



Predicting freshmen dropouts at Montana State University using selected institutional data
by Dennis Joseph Dulniak

A thesis submitted in partial fulfillment of the requirements for the degree of DOCTOR OF
EDUCATION

Montana State University

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Abstract:

The purpose of this study was to establish the current freshman dropout rate at Montana State University (MSU), obtain information to better understand the dropout phenomenon, and develop equations that efficiently predict freshmen dropouts.

Data from the sample of 1,159 first-time freshmen who matriculated at MSU during the 1977, 1978 and 1979 Autumn Quarters were obtained primarily from institutional information gathered through the admissions process and others maintained in Registrar files. The independent variables were: sex, freshman age, Montana high school class division, high school grade point average, rank and class size, residency classification, orientation attendance, race, university computed high school grade point average, verbal and quantitative aptitude stanines, MSU predicted grade point average, general studies enrollment, scholarship or athletic fee waiver, scholastic probation, honorable dismissal, cumulative credits passed, and autumn, winter, spring and last quarter grade point average. Students were tracked for their first academic year.

The freshman dropout rate of 31.4 percent was made up of academic dropouts, voluntary dropouts and transfers. The 68.6 percent nondropout rate was determined by persisters and stopouts. The results found that males had a higher academic dropout rate and females a higher persistence rate. Students with low aptitude stanines had a higher proportion of dropouts. Undecided students had a higher dropout rate than students registered in a specific curriculum.

The phenomenological research approach involved interviewing freshmen dropouts to aid in the understanding of attrition. A lower sense of commitment to college was universal among the dropouts. Dropouts expressed a high degree of confidence in their decision and had no regrets.

Factor analysis resulted in interaction of twenty variables among five cluster groupings. Stepwise multiple regression established significant prediction equations for the dependent variables, dropout/non-dropout and academic/voluntary dropout. Of the pre-matriculation variables, high school grades and scholastic aptitude were the most significant predictors of attrition. When using all selected variables, quarterly GPAs and credits earned were the strongest predictors of attrition. Double cross-validation found that the full set of characteristics (as compared to pre-matriculation and factor clusters) represented the most efficient prediction models.

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USING SELECTED INSTITUTIONAL DATA

by

DENNIS JOSEPH DULNIAK

A thesis submitted in partial fulfillment
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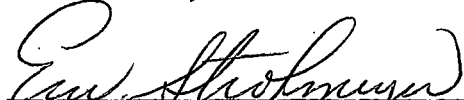
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ABSTRACT

The purpose of this study was to establish the current freshman dropout rate at Montana State University (MSU), obtain information to better understand the dropout phenomenon, and develop equations that efficiently predict freshmen dropouts.

Data from the sample of 1,159 first-time freshmen who matriculated at MSU during the 1977, 1978 and 1979 Autumn Quarters were obtained primarily from institutional information gathered through the admissions process and others maintained in Registrar files. The independent variables were: sex, freshman age, Montana high school class division, high school grade point average, rank and class size, residency classification, orientation attendance, race, university computed high school grade point average, verbal and quantitative aptitude stanines, MSU predicted grade point average, general studies enrollment, scholarship or athletic fee waiver, scholastic probation, honorable dismissal, cumulative credits passed, and autumn, winter, spring and last quarter grade point average. Students were tracked for their first academic year.

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Chapter 1

INTRODUCTION

The college dropout continues to be an increasing cause of concern throughout higher education. Attrition, resulting from the number of college dropouts, has been called one of the great contemporary issues with serious national implications (Brawer, 1973). Dropouts may suffer personal setbacks in career development and a futile expenditure of time and effort. The dropouts cause institutional administrations to face misallocation of limited educational resources and the nation to obtain a less than optimal use of talent and financial resources.

Summerskill, in summarizing thirty-five studies conducted over forty years, reported that about half of all entering freshmen left before completing a baccalaureate degree (1962). Additionally, forecasts of declining postsecondary enrollments are further magnified by the U.S.

X Census Bureau's report that the percentage of 18-year-olds declined 3.4 percent in the two years after 1979 (Magarrell, 1981a), and that a prospective decline of 23.3 percent of the 18 to 24 year age group is forecast between 1979 and 1997 (Carnegie Council, 1980). This loss of enrolled students and the projected decline in entering freshmen classes have become key sources for an expanding interest in attrition rates and retention programs.

