	17.357	50
VAR008 (ScT2)	68.820	15.418	50
VAR009 (NurT2)	66.460	14.397	50
VAR010 (GPAT2)	16.498	32.410	50
VAR011 (LP1)	37.980	6.076	50
VAR012 (LP2)	37.600	6.946	50
VAR013 (GPAT3)	2.440	3.908	50
VAR14 (GPAT4)	33.822	42.565	50

TABLE 12

Correlation Co-efficients for Variables for Group II

	VAR001	VAR002	VAR003	VAR004	VAR005	VAR006	VAR007	VAR008	VAR009	VAR010	VAR011	VAR012
VAR001	1.000	<u>0.602</u>	<u>0.587</u>	<u>0.396</u>	<u>0.478</u>	<u>0.441</u>	0.037	<u>0.380</u>	<u>0.436</u>	-0.005	<u>0.592</u>	<u>0.562</u>
VAR002	<u>0.602</u>	1.000	<u>0.492</u>	<u>0.455</u>	<u>0.473</u>	<u>0.440</u>	0.036	<u>0.425</u>	<u>0.486</u>	0.085	<u>0.624</u>	<u>0.481</u>
VAR003	<u>0.587</u>	<u>0.492</u>	1.000	<u>0.427</u>	<u>0.490</u>	0.325	0.005	<u>0.428</u>	<u>0.471</u>	0.002	<u>0.564</u>	<u>0.460</u>
VAR004	<u>0.396</u>	<u>0.455</u>	<u>0.427</u>	1.000	<u>0.436</u>	0.296	0.088	<u>0.409</u>	<u>0.430</u>	0.136	<u>0.501</u>	<u>0.434</u>
VAR005	<u>0.478</u>	<u>0.473</u>	<u>0.490</u>	<u>0.436</u>	1.000	<u>0.559</u>	<u>0.363</u>	<u>0.751</u>	<u>0.747</u>	0.382	<u>0.646</u>	<u>0.599</u>
VAR006	<u>0.442</u>	<u>0.440</u>	<u>0.325</u>	0.296	<u>0.559</u>	1.000	0.259	<u>0.581</u>	<u>0.638</u>	0.335	<u>0.497</u>	<u>0.536</u>
VAR007	0.037	0.036	0.005	0.088	<u>0.363</u>	<u>0.259</u>	1.000	0.289	0.336	0.444	0.083	0.085
VAR008	<u>0.380</u>	<u>0.425</u>	<u>0.427</u>	<u>0.409</u>	<u>0.751</u>	<u>0.581</u>	0.289	1.000	<u>0.906</u>	<u>0.618</u>	<u>0.603</u>	<u>0.536</u>
VAR009	<u>0.436</u>	<u>0.486</u>	<u>0.471</u>	<u>0.430</u>	<u>0.747</u>	<u>0.638</u>	0.339	<u>0.906</u>	1.000	<u>0.731</u>	<u>0.668</u>	<u>0.610</u>
VAR010	-0.005	0.085	0.002	0.136	<u>0.382</u>	0.335	<u>0.444</u>	<u>0.618</u>	<u>0.731</u>	1.000	0.156	0.160
VAR011	<u>0.592</u>	<u>0.624</u>	<u>0.563</u>	<u>0.501</u>	<u>0.646</u>	<u>0.497</u>	0.083	<u>0.603</u>	<u>0.668</u>	0.156	1.000	0.681
VAR012	<u>0.562</u>	<u>0.482</u>	<u>0.460</u>	<u>0.434</u>	<u>0.599</u>	<u>0.536</u>	<u>0.085</u>	<u>0.536</u>	<u>0.610</u>	0.160	<u>0.680</u>	1.000
VAR013	-0.006	0.052	0.055	-0.369	0.064	0.203	0.017	0.027	0.026	-0.073	-0.032	0.049
VAR014	0.172	0.152	0.117	0.305	0.227	0.234	0.251	<u>0.357</u>	<u>0.403</u>	<u>0.579</u>	0.086	<u>0.256</u>

Note: Correlations significant at the .01 level of confidence are underlined.

TABLE 12 (Continued)

	VAR013	VAR014
VAR001	-0.006	0.172
VAR002	0.052	0.152
VAR003	0.055	0.117
VAR004	-0.369	0.305
VAR005	0.064	0.227
VAR006	0.203	0.234
VAR007	0.017	0.251
VAR008	0.027	0. <u>357</u>
VAR009	0.026	0. <u>403</u>
VAR010	-0.073	0. <u>579</u>
VAR011	-0.032	0.086
VAR012	0.049	0.256
VAR013	1.000	-0.116
VAR014	-0.116	1.000

Note: Correlations significant at the .01 level of confidence are underlined,

TABLE 13
Significant Correlations in order
of Magnitude for Group II

VARIABLE	VARIABLE	CORRELATION
009 (NURT2)	008 (ScT2)	.906
005 (ScT1)	008 (ScT2)	.751
005 (ScT1)	009 (NURT2)	.747
009 (NURT2)	010 (GPAT2)	.731
012 (LP2)	011 (LP1)	.681
011 (LP1)	005 (ScT1)	.646
011 (LP1)	009 (NURT2)	.668
009 (NURT2)	006 (NURT1)	.638
011 (LP1)	002 (Comp)	.624
012 (LP2)	009 (NURT2)	.610
010 (GPAT2)	008 (ScT2)	.618
011 (LP1)	008 (ScT2)	.603
012 (LP2)	005 (ScT2)	.600
011 (LP1)	001 (Vocab)	.592
003 (HSEng)	001 (Vocab)	.586
008 (ScT2)	006 (NURT1)	.581
010 (GPAT2)	014 (GPAT3)	.579
011 (LP1)	003 (HSEng)	.564
012 (LP2)	001 (Vocab)	.562
006 (NURT1)	005 (ScT1)	.559
012 (LP2)	006 (NURT1)	.536

TABLE 13 (Continued)

VARIABLE	VARIABLE	CORRELATION
012 (LP2)	008 (ScT2)	.536
011 (LP1)	004 (HSSc)	.500
011 (LP1)	006 (NURT1)	.497
003 (HSEng)	002 (Comp)	.492
003 (HSEng)	005 (ScT1)	.490
002 (Comp)	009 (NURT2)	.486
002 (Comp)	012 (LP2)	.481
001 (Vocab)	005 (ScT1)	.478
002 (Comp)	005 (ScT1)	.472
003 (HSEng)	009 (NURT2)	.471
003 (HSEng)	012 (LP2)	.460
002 (Comp)	004 (HSSc)	.454
007 (GPAT1)	610 (GPAT2)	.444
006 (NURT1)	001 (vocab)	.442
006 (NURT1)	002 (Comp)	.440
004 (HSSc)	005 (ScT1)	.436
001 (vocab)	009 (NURT2)	.436
004 (HSSc)	012 (LP2)	.434
004 (HSSc)	009 (NURT2)	.430
008 (ScT2)	003 (HSEng)	.427
003 (HSEng)	004 (HSSc)	.426
008 (ScT2)	002 (comp)	.425
008 (ScT2)	004 (HSSc)	.409

TABLE 13 (Continued)

VARIABLE	VARIABLE	CORRELATION
009 (NURT2)	014 (GPAT3)	.403
004 (HSSc)	001 (vocab)	.396
005 (ScT1)	010 (GPAT2)	.382
001 (vocab)	008 (ScT2)	.380
005 (ScT1)	007 (GPAT1)	.363
008 (ScT2)	014 (GPAT2)	.357

TABLE 14

Summary of Multiple Regression Analysis for
the Prediction of GPAT1 Group II

VARIABLE	MULTIPLE R	R SQUARE	RSQ CHANGE	SIMPLE R	B	BETA	F	df
VAR004 HSSC	0.088	0.008	0.008	0.088	0.117	0.113	0.372	1, 49
VAR013 YEARS	0.103	0.011	0.003	0.017	0.295	0.066	0.250	2, 48
VAR003 HSENG	0.115	0.013	0.003	0.005	-0.104	-0.088	0.204	3, 47
VAR011 LP1	0.131	0.017	0.004	0.083	0.220	0.077	0.196	4, 46
VAR002 COMP	0.134	0.018	0.001	0.036	-0.307	-0.043	0.162	5, 45
VAR012 LP2	0.138	0.019	0.001	0.085	0.103	0.041	0.138	6, 46
(CONSTANT)								