The projection for the State of Montana by the Office of Public

X Instruction indicates a 20 percent reduction from 1979 to 1985 in the number of high school graduates. This fact combined with the historical base provided by Montana State University's (MSU) Office of the Registrar that nearly 88 percent of first-time freshmen have come from Montana high schools, the not too distant future portends a sizeable reduction in enrollments for MSU. In light of this, local retention efforts take on an even greater importance.

Astin has stated that the ability to estimate any given student's chances of dropping out was of interest to students, institutional administrators and educational policy makers (1975). Astin (1971, 1975) and numerous authors in local and national studies have established that predictive capabilities do exist in varying degrees of effectiveness. Although college dropouts are not a homogeneous group and no single set of characteristics is known to confidently predict who will dropout, results from institutional studies examining the attrition phenomenon have actuated the development and implementation of retention programs.

Generally, attrition has been found to be the highest during the first year or prior to the start of the second year of college (Albers, 1965; Astin, 1971; Brawer, 1973; Brigman and Stager, 1980; Eckland, 1964; Fетters, 1977, Iffert, 1957; Newlon and Gaither, 1980; Pantages and Creedon, 1978; Stork and Berger, 1978; Summerskill, 1962; and Terenzini and Pascarella, 1978). These studies suggested a retention

program that identified potential dropouts as early as possible. Early identification of the potential dropouts may then lead to more clearly defined goals and a more efficient use of resources by all parties involved.

Statement of the Problem

The problem of this study was threefold:

1. to establish a current freshman dropout rate for Montana State University,
2. to obtain an understanding of the attrition phenomenon through interviews with freshmen dropouts, and
3. to determine if efficient equations could be obtained from selected institutional data in predicting freshmen dropouts.

Need for the Study

It is naive to assume that an institution could eliminate attrition. Open-door admissions institutions have come to accept attrition as an inevitable outcome of their entrance policy. Although the attrition rate can be reduced through selective admission policies (Iffert, 1956), it is not feasible for open-door admissions institutions operating under law to enact such change. It is, however, within reason for institutions to reduce student attrition by six to eight percent (Middleton, 1978). To achieve such a decrease, there is a

need for institutions to realistically study themselves and establish a current attrition rate, obtain a better understanding of the students who do dropout, and construct appropriate strategies for reducing their number of dropouts. Brigman and Stager (1980) have suggested that institutions need to understand the local nature of attrition to effectively confront the problem. Research findings by Stork and Berger (1978) have also established and recommended that prediction equations be formulated by specific institutions, so that appropriate resources may be allocated to students who may need them the most.

The problem of attrition is unique for each institution. Previous research cannot necessarily be applied with confidence at the local level, for it is not known which comparisons may be applicable or misleading for the specific institution. It had become apparent from research and various meetings, including a Retention Task Force, that Montana State University knew very little about the current attrition rate of its freshmen students. Also, there was no organized retention effort, although it had been expressed that various retention devices were in place and operating independently. Presently, Montana State University collects and maintains numerous data elements obtained through the Admissions process, supplemented by statistical functions from the Testing Office, and stored, along with additional academic and student related information, in Registrar files. Existing literature suggested that portions of these data have been

significant in predicting potential dropouts at specific institutions and in more widespread national studies. This study included variables which have been shown to be effective predictors of attrition, along with new variables that were unique to MSU. Variables that had not been previously tested in a prediction model were Montana High School Class Division, University Computed High School Grade Point Average and Predicted MSU Grade Point Average. This study also had the uniqueness of predicting dropouts by exclusively utilizing selected data files maintained by an institution of higher education. There was no attempt to obtain additional predictive information.

Too often, inadequate attention has been afforded to the definition of a dropout. Researchers have suggested that attrition studies should separate the categories of dropouts into subgroups of finer distinction. This study distinguished among the various categories of dropouts and non-dropouts as follows: academic dropouts, voluntary dropouts, transfers, persisters and stopouts, as defined in Chapter 3. Currently, little is known about the number of students who transfer from MSU or the institutions in which they enroll. There has also been a lack of knowledge about students who stopout, re-enroll at MSU but miss one or more quarters, excluding summer.