* p .05

** p .01

TABLE 15

Summary of Multiple Regression Analysis for
the Prediction of GPAT2 Group II

VARIABLE	MULTIPLE R	R SQUARE	RSQ CHANGE	SIMPLE R	B	BETA	F	df
VAR007	GPAT1	0.444	0.197	0.197	0.524	0.280	11.772**	1,48
VAR005	SCT1	0.503	0.253	0.382	0.729	0.311	7.962**	2,47
VAR001	VOCAB	0.528	0.279	-0.005	-3.014	-0.218	5.939**	3,46
VAR006	NURT1	0.555	0.308	0.335	0.492	0.255	5.007**	4,45
VAR013	YEARS	0.573	0.328	-0.073	-1.360	-0.164	4.310**	5,44
VAR003	HSENG	0.577	0.334	0.002	-0.181	-0.082	3.589**	6,43
VAR004	HSSC	0.578	0.335	0.136	-0.796	-0.041	3.016*	7,42
VAR002	COMP	0.579	0.335	0.085	0.373	0.028	2.579*	8,41
VAR011	LPI	0.579	0.335	0.156	-0.118	-0.022	2.239	9,40
(CONSTANT)					-14.740			

* p .05

** p .01

TABLE 16

Summary of Multiple Regression Analysis
for the Prediction of GPAT 3 Group II

VARIABLE	MULTIPLE R	R SQUARE	RSQ CHANGE	SIMPLE R	B	BETA	F	df
VAR010	GPAT2	0.579	0.335	0.335	1.640	1.249	24.178**	1, 48
VAR004	HSSC	0.622	0.387	0.305	0.714	0.282	14.845**	2, 47
VAR009	NURT2	0.643	0.413	0.403	-3.807	-1.288	10.800**	3, 46
VAR012	LP2	0.688	0.474	0.256	2.417	0.394	10.123**	4, 45
VAR001	VOCAB	0.711	0.506	0.172	3.548	0.195	9.000**	5, 44
VAR003	HSENG	0.723	0.523	0.117	0.614	0.212	7.847**	6, 43
VAR013	YEARS	0.736	0.542	-0.116	0.681	0.063	6.073**	8, 41
VAR008	SCT2	0.733	0.537	0.357	0.908	0.324	6.959**	7, 42
VAR005	SCT1	0.739	0.546	0.227	-0.293	-0.095	5.341**	9, 40
VAR011	LP1	0.740	0.548	0.086	-0.709	-0.101	4.727**	10, 39
VAR002	COMP	0.742	0.551	0.152	1.256	0.072	4.234**	11, 38
VAR006	NURT1	0.743	0.552	0.234	0.140	0.055	3.802**	12, 37
(CONSTANT)					0.584			

* P .05
** P .01

All factors were found to be significant at the .01 level of confidence.

This summary concludes the data for Group II.

C GROUP III:

As this group of students had completed only the first year of their program, no values for GPAT3 were available. With this exception, the variables for this group were the same as those for Group II. The types of analysis were the same.

Table 17 lists means, standard deviations and number of cases for each variable for this group.

Null Hypothesis I:

Table 18 lists correlation co-efficients for the thirteen variables for this group. For the convenience of the reader, values significant at the .01 level of confidence have been underlined. For $N - 1$ df significance at the .05 level of confidence was .240 while for the .01 level it is .313 (Ferguson 1971 p. 457).

Table 19 lists, in order of magnitude, correlation co-efficients significant at the .01 level of confidence.

Null Hypothesis II:

No single factor or group of factors is significant in the prediction of GPAT1.

The results of the step-wise regression analysis are listed in Table 20, and discussed in Chapter 6. Significance was determined by Critical Values Table D (Ferguson 1971 p. 454). All calculated values were noted to be significant at

the .01 level of confidence.

Null Hypothesis III:

No single factor or group of factors is significant in the prediction of GPAT2.

The results of the analysis are listed in Table 21 and discussed in Chapter 6. All calculated values were significant at the .01 level of confidence.

A table displays the computer printout of standardized residuals against sequence of scores for var 010 (GPAT2). It also lists the observed and predicted values for this variable.

D GROUP IV:

This group is a composite of Groups II and III. Variables and analyses are the same as those for Group III.

Table 22 lists means, standard deviations and numbers of cases for each variable for this group.

Null Hypothesis I:

Table 23 lists correlation co-efficients for the 13 variables for this group. For the convenience of the reader, correlations significant at the .01 level of confidence have been underlined. For $N - 1$ df significance at the .05 level of confidence is .195 while at the .01 level it is .254 (Ferguson 1971 p. 457).

Table 24 lists these correlations in order of magnitude.

Null Hypothesis II:

The results of the step-wise multiple regression analysis for the prediction of GPAT1 are listed in Table 25.

TABLE 17
Means, Standard Deviation and
Numbers of Cases for Variables
for Group III

VARIABLE	MEAN	STANDARD DEV	CASES
VAR001 (Vocab)	11.478	1.705	67
VAR002 (Comp)	12.309	1.785	67
VAR003 (HSEng)	62.388	10.882	67
VAR004 (HSSc)	64.478	12.500	67
VAR005 (ScT1)	65.067	15.000	67
VAR006 (NurT1)	63.202	19.837	67
VAR007 (GPAT1)	12.248	27.428	67
VAR008 (ScT2)	72.209	15.841	67
VAR009 (NurT2)	72.537	14.549	67
VAR010 (GPAT2)	24.844	38.283	67
VAR011 (LP1)	36.209	6.042	67
VAR012 (LP2)	48.731	110.445	67
VAR013 (GPAT3)	2.657	3.033	67

TABLE 18

Correlation co-efficients for Variables
for Group III

	VAR001	VAR002	VAR003	VAR004	VAR005	VAR006	VAR007	VAR008	VAR009	VAR010
VAR001	1.000	0.258	<u>0.334</u>	0.247	-0.076	-0.093	-0.147	0.144	0.106	0.102
VAR002	0.258	1.000	-0.002	-0.001	-0.037	-0.204	<u>-0.372</u>	0.043	0.051	-0.079
VAR003	<u>0.334</u>	-0.002	1.000	0.749	-0.085	<u>0.399</u>	-0.036	-0.117	-0.083	-0.023
VAR004	0.247	-0.001	0.749	1.000	-0.181	0.229	-0.091	-0.159	-0.097	-0.070
VAR005	-0.076	-0.037	-0.085	-0.181	1.000	0.175	0.555	0.181	0.220	0.137
VAR006	-0.093	-0.204	<u>0.399</u>	0.229	0.175	1.000	0.446	0.124	0.168	0.236
VAR007	-0.147	<u>-0.372</u>	-0.036	-0.091	0.555	0.446	1.000	<u>0.359</u>	<u>0.342</u>	0.549
VAR008	0.144	0.043	-0.117	-0.159	0.181	0.124	<u>0.359</u>	1.000	0.869	0.669
VAR009	0.106	0.051	-0.083	-0.097	0.220	0.168	0.342	0.869	1.000	0.714
VAR010	0.102	-0.079	-0.023	-0.070	0.137	0.236	0.439	0.669	0.714	1.000
VAR011	0.047	0.243	-0.040	-0.034	-0.224	-0.090	-0.308	-0.243	-0.246	-0.340
VAR012	-0.169	-0.131	-0.034	-0.108	0.046	0.050	-0.052	-0.048	-0.010	-0.085
VAR013	0.075	0.112	<u>-0.273</u>	-0.241	0.223	-0.180	0.015	0.023	0.052	-0.103

Note: Correlations significant at the .01 level of confidence are underlined.

TABLE 18 (Continued)

	VAR011	VAR012	VAR013
VAR001	0.047	-0.169	0.075
VAR002	0.243	-0.131	0.112
VAR003	0.040	-0.034	0.273
VAR004	0.034	-0.108	-0.241
VAR005	0.224	0.046	0.223
VAR006	0.090	0.050	-0.180
VAR007	0.308	-0.052	0.015
VAR008	0.243	-0.048	0.023
VAR009	0.246	-0.010	0.052
VAR010	0.340	-0.085	-0.103
VAR011	1.000	0.093	0.016
VAR012	0.093	1.000	0.219
VAR013	0.016	0.219	1.000

Note: Correlations significant at the .01 level of confidence are underlined.

TABLE 19
 Statistically Significant
 Correlations in order of
 Magnitude Group III

VARIABLE	VARIABLE	CORRELATION
008 (ScT2)	009 (NURT2)	.869
003 (HSEng)	004 (HSSc)	.749
009 (NURT2)	010 (GPAT2)	.714
008 (ScT2)	010 (GPAT2)	.669
005 (ScT1)	007 (GPAT1)	.555
007 (GPAT1)	010 (GPAT2)	.549
006 (NURT1)	007 (GPAT1)	.446
003 (HSEng)	006 (NURT1)	.399
007 (GPAT1)	008 (ScT2)	.359
007 (GPAT1)	009 (NURT2)	.342
001 (vocab)	003 (HSEng)	.334
010 (GPAT2)	011 (LP1)	-.340
002 (comp)	007 (GPAT1)	-.372

TABLE 20

Summary of Multiple Regression Analysis
for the Prediction of GPAT1 Group III

VARIABLE	MULTIPLE R	R SQUARE	RSQ CHANGE	SIMPLE R	B	Beta	F	df
VAR005	SCT1	0.555	0.308	0.308	0.822	0.450	28.968**	1,65
VAR006	NURT1	0.659	0.434	0.446	0.523	0.378	24.504**	2,64
VAR002	COMP	0.718	0.516	-0.372	-4.277	-0.278	22.355**	3,63
VAR012	LP2	0.730	0.532	-0.052	-0.295	-0.119	17.648**	4,64
VAR003	HSENG	0.742	0.550	-0.036	-0.427	-0.170	14.923**	5,61
VAR011	LP1	0.748	0.559	-0.308	-0.466	-0.103	12.692**	6,60
VAR001	VOCAB	0.749	0.560	-0.147	0.567	0.035	10.739**	7,59
(CONSTANT)					16.822			

* P .05

** P .01

TABLE 21

Summary of Multiple Regression Analysis
for the Prediction of GPAT2 Group III

VARIABLE	MULTIPLE R	R SQUARE	RSQ CHANGE	SIMPLE R	B	BETA	F	df
VAR009	NURT2	0.714	0.510	0.714	1.500	0.570	67.559**	1,65
VAR007	GPAT1	0.784	0.614	0.549	0.769	0.551	50.003**	2,64
VAR005	SCT1	0.815	0.664	0.137	-0.735	-0.288	41.534**	3,63
VAR011	LP1	0.822	0.676	-0.340	-0.871	-0.137	32.303**	4,62
VAR001	VOCAB	0.828	0.685	0.102	2.375	0.106	26.505**	5,61
VAR013	YEARS	0.832	0.692	-0.103	-1.516	-0.120	22.499**	6,60
VAR002	COMP	0.836	0.699	-0.079	2.140	0.100	19.555**	5,59
VAR004	HSSc	0.839	0.704	-0.070	-0.277	-0.090	17.253**	8,58
VAR006	NURT1	0.840	0.705	0.236	-0.942	-0.049	15.132**	9,58
VAR012	LP2	0.840	0.706	-0.085	0.862	0.025	13.421**	10,56
VAR003	HSENG	0.840	0.706	-0.023	0.110	0.031	12.001**	11,55
VAR008	SCT2	0.840	0.706	0.669	-0.640	-0.027	10.809**	12,54
(CONSTANT)					-42.439			

* P .05
** P .01

Significance was determined by the Critical Values in Table D (Ferguson 1971 P. 454). All calculated values were significant at the .01 level of confidence.

Null Hypothesis III:

The results of the multiple regressions analysis for the prediction of GPAT2 are found in Table 26. All calculated values were significant at the .01 level of confidence.

A table displays the computer printout of standardized residuals against sequence of scores for var 10 (GPAT2). It also lists the observed and predicted values for this variable.

This concludes the presentation of the results of the data analysis for all four groups. The next chapter will discuss these results.

TABLE 22
Means, Standard Deviations
and Numbers of Cases for
Variables for Group IV

VARIABLE	MEAN	STANDARD DEV.	CASES
VAR001 (Vocab)	11.523	1.993	117
VAR002 (Comp)	12.021	2.114	117
VAR003 (HSEng)	63.076	12.622	117
VAR004 (HSSc)	54.333	14.426	117
VAR005 (ScT1)	65.765	14.476	117
VAR006 (NurT1)	66.200	18.844	117
VAR007 (GPAT1)	9.561	23.770	117
VAR008 (ScT2)	70.761	15.685	117
VAR009 (NurT2)	69.940	14.735	117
VAR010 (GPAT2)	21.277	35.983	117
VAR011 (LP1)	36.966	6.094	117
VAR012 (LP2)	43.974	83.614	117
VAR013 (GPAT3)	2.564	3.420	117

TABLE 23

Correlation Co-efficients for

Variables for Group IV

	VAR001	VAR002	VAR003	VAR004	VAR005	VAR006	VAR007	VAR008	VAR009
VAR001	1.000	<u>0.449</u>	<u>0.480</u>	<u>0.333</u>	0.190	0.152	-0.073	<u>0.253</u>	<u>0.257</u>
VAR002	<u>0.449</u>	1.000	<u>0.270</u>	<u>0.261</u>	0.195	0.060	-0.172	0.243	<u>0.290</u>
VAR003	<u>0.481</u>	<u>0.270</u>	1.000	<u>0.562</u>	0.191	<u>0.360</u>	-0.027	0.142	0.174
VAR004	<u>0.333</u>	<u>0.261</u>	<u>0.562</u>	1.000	0.112	0.247	-0.019	0.120	0.162
VAR005	0.190	0.195	0.191	0.112	1.000	<u>0.320</u>	<u>0.477</u>	<u>0.400</u>	<u>0.411</u>
VAR006	0.152	0.060	<u>0.360</u>	0.247	<u>0.320</u>	1.000	<u>0.355</u>	<u>0.270</u>	<u>0.296</u>
VAR007	-0.073	-0.172	-0.027	-0.019	<u>0.477</u>	<u>0.355</u>	1.000	<u>0.340</u>	<u>0.351</u>
VAR008	0.253	0.243	0.142	0.120	<u>0.400</u>	<u>0.270</u>	<u>0.340</u>	1.000	<u>0.883</u>
VAR009	<u>0.257</u>	<u>0.290</u>	0.174	0.161	<u>0.411</u>	<u>0.296</u>	<u>0.351</u>	<u>0.883</u>	1.000
VAR010	0.047	0.015	-0.019	0.024	0.219	0.242	<u>0.522</u>	<u>0.652</u>	<u>0.722</u>
VAR011	<u>0.320</u>	<u>0.398</u>	<u>0.266</u>	0.227	0.137	0.159	-0.194	0.096	0.108
VAR012	-0.087	-0.053	-0.008	-0.052	0.052	0.045	-0.034	-0.011	0.027
VAR013	0.028	0.081	-0.090	-0.312	0.145	-0.014	0.019	0.028	0.045

Note: Correlations significant at the .01 level of confidence are underlined

TABLE 23 (continued)

	VAR010	VAR011	VAR012	VAR013
VAR001	0.047	<u>0.320</u>	-0.087	0.028
VAR002	0.015	<u>0.398</u>	-0.053	0.082
VAR003	-0.019	<u>0.266</u>	-0.008	-0.090
VAR004	0.024	0.227	-0.051	<u>-0.312</u>
VAR005	0.219	0.137	0.052	0.145
VAR006	0.242	0.159	0.044	-0.014
VAR007	<u>0.521</u>	-0.194	-0.034	0.019
VAR008	<u>0.652</u>	0.096	-0.011	0.028
VAR009	<u>0.722</u>	0.108	0.027	0.045
VAR010	1.000	-0.162	-0.056	-0.083
VAR011	-0.162	1.000	0.084	-0.012
VAR012	-0.056	0.084	1.000	0.150
VAR013	-0.083	-0.012	0.150	1.000

Note: Correlations significant at the .01 level of confidence are underlined.