The study employed a phenomenological research approach that involved interviewing freshmen dropouts to aid in the understanding of students who leave MSU. Phenomenological research allowed a

comparison of the findings with those of literature, was a source of additional retention ideas, and attempted to establish attrition theory.

The study also yielded efficient models for predicting potential freshmen dropouts as an early warning device. The findings of this study also present suggestions to reduce the number of dropouts at MSU.

General Questions to be Answered

Analysis of data obtained in this study answered the following questions:

1. What percentage of the first-time freshmen are: academic dropouts, voluntary dropouts, transfers, persisters, and stopouts?
2. What is the dropout rate of first-time freshmen at Montana State University?
3. Are there any universals about freshmen dropouts which can be obtained through a phenomenological approach and lead to the formulation of substantive theory?
4. Which significant pre-matriculation characteristics can best predict dropouts?
5. Which of the full set of significant characteristics can best predict dropouts?

6. Which significant pre-matriculation characteristics can best predict academic dropouts?

7. Which of the full set of significant characteristics can best predict academic dropouts?

8. What is the efficiency of the significant pre-matriculation characteristics in predicting dropouts?

9. What is the efficiency of the full set of significant characteristics in predicting dropouts?

10. What is the efficiency of the significant pre-matriculation characteristics in predicting academic dropouts?

11. What is the efficiency of the full set of significant characteristics in predicting academic dropouts?

General Procedures of the Study

The procedures followed in this study were:

1. A thorough review of literature and related research was conducted.

2. A random sample of first-time freshmen at Montana State University over a three year period was selected.

3. Mailings to verify transfer students were sent to respective Registrars.

4. Data were tabulated, coded, checked and corrected in

preparation for statistical analyses.

5. Statistical procedures were employed to answer the general questions and test the hypotheses.

6. Interviews with dropouts were scheduled, taped and analyzed.

7. Conclusions and recommendations were drawn.

Limitations and Delimitations

1. The sample was taken from the population of first-time freshmen matriculating at Montana State University during the 1977, 1978, and 1979 Autumn Quarters.

2. Only students with a complete data set were used in the analysis.

3. The study was limited to the first academic year on each of the three selected classes.

4. Data collected and utilized in the study were limited to the independent variables chosen by the researcher.

5. Institutional information on dropouts was limited to the data in the computer and permanent files maintained by the Office of the Registrar.

6. The categories of academic dropout, voluntary dropout, stopout, transfer and persister have been adopted and defined specifically for this study.

7. Transfer students were verified to have enrolled in another higher educational institution within a year of the start of the second academic year.

Definition of Terms

The following terms were defined to insure clarity of their use in this study:

Academic Year -- Referred to the instructional quarters of Autumn, Winter, Spring and Summer. One complete academic year was from Autumn to Autumn.

Dropout -- A student who did not enroll at Montana State University for the start of his/her second academic year.

Dropout rate -- The percentage of first-time freshmen students at Montana State University matriculating in Autumn Quarter which did not enroll for the start of the second academic year at MSU.

Montana High School Class Division -- An established classification of Montana high schools based on district enrollment. The divisions used were first, second, and third class, and private. First class high schools were in districts with a population of 8,000 persons or more. Second class high schools represented districts having a population of 1,000 - 7,999 persons and third class schools had district populations of less than 1,000 (Hamilton, 1962). Generally, first class schools were the largest with third class

representing the smallest public high school in Montana.

Montana State University -- (MSU) comprehensive land-grant institution renamed from Montana State College (MSC) July 1, 1965.

Non-dropout -- A student who enrolled at MSU for the start of his/her second academic year.

Predicted MSU Grade Point Average - A statistically derived number obtained through a regression equation based on academic achievement variables as follows:

$$\text{PREDGPA} = .1109 + .6639 (\text{UCHSGPA}) + .06982 (\text{VSTAN})$$

where:

UCHSGPA = University Computed High School Grade Point Average

VSTAN = conversion of raw national test score to local MSU verbal stanine score (Suvak, 1968).

University Computed High School Grade Point Average -- A statistically derived number computed by averaging the grades in the following high school subjects: junior and senior year English courses, junior and senior social studies, chemistry, physics, commercial courses, vocational courses, language, algebra, solid geometry, trigonometry, and advanced math courses (Suvak, 1966).