TABLE 24
Statistically Significant
Correlations in Order of
Magnitude Group IV

VARIABLE	with	VARIABLE	CORRELATION
008 (ScT2)		009 (NurT2)	.883
010 (GPAT2)		009 (NurT2)	.722
010 (GPAT2)		008 (ScT2)	.652
003 (HSEng)		004 (HSSc)	.562
010 (GPAT2)		007 (GPAT1)	.522
001 (Vocab)		003 (HSEng)	.481
005 (ScT1)		007 (GPAT1)	.477
001 (Vocab)		002 (Comp)	.449
005 (ScT1)		009 (NurT2)	.411
005 (ScT1)		008 (ScT2)	.400
002 (Comp)		011 (LP1)	.398
006 (NurT1)		003 (HSEng)	.360
006 (NurT1)		007 (GPAT1)	.360
009 (NurT2)		007 (GPAT1)	.351
008 (ScT2)		007 (GPAT1)	.339
004 (HSSc)		001 (Vocab)	.333
005 (ScT1)		006 (NurT1)	.320
001 (Vocab)		010 (GPAT2)	.320
004 (HSSc)		013 (Years)	.312
006 (NurT1)		009 (NurT2)	.296
002 (Comp)		009 (NurT2)	.290
002 (Comp)		003 (HSEng)	.270
008 (ScT2)		003 (HSEng)	.270
003 (HSEng)		011 (LP1)	.266
002 (Comp)		004 (HSSc)	.261
001 (Vocab)		009 (NurT2)	.257
001 (Vocab)		008 (ScT2)	.253
004 (HSSc)		006 (NurT1)	.247
002 (Comp)		008 (ScT2)	.243
006 (NurT1)		010 (GPAT2)	.242

TABLE 25

Summary of Multiple Regression
Analysis for the Prediction
of GPAT1 Group IV

VARIABLE	MULTIPLE R	R SQUARE	RSQ CHANGE	SIMPLE R	B	BETA	F	df
VAR005 SCT1	0.477	0.228	0.228	0.477	0.785	0.478	33.95	1, 115
VAR002 COMP	0.549	0.301	0.073	-0.172	-1.838	-0.164	25.54	2, 114
VAR006 NURT1	0.588	0.346	0.045	0.355	0.368	0.292	19.94	3, 113
VAR011 LP1	0.621	0.387	0.041	-0.198	-0.772	-0.198	17.67	4, 112
VAR003 HSENG	0.631	0.399	0.012	-0.027	-0.230	-0.122	14.72	5, 111
VAR012 LP2	0.635	0.403	0.004	-0.034	-0.175	-0.061	12.37	6, 110
VAR013 YEARS	0.636	0.404	0.001	0.019	-0.250	-0.036	10.56	7, 109
VAR001 VOCAB	0.636	0.404	0.000	-0.073	-0.209	-0.018	9.16	8, 108
(CONSTANT)					2.515			

TABLE 26
Summary of Multiple Regression
Analysis for the Prediction
of GPAT2 Group IV

VARIABLE	MULTIPLE R	R SQUARE	RSQ CHANGE	SIMPLE R	F	B	BETA	df
VAR009	0.722	0.521	0.521	0.722	125.32	1.68	0.691	1, 115
VAR007	0.777	0.603	0.082	0.522	86.72	0.482	-0.318	2, 114
VAR005	0.806	0.650	0.046	0.219	69.83	-0.463	-0.186	3, 113
VAR011	0.817	0.667	0.017	-0.162	56.02	-0.729	-0.124	4, 112
VAR013	0.822	0.675	0.009	-0.083	46.18	-1.129	-0.107	5, 111
VAR003	0.825	0.680	0.004	-0.019	38.93	-0.173	-0.061	6, 160
VAR004	0.825	0.681	0.001	0.024	33.23	-0.102	-0.041	7, 109
VAR012	0.926	0.682	0.001	-0.056	28.92	-0.134	-0.031	8, 108
VAR006	0.826	0.682	0.001	0.242	25.56	0.520	0.027	9, 107
VAR002	0.826	0.683	0.000	0.015	22.80	-0.412	-0.024	10, 106
VAR008	0.826	0.683	0.000	0.652	20.56	0.751	0.033	11, 105
VAR001	0.826	0.683	0.000	0.047	18.67	0.173	0.010	12, 104
(CONSTANT)						-28.73		

CHAPTER 6

THE DISCUSSION

The previous chapter contained a presentation of the results of the analysis of data for the four groups. In this chapter these results are discussed. Implications of the study follow this discussion. For the convenience of the reader, the variables and their abbreviations will be listed here. A more complete explanation is found in Chapter 3.

001	vocab	-	vocabulary section of reading test
002	comp	-	comprehension section of reading test
001	HSA	-	high school average
003	HSEng	-	high school English grades
004	HSSc	-	high school Science grades
005	ScT1	-	Science Term I
008	ScT2	-	Science Term II
006	Nur T1	-	Nursing Term I
009	Nur T2	-	Nursing Term II
007	GPAT1	-	Grade Point Average Term I
010	GPAT2	-	Grade Point Average Term II
013	GPAT3	-	Grade Point Average Term III
004	GPAT4	-	Grade Point Average Term IV
005	RN's	-	scores on national registration examinations
010	LP1	-	Learning Preference Inventory - symbolic
012	LP2	-	Learning Preference Inventory - structure
013	years	-	length of time out of school

GROUP I

Null Hypothesis I:

There will be no statistically significant correlation between the factors listed for this group.

A number of statistically significant correlations were noted, the greatest between GPAT4 and RN scores. (Table 7 p. 96). In other words, the final GPA of the program correlated strongly with the score on the national examinations. The college can thus determine which students are likely to pass or to fail by examining the GPA. If a high pass rate in the RN's is important, the college must admit to the examination only those students with a high GPA. Promotion policies must reflect the philosophy of the college in this area. The next highest correlations are between the GPA and science and between RN's and science. Traditionally the science courses are considered demanding, the weaker students displaying the most difficulty, so this correlation is to be expected. Taken in reverse sequence, HSA correlates with Science, which correlates with GPA, which in turn correlates with RN's. (Table 8 p. 97). The student who did well in high school did well in the school and well in the RN's. On the basis of this correlation, Null hypothesis I was rejected and alternate hypothesis I was accepted.

Null Hypothesis II:

No single factor or group of factors is a significant predictor of GPAT4.

The best predictor of GPAT4 was ScT2 which accounted

for 42% of the prediction. (Table 9 p.98). This is interesting as GPA is not cumulative and Science is not taught in Term 4, hence does not form part of the GPA. The next best predictor was ScT1 with an R squared value of 0.538; in other words it added 12% to the prediction. Other factors, while significant, added little to the predictive value. These results are consistent with the simple correlations. As the single factor ScT2 provided 42% of the prediction it is a significant factor, hence Null Hypothesis II is rejected and Alternate Hypothesis II is accepted. The implication of this is that students who do well in Science at the end of the first year will do well in the second year, those who do not can be expected to have academic problems in the second year.

Null Hypothesis III:

No single factor or group of factors is a significant predictor of RN scores.

The most significant predictor was GPAT4 with an R squared value of 0.506, which means 51% of the prediction is due to the one factor. (Table 10 p.99). Again, this agrees with the simple correlation. The next best predictor was ScT1 which added 14% to the prediction. Students with high scores in the final year of the college program can be expected to have high scores in the national examinations. On this basis, null hypothesis III was rejected and alternate hypothesis III was accepted. The practice at RRCC is to admit to the RN's those students who have a reasonable chance of success. GPA scores achieved at the end of the program could be used

as predictors, or as an indication of which students should be counselled to seek help before they attempted the RN's.

GROUP II

Null Hypothesis I:

There will be no significant correlation between the variables listed for this group.

Seventeen significant correlations were listed for this group. (Table 12 p.102). The highest degree of positive relationship was between two Term 2 subjects--Science and Nursing, second between Term 1 and Term 2 Science, then between Science Term 1 and Nursing Term 2. (Table 13 p.104). The Learning Preference scores correlated positively not only with one another, but also with both Nursing and Science. LPl correlated with the Reading Comprehension scores as well. The only pre-admission score of significance was HSEng which correlated with Vocab. The table reveals a relationship between many pairs of factors. The only one not noted was Years, the length of time students had been out of school. Concern is expressed about the ability of the older student to complete the program successfully. According to these correlations, some factor other than time is significant. In view of the correlations noted, Null hypothesis I was rejected and alternate hypothesis I was accepted.

Null hypothesis II:

No single factor or group of factors is significant in the prediction of GPAT1.

The results of the multiple regression analysis are

listed in Table 14 p.107. No significant predictor was noted. High school Science was the best predictor, but was not statistically significant at the .05 level. On the basis of these results, Null Hypothesis II was accepted.

Null Hypothesis III:

No single factor or group of factors is a significant predictor of GPAT2.

The results of a step-wise multiple regression analysis are listed in Table 15 p.108. The most significant predictor was GPAT1 which accounted for almost 20% of the prediction. Next was ScT1 which added another 5% and Vocab which added 2% more. While these results were significant, 73% of the prediction came from other sources. Only one of the factors listed (Vocab) was a pre-admission score, the others first term scores. On the basis of the regression analysis, Null hypothesis II was rejected and alternate hypothesis II was accepted, although factors other than the ones identified played a large role in the prediction of the dependent variable. This could be the subject of a future study.

Null Hypothesis IV:

No single factor or group of factors is significant in the prediction of GPAT3. Table 16 p.109 lists the results of the step-wise regression analysis which shows one third of the prediction was due to GPAT2. This is in accord with the previous analysis in which the GPA of the previous term was the best predictor of the next term. The next factor HSSc added about 6%, NURT2 another 2% and LP2 6% more. Thus the

single best predictor was GPAT2, while the group of four factors accounted for almost half of the prediction. On the basis of this analysis Null hypothesis III was rejected and alternate hypothesis III was accepted.

In summary, the best predictor of GPA was the GPA of the previous term. This was to be expected, as we have found students who are weak in the first term are weak throughout the program; those with good marks in the first term tend to have good marks in all the terms. Traditionally, high school grades have been stated to be the best predictor of college grades. The writer had noted this relationship in a previous school. For Group II no significant pre-admission predictor was noted. Many of our students have not completed high school, or have done so a number of years ago. Furthermore, those that do have high school credentials have taken a variety of courses. This may be one reason why high school marks were not a significant predictor of GPA in the first term.

GROUP III

Null Hypothesis I:

No statistically significant correlation will be found between the factors listed for this group. As for Group II, the most significant correlation was between ScT2 and NurT2 with a correlation of 0.869. (Table 18 p.113). The next highest correlation was between HSSc and ScT1. (Table 19 p.115) As both deal with science this was to be expected although it was not noted for Group II (Table 12 p.102) As for Group II there were significant correlations between GPAT2 and NurT2,

GPAT2 and ScT2, between GPA of both terms and GPA and Science and Nursing of the same term. As both nursing and science form a large part of the GPA this is not a surprising finding. In view of the correlations noted, Null hypothesis I was rejected and alternate hypothesis I was accepted.

Null Hypothesis II:

No single factor or group of factors is a significant predictor of GPAT1.

The data listed in Table 20 p.116 reveals significance. ScT1 was the best predictor with an Rsquared value of 0.308. NurT1 added 12% to the prediction. Reading comprehension added 8% while LP2 added 2%. HSSc, while significant, added little more to the prediction. It is interesting to note that while NurT1 is weighted more heavily than ScT1 in the computation of GPAT1, ScT1 is the better predictor. On the basis of the results of the multiple regression analysis, Null hypothesis II is rejected and alternate hypothesis II is accepted.

Null Hypothesis III:

No single factor or group of factors is significant in the prediction of GPAT2.

Table 21 p.117 indicates the most significant predictor to be NurT2 with an Rsquared value of 0.510. GPAT1 is the next best predictor with an Rsquared value of 0.614. GPAT1 was the best predictor for Group II. (Table 14 p.107). Next is ScT1 which was second for Group II. LP1 with an Rsquared value of 0.675 and Vocab with an Rsquared value of 0.684 were

next. Years was also a significant factor. While the last three factors were statistically significant, only the first three have a practical predictive value. Again Null hypothesis III was rejected and alternate hypothesis III was accepted. Papcum (1971), Payne (1968), and Zegil (1973) conclude high school grades are good predictors of success in post-secondary education. Owen and Feldhusen (1970) used pre-admission criteria and subsequent grades to predict success in the next grade. They found the grades of the previous semester to be the best predictors of the grades achieved in the next semester. The writer's expectations concurred with these findings. The results of the analysis of the data for Group III were, therefore, not quite as expected. High school grades were fifth in predicting term I GPA. The reason for this may be the same as the reason for the same finding for Group II. Relatively few of our students have recent, complete, high school grades. The writer expected term I GPA to be the best predictor of the GPA for the subsequent term. Nursing scores for the term were the best predictor while GPA of the previous term was second. The other expectation was that the length of time since high school would be a predictor, as students would have lost study skills, reading speed, and confidence in their role as a student. Years was not a significant predictor for either Group II or III. A study of the motivation of mature students might reveal that to be a significant factor.

GROUP IV

As Group IV was a combination of Groups II and III

results similar to these two groups was to be expected.

Table 24 presents a summary of factors listed in order of significance.

Null Hypothesis I:

There will be no statistically significant correlation between the factors listed for this group. Table 23 (p.120) listed correlations for this group. The five most significant correlations were as follows:

ScT2 and NurT2

GPAT2 and NurT2

GPAT2 and ScT2

HSEng and HSSc

GPAT1 and GPAT2

A comparison of the sequence of significant factors of Group II, III, and IV reveals a marked similarity. (Table 13, p.104, Table 19, p.115, Table 24, p.122). The highest correlation was between ScT2 and NurT2 for all three groups. GPAT2 and NurT2 was second for the combined group, fourth for Group II, and third for Group III. GPAT2 and ScT2 was third for the combined group, only eleventh for Group II and fourth for Group III. HSEng and HSSc was fourth for the combined group, well down on the list for Group II, but second for Group III. Fifth for the combined group was GPAT1 and GPAT2 which was high on the list for Group III, but low for Group II. This comparison shows a program which is internally consistent, but shows little relationship with pre-admission factors. As expected, Null Hypothesis I was rejected for this group

and Alternate Hypothesis I accepted.

Null Hypothesis II:

No single factor or group of factors is a significant predictor of GPAT1. Table 25 (p.123) reveals ScT1 was the best predictor, with Comp, NurT1 and LP1 as significant predictors. For practical purposes ScT1 with an R-squared value of 0.228, Comp with an R-squared value of 0.301, NurT1 with an R-squared value of 0.346, and LP1 with an R-squared value of 0.387 would be useful predictors, as the rest add very little to the accuracy of prediction. Null Hypothesis II was rejected and Alternate Hypothesis II accepted for this group. As first term grades had been the best predictors for term I GPA for the two single groups, it was expected that this would be true for the combined group as well. The only significant pre-admission factor was reading comprehension.

Null Hypothesis III:

No single factor or group of factors is significant in the prediction of GPAT2. Table 26 (p.124) lists factors significant in the prediction of GPAT2 for the combined group. As expected, NurT2 was the best predictor with an R-squared value 0.521, which means it provided 52% of the predictions. Next was GPAT1 which added 8% to the prediction and ScT1 which added another 5%. While LP1, Years, and HSEng were all statistically significant, they added little to the predictive accuracy. On the basis of these results, Null Hypothesis III was rejected and alternate hypothesis III was accepted.

For the reason outlined for Group III, term I GPA was

expected to be the best predictor for the GPA of the subsequent term. The analysis of the data for Group IV showed GPAT1 to be the second best predictor with nursing grades as the best predictor. One reason for this may be that nursing is heavily weighted in the computation of GPA.