Additional terms and variables as they pertain to this study will be defined in later sections.

Summary

College attrition has attracted the attention of numerous segments of our society. Institutions look to retention as a way of combating projected enrollment declines. Students view higher education as a means to an end that should not be a waste of their time, energy and money. Outsiders view attrition as a waste of expensive resources and loss of talent. A certain level of attrition should be expected at the institutional level, but through studying the attrition phenomenon and enacting a retention program, some attrition can be avoided.

The problem of this study was to investigate the freshman drop-out rate, gain a better understanding of students who dropped out, and establish efficient prediction models to identify potential dropouts. The information obtained was then useful in suggesting specific concepts to increase retention.

Chapter 2

REVIEW OF LITERATURE

The study of college dropouts is not a new phenomenon. As early as 1872, the problem was discussed at the annual convention of the National Education Association. Attrition rates have received increased attention due to the projected decline in the general population of the 18-24 year-olds, the traditional age group attending institutions of higher education. Attrition research has led them to the development of retention programs.

The problem of this study was to investigate the freshman dropout rate, gain a better understanding of students who dropped out, and establish efficient prediction models to identify potential dropouts to reduce attrition. This chapter will review selected literature findings with regard to attrition. It will be presented as follows:

1. Dropout Rates and Categories of Dropouts
2. Predictability of Dropouts
3. Pre-matriculation Characteristics
4. Post-matriculation Characteristics
5. Summary

Dropout Rates and Categories of Dropouts

Summerskill, in reviewing thirty-five attrition studies performed

over a period of forty years, found no appreciable change in the dropout rate (1962). The median dropout rate was 50 percent during the four years of college. He also found that the percentage of students lost at a given institution had stayed constant. Summerskill concluded that attrition is the result of multicausal factors.

Literature findings have been difficult to interpret and generalize from due to the variability in the definition of dropouts. National studies have been useful in providing a broader, more general survey on college attrition. A national study by the U.S. Department of Health, Education and Welfare surveyed 12,667 students at 149 colleges and universities (Iffert, 1957). Iffert noted that of the students who withdrew, approximately one-half did so before the student's second year. Freshmen dropouts in higher education were figured at 27.6 percent in Iffert's study. But the rates of attrition have varied by type of institution. Feters (1977), in the National Longitudinal Study of the High School Class of 1972, cited a 16.63 percent freshman withdrawal rate in four-year colleges of 5,001 - 10,000 students. Both Iffert and Feters did not include students who transferred, since by their definition, transfers were still pursuing their education at some institutions. Also, selective private colleges and universities were found to have lower dropout rates than public institutions and community colleges.

Cope and Hannah (1975) found a 33 percent freshmen dropout rate,

which included transfers, at four-year public institutions from 1975 to 1977. Specifically, Haviland (1979) found a 32.9 percent attrition at the University of Northern Colorado, and Newlon and Gaither (1978), 32 percent at California State University, Northridge.

Presently, Montana State University has little current knowledge about the attrition rate of its students. Studies in the early 1960's placed MSU's (then Montana State College) freshman dropout rate at 20 percent (Boyd, 1969; Correll, 1968; and Hamilton, 1962). This 20 percent dropout rate, which included transfers, was remarkably lower than the 32 - 33 percent national figure. An MSU Retention Task Force, established in 1978, found a lack of attrition data to support the formulation of a coordinated retention program. The Task Force failed to maintain its momentum and few results were achieved.

Students who transferred between institutions also represented an identifiable category of dropouts. The classification of transfer students, however, present a dilemma in interpreting attrition research. The point of view taken by institutions was that transfers represented students who dropped out from that school. From the wider view of higher education, transfers represented students who continued their education at another college or university. Iffert and Clarke (1965) found that transfers made up about 25 percent of an institution's dropouts. Stefanich (1971), in a study at the University of Montana, found that the freshmen transfer rate ranged

between 13 and 21 percent for 1968 and 1969. He established that 87 percent of the transfers enrolled in another Montana institution, of which 55 percent transferred to MSU. Boyd (1969) found 22.6 percent of the freshmen dropouts from the class of 1963 transferred from Montana State College.