IMPLICATIONS OF THE STUDY

GROUP I

The greatest degree of positive relationship was noted between GPAT4, representing the final test scores in the program, and RN's which are national examinations. The other significant scores are in Science which is considered a difficult subject. It is useful to predict in the first term how well a student is likely to perform in the college course and in the RN's. If a student has borderline grades in Science she may be expected to have borderline grades in RN's as well. If she performs poorly in the college program she can be expected to perform poorly in the RN's. The college must make a decision re the number of failures in RN's it is willing to tolerate and place the student accordingly. As schools of nursing may be judged on RN results, prediction of success in this area is imperative.

GROUP II

The greatest degree of positive relationship was between Nursing and Science and between Term I Science and Term II Science, but the best prediction was between GPA of the first two terms. The only high ranking pre-admission scores were the vocabulary section of the reading score and

the high school science marks. One reason for this was that students with low reading scores were not admitted to the program. The reading scores had served as screening devices as had the high school grades. The implication of this interpretation of these results is that the absence of high school credentials need not deter a student's admission to the program. With the exception of high school science, pre-admission factors, other than those for which data is routinely collected at RRCC, may be significant predictors of success. The writer had expected reading scores and learning preference scores to be significant predictors, as the individualization of the program at RRCC had led to independent study. This was so for the vocabulary section of the reading test, but not so for the learning preference inventory. As students can exercise several learning options, they are free to choose the method of learning they prefer. This may be the reason why the learning preference scores were not good predictors of success.

GROUP III

As for Group II, the greatest degree of positive relationship was between Nursing and Science. High school science was high as was the correlation between Nursing, Science, and GPA. The positive relationship between the two GPA's was lower. Science was again the best predictor for GPAT1, but Nursing was best for GPAT2, with Science placing third. Although Nursing is weighted more heavily in the computation of GPA, Science is the better predictor for Term I. While the sequence of factors is slightly different for

Group II and III, the same factors are the best predictors of success. Once more high school science was high on the list of correlations, but much lower as a predictor. The implications of the analysis of results for this group are similar to those of Group II.

GROUP IV

As this group is a composite of Groups II and III the results could be expected to be similar and they are. Nursing, Science and GPA are strongly correlated. Science, Nursing and the previous GPA are the best predictors. As Term IV results and RN scores are not available for this group, no regression analysis or correlation could be done on these factors. However as neither the students, the faculty nor the program had changed markedly from Group I, similar results could be expected.

CONCLUSIONS

The results of the analysis of simple correlation and the results of the Multiple Regression analysis indicated a high degree of positive relationship and prediction within the college program and with the RN's, but relatively low relationship or prediction with pre-admission scores. One reason for this is that students with very low scores were not admitted to the program, while those with very high marks tended to go to the university. Thus these two factors which were cited as predictors in other studies acted as screening devices for this program. Learning Preference Inventories while significant, did not rank as high as college marks.

The scattergrams in Appendix A shows scores tended to cluster, showing relatively little diversity in the student population. This may be one reason why correlation tended to be low.

One unexpected finding was that the length of time out of school was not significant to achievement. As the number of mature students is increasing it would be interesting to correlate motivation and study skills with length of time out of school.

To prevent loss of time, material, and human resources, prediction of success is a legitimate goal. Other studies have indicated specific factors which correlated with success. Most common was previous academic achievement. This study supports these findings, although high school grades were not the best predictors. Some studies indicated grades in previous terms were the best predictors of later grades. This study strongly supports these findings. Personality tests and interviews were cited as predictors. Except for the Learning Preference Inventory neither of these factors were available for this study.

The nursing program at RRCC was undergoing major revisions at the time of the study. When the new program is implemented a study on factors affecting success should be considered as a part of the program evaluation. If pre-admission scores are to play a significant role in this prediction, some other form of testing should be included in the admission requirements. The questionnaire proposed by Pare and Butznov (p. 61) might be considered. Wood's format

(p.65) might be useful as a guide to the selection of students.

Is the routine collection of data useful for the prediction of success in the program? Yes and no. Pre-admission factors showed low predictive values for most groups. High school marks, the traditional predictors, are not available for the increasing number of mature students. These marks, can however, serve as a counselling guide for the students who do have them. Reading scores, while not the most significant factor, could alert counsellors to the possibility of academic problems. An early assessment of study skills, particularly for those students with low reading skills, would detect students who could be expected to have academic problems. Many of the subjects are graded by term marks. Students who have repeatedly failed tests before they have established good study habits find it very difficult to bring these scores to satisfactory levels. The Learning Preference Inventory showed low predictive value, thus its use should be discontinued.

As the college is legally responsible for the recording of student grades and as these are the best predictors, promotion policies should be formulated on the basis of these grades. If satisfactory completion of both the program and the RN's is an objective of the college, the promotion of students within the program should be based on these policies.

SUMMARY OF THE STUDY

This study was undertaken to determine the predictive

value of pre and post admission scores obtained by three consecutive groups of students enrolled in the diploma nursing program at RRCC. A comprehensive review of the literature revealed that changes occurring in nursing education demanded a new approach to prediction, as the traditional predictor, high school grades, was frequently not available. Alternate predictors were suggested, such as reading and study skills scores, tests of motivation, attitude and personality, cognitive mapping, and learning preference inventories.

A statistical analysis of simple correlation revealed a high degree of positive relationship among the post-admission scores, but a low degree of relationship between pre and post-admission scores. A multiple regression analysis of scores obtained by the first group indicated school marks, especially the marks obtained in science and the GPA were the best predictors of both the subsequent GPA and the standardized national registration examinations. Multiple regression analyses of the scores obtained by the other groups, who had neither completed the program nor written the national examinations, revealed that pre-admission factors were poor predictors of success within the program. Post-admission factors, especially scores obtained in science and nursing, and the previous GPA, were good predictors for the subsequent GPA.

It was recommended that promotion policies be based on scores obtained within the nursing program. The second recommendation was that a longitudinal study be undertaken to determine differences between subsequent groups of students.

Limitations of the study included the use of only one community college, the loss of students to the study on the basis of missing data, the lack of uniformity in the reporting of high school grades, and the lack of comparable data for all groups.

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APPENDIX A

LEARNING ACTIVITIES OPINIONAIRE
SUMMARY OF STUDENT RESPONSES AND SCATTERGRAMS
for Class 1976 and 1977

Number of years out of school a. went to High School last yr —
b. have been out of High School for — yrs

Learning Activities Opinionnaire

Directions: The statements below describe a variety of activities used to learn skills and knowledges. Read each statement. Respond to the statement on the basis of its value to you in a learning situation. React according to the following scale:

1 - Of No Value, 2 - Somewhat Valuable, 3 - Of Average Value,
 4 - Very Valuable, 5 - Extremely Valuable

Please answer all the questions.

Place your answers on the answer sheet provided. Darken the space under the number that represents your response. Be sure to go across the answer sheet. There are no right or wrong statements - just the value to you in learning.

- | | Of No Value | Somewhat Valuable | Of Average Value | Very Valuable | Extremely Valuable |
|---|-------------|-------------------|------------------|---------------|--------------------|
| | 1 | 2 | 3 | 4 | 5 |
| 1. Working with tools, equipment, apparatus and materials. | 1 | 2 | 3 | 4 | 5 |
| 2. Working and meeting with individuals or groups of people to learn new information and ideas. | 1 | 2 | 3 | 4 | 5 |
| 3. Activities involving the use of scale models, devices, and simulated situations. (Role playing, driver training simulator, games). | 1 | 2 | 3 | 4 | 5 |
| 4. Activities that teach job skills. | 1 | 2 | 3 | 4 | 5 |
| 5. Learning activities in which information and skills are presented by television, teacher or a classmate. | 1 | 2 | 3 | 4 | 5 |
| 6. Activities that allow me to immediately apply what I learn to actual problems I face. | 1 | 2 | 3 | 4 | 5 |
| 7. Learning experiences that only use verbal presentation to teach new information. | 1 | 2 | 3 | 4 | 5 |
| 8. Instruction using media (films, tapes, slides) to pictorially and graphically describe events, skills and procedures. | 1 | 2 | 3 | 4 | 5 |
| 9. Instruction dealing with formulas and symbols which describe the knowledges to be learned. | 1 | 2 | 3 | 4 | 5 |
| 10. Instruction based mainly on reading. | 1 | 2 | 3 | 4 | 5 |
| 11. Verbal instruction (written or oral) presented by a teacher with support of films, slides, and tapes. | 1 | 2 | 3 | 4 | 5 |
| 12. Classes where everything is set up allowing me no choice in determining goals or objectives. | 1 | 2 | 3 | 4 | 5 |
| 13. Teacher organized instruction where I have little influence on the type of instructional material and learning activities used. | 1 | 2 | 3 | 4 | 5 |

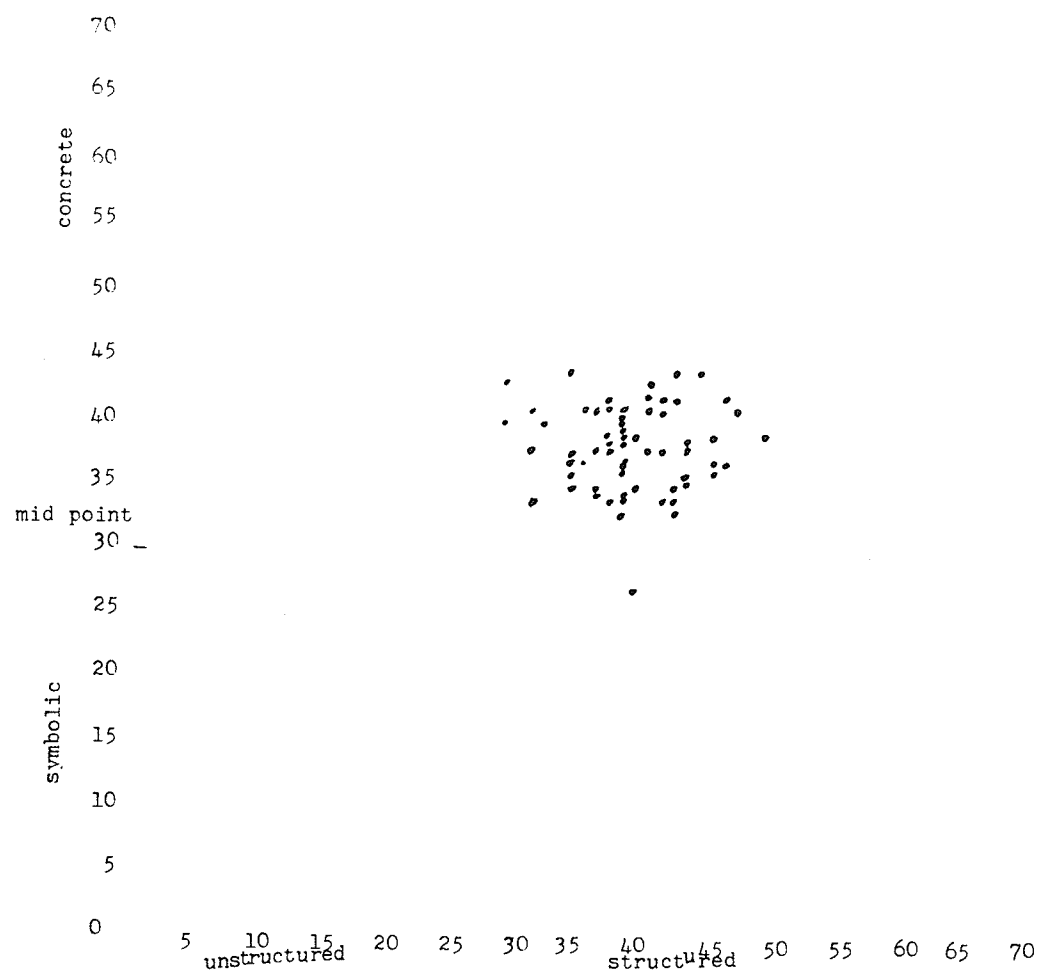
please turn over

	Of No Value Somewhat Valuable Of Average Value Very Valuable Extremely Valuable				
	1	2	3	4	5
14. Class situations that lead me from simple to complex learning activities with pre-determined goals, objectives and sequence.					
15. Working alone but with constant teacher supervision and organization.					
16. Organized situations from simple to complex giving me a choice of where I want to start, stop or branch out to new experiences.					
17. Learning activities that have no pre-set goals, you just set your own and do what you want.					
18. Working alone and setting my own pace, determining my own goals and objectives.					
19. Courses that allow me to establish my own learning sequence and activities.					
20. Student designed, and directed instructional activities.					
21. Classes involving a minimum amount of organization.					
22. Instruction completely organized by me.					

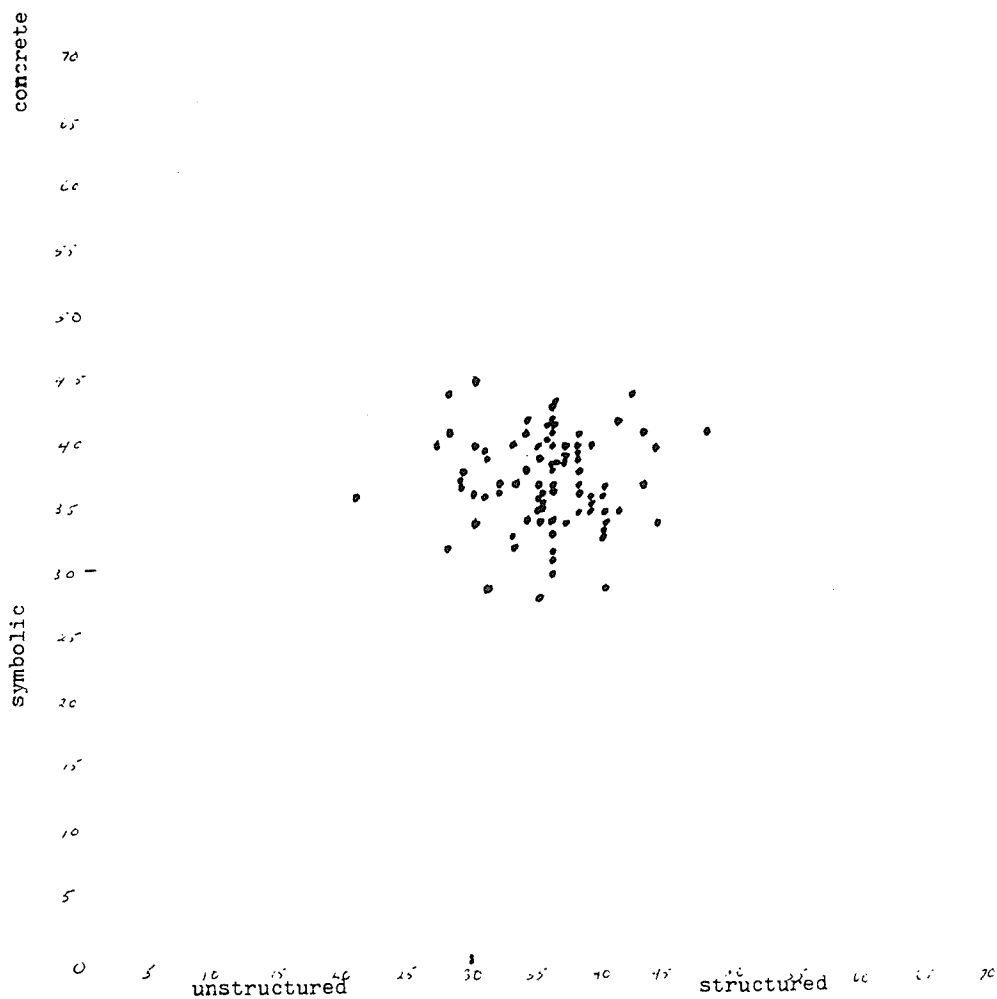
STUDENT STUDY PREFERENCE					Run Date	
					77 11 24	
H. Utler	Of No	Somewhat	Of Aver-	Very	Extremely	Non
Class 1976	Value	Valuable	age Value	Valuable	Valuable	Resp
1. Working with tools, equipment, apparatus and materials.	0	7	14	21	19	0
2. Working and meeting with individuals or groups of people to learn new information and ideas.	0	11	23	34	31	0%
3. Activities involving the use of scale models, devices and simulated situation. (Role playing, driver training simulator, games).	0	6	11	33	11	0
4. Activities that teach job skills.	0	10	18	54	18	0%
5. Learning activities in which information and skills are presented by television, teacher or a classmate.	0	10	25	23	2	0
6. Activities that allow me to immediately apply what I learn to actual problems I face.	2	16	41	38	3	0%
7. Learning experiences that only use verbal presentation to teach new information.	9	25	22	49	48	0%
8. Instruction using media (films, tapes, slides) to pictorially and graphically describe event, skills and procedures.	15	41	36	5	3	0%
9. Instruction dealing with formulas and symbols which describe the knowledge to be learned.	1	7	25	25	3	0%
10. Instruction based mainly on reading.	2	11	41	10	5	0%
11. Verbal instruction (written or oral) presented by a teacher with support of films, slides, and tapes.	9	29	13	16	0	0%
12. Classes where everything is set up allowing me no choice in determining goals or objectives.	15	48	21	16	0	0%
13. Teacher organized instructional material and learning activities used the type of instructional material and learning activities used.	6	26	25	4	0	0%
14. Class situations that lead me from simple to complex learning activities with pre-determined goals, objectives and sequence.	10	43	41	7	0	0%
15. Working alone but with constant teacher supervision and organization.	4	4	20	25	12	0
16. Organized situations from simple to complex giving me a choice of where I want to start, stop or branch out to new experiences.	0	7	33	41	20	0%
17. Learning activities that have no pre-set goals, you just set your own and do what you want.	27	21	11	2	0	0%
18. Working alone and setting my own pace, determining my own goals and objectives.	44	34	18	3	0	0%
19. Courses that allow me to establish my own learning sequence and activities.	22	22	14	3	0	0%
20. Student designed, and directed instructional activities.	36	36	23	5	0	0%
21. Classes involving a minimum amount of organization.	0	10	24	46	10	0%
22. Instruction completely organized by me.	5	12	28	11	5	0%
	8	20	46	18	8	0%
	3	6	21	23	8	0
	5	10	34	38	13	0%
	36	13	9	3	0	0
	59	21	15	5	0	0%
	11	23	16	9	2	0
	18	38	26	15	3	0%
	10	17	22	10	2	0
	16	28	16	16	3	0%
	15	22	16	8	0	0
	25	36	26	13	0	0%
	30	23	8	0	0	0
	49	36	13	0	0	0%
	26	19	7	0	0	0%
	43	31	11	11	3	0%