A further distinction was made between academic and voluntary dropouts. Although there has been variability among institutions, it has been generally established that academic dropouts, students who withdrew for academic reasons or had a grade point average below 2.0 on a 4.0 scale, accounted for approximately one-third of all dropouts (Brigman and Stager, 1980; Fетters, 1977; Iffert, 1965; MacMillan, 1969; Newlon and Gaither, 1980; and Summerskill, 1962). Thus, the majority of dropouts were not students who failed to perform academically. Literature reviews have also concluded that men tended to cite academic reasons for dropping out, while women were frequently considered voluntary dropouts for personal reasons (Astin, 1972; Cope and Hannah, 1975; Pantages and Creedon, 1978; and Tinto, 1975).

Predictability of Dropouts

Attrition has been established as a multicausal phenomenon, the result of extremely intricate interplay among a multitude of variables. No single factor has been isolated as the major cause of attrition. Some institutions take such a long time to discover who the dropouts

are, that the current practices are ineffective in predicting dropouts and reducing attrition. There have been, however, studies that identified predictive characteristics of potential dropouts.

X The most comprehensive notable research on predicting college dropouts was a national longitudinal study performed by Astin (1975). This study initially included 243,156 entering freshmen in the fall of 1968 at 358 two- and four-year colleges and universities. Freshmen and follow-up questionnaires were received from 41,356 four-year college and university students selected from the sample, in addition to student scores on the Scholastic Aptitude Test and American College Test provided by the institution. From this study, Astin developed regression weights to calculate a student's "dropout-proneness". Fifty-two student variables, including aptitude, family background, educational aspirations, study habits, college expectations, and twelve additional variables on financial aid, work status and residence were offered as a method of computing a student's chances of dropping out (pp. 182-94). Astin stated that the multiple correlations obtained from the analysis accounted for 14.5 percent of the variability in predicting potential dropouts.

Other studies have also examined prediction models to predict college dropouts. Pre-college and college academic variables have been most useful in distinguishing between dropouts and non-dropouts. Terenzini and Pascarella (1978) found in a study conducted at

Syracuse University that pre-matriculation characteristics were weak predictors of attrition. They determined that what happened after enrolling was more important to subsequent attrition decisions than the attributes that the student brought to college. Measures of ability and achievement have been primarily useful in identifying students who are most likely to dropout for academic reasons. Voluntary dropouts have been found to be relatively unpredictable, since they cannot be easily identified prior to departure (Eichworth, 1971).

Sexton, in reviewing twenty-five years of attrition research, claimed that freshmen dropouts were largely due to poor academic performance (1965). She suggested that academic dropouts may be subject to a higher degree of predictiveness than those who voluntarily dropout.

Stork and Berger (1978) called for an earlier identification of potential dropouts. In light of the claim that each institution is unique and so may be the factors for dropping out (Kowalski, 1977), retention efforts need to focus on institutional and student characteristics. Additional research is needed to examine characteristics found to have predictive capabilities and other factors that researchers may intuitively include as potential predictors.

The next two sections discuss the predictiveness of selected pre-matriculation and post-matriculation characteristics.

Pre-matriculation Characteristics

Past research has found that pre-matriculation information collected through the admissions process, high school record and scholastic aptitude (entrance) examinations have predictive capabilities.

High School Record

In much of the early research regarding student attrition, there was a positive relationship between high school grades and rates of persistence. Pantages and Creedon's review of studies on attrition found that high school grade point average and rank in class were the strongest single-variable predictors available for persistence and attrition (1978). This was confirmed by Haviland (1979) in a study of freshmen at the University of Northern Colorado. Astin's nationwide study indicated that the students' chances of dropping out of college increased consistently as their high school grades decreased, and that high school grades were the most consistently "potent" predictors of college attrition (1975). High school grades have been found to be powerful predictors by numerous researchers besides Astin (Belk, 1966; Eckland, 1964; Fетters, 1977; Harman, 1969; Haviland, 1979; Howell, 1979; Stork and Berger, 1978; Terenzini and Pascarella, 1978; and Waller, 1962).

Class rank in high school has also been found significant in predicting dropouts and non-dropouts (Astin, 1971 and 1975; Baier, 1974; Belk, 1966; Blanchfield, 1971; Brigman and Stager, 1980; Eckland, 1964; Fетters, 1977; Harman, 1969; Haviland, 1979; Howell, 1979; Storks and Berger, 1978; Terenzini and Pascarella, 