H. Wieler Class 1977	STUDENT STUDY PREFERENCE				Run Date		77 11 24	
	Of No Value	Somewhat Valuable	Of Aver- age Value	Very Valuable	Extremely Valuable	Non Resp		
1. Working with tools, equipment, apparatus and materials.	0	8	28	23	23	0		
2. Working and meeting with individuals or groups of people to learn new information and ideas.	0	4	19	38	21	0		
3. Activities involving the use of scale models, devices and simulated situation. (Role playing, driver training simulator, games).	1	16	30	29	6	0		
4. Activities that teach job skills.	1	10	37	35	7	0		
5. Learning activities in which information and skills are presented by television, teacher or a classmate.	0	4	23	33	40	0		
6. Activities that allow me to immediately apply what I learn to actual problems I face.	0	1	8	37	24	0		
7. Learning experiences that only use verbal presentation to teach new information.	6	21	40	13	2	0		
8. Instruction using media (films, tapes, slides) to pictorially and graphically describe event, skills and procedures.	1	5	32	34	10	0		
9. Instruction dealing with formulas and symbols which describe the knowledges to be learned.	5	27	28	18	4	0		
10. Instruction based mainly on reading.	5	32	35	22	5	0		
11. Verbal instruction (written or oral) presented by a teacher with support of films, slides, and tapes.	0	1	23	32	26	0		
12. Classes where everything is set up allowing me no choice in determining goals or objectives.	33	29	17	3	0	0		
13. Teacher organized instruction where I have little influence on the type of instructional material and learning activities used.	17	33	29	3	0	0		
14. Class situations that lead me from simple to complex learning activities with pre-determined goals, objectives and sequence.	0	7	31	30	14	0		
15. Working alone but with constant teacher supervision and organization.	3	24	33	15	7	0		
16. Organized situations from simple to complex giving me a choice of where I want to start, stop or branch out to new experiences.	4	13	21	33	11	0		
17. Learning activities that have no pre-set goals, you just set your own and do what you want.	36	23	18	4	1	0		
18. Working alone and setting my own pace, determining my own goals and objectives.	44	28	22	5	1	0		
19. Courses that allow me to establish my own learning sequence and activities.	12	28	19	21	2	0		
20. Student designed, and directed instructional activities.	15	34	23	26	2	0		
21. Classes involving a minimum amount of organization.	8	26	35	10	3	0		
22. Instruction completely organized by me.	10	32	43	12	4	0		
	9	24	33	14	2	0		
	11	29	40	17	2	0		
	31	31	16	3	1	0		
	38	38	20	4	1	0		
	34	31	11	5	1	0		
	41	38	13	6	1	0		

Class 1976



Class 1977



APPENDIX B

AUTHOR'S DESCRIPTION OF SPSS

MULTIPLE REGRESSION PROGRAM

SPSS STATISTICAL PACKAGE FOR SOCIAL SCIENCES

SOCIAL SCIENCES

Nie, N. H., Hull C. C.H., Jenkins, J. G.,
Steinbrenner, K. & Bent, D. H. Statistical
package for the social sciences (2nd ed.).
U.S.A.: McGraw-Hill, Inc., 1970.

p. 8 - 9 - 11

AN INTRODUCTION TO COMPUTING WITH SPSS

1.2.2.5 Multiple Correlation and Regression

Multiple regression is an extension of the bivariate correlation coefficient to multivariate analysis. Multiple regression allows the researcher to study the linear relationship between a set of independent variables and a dependent variable while taking into account the interrelationships among the independent variables. The basic goal of multiple regression is to produce a linear combination of independent variables which will correlate as highly as possible with the dependent variable. This linear combination can then be used to "predict" values of the dependent variable, and the importance of each of the independent variables in that prediction can be assessed.

A variety of multiple-regression calculations can be accomplished with the use of the REGRESSION procedure. This subprogram, like PARTIAL CORR, can operate either on raw data or a matrix of correlation coefficients. The user can perform the regression upon a fixed number of variables or, using a forward-selection stepwise technique, allow the variables to be introduced into the computation sequentially depending upon their explanatory power. REGRESSION also allows the user to perform a regression procedure midway between these two extremes; he can allow the program to choose the order of introduction of the variables from a certain set, then force certain other variables into the calculation, then proceed stepwise for a period, and so forth. This flexibility, together with the ability of SPSS to transform variables, allows the user to handle most polynomial and dummy-variable multiple-regression applications with relative ease. Output from the program includes both the standardized and nonstandardized regression coefficients, their standard error, and the significance level of the coefficients. Multiple r , r^2 , and the significance of the regression equation are also computed at each stage. The user can also obtain written or punched zero-order correlation matrices.

Subprogram REGRESSION also permits the user to write or punch-out a full set of residuals for each individual case in the file for any set of regression equations. The residual can then, in any subsequent run, be entered into SPSS as a new variable or group of variables in the analysis.

1.3.4 MISSING DATA

It is a common occurrence in social science research to find that for one reason or another it has been impossible to obtain a complete set of data for every case in the file. Such a situation would occur if a respondent refused or neglected to answer a question on a questionnaire, or if the response was not entered correctly on the data sheets. SPSS has a number of features for processing such missing data. Each variable may have up to three values that are designated as *missing*. The choice of these values is totally a matter of the user's discretion, and is used to designate the reason why proper data has not been obtained. For example, the user may elect to use the code 0 for *not applicable*, 8 for *don't know*, and 9 for *refused to answer*. These missing-data indicators may be defined by the use of a MISSING VALUES control card and retained with the other information in a SPSS system file. Each of the statistical subprograms contains a number of options for processing missing data, and the user may select whichever option seems best suited to the particular analysis situation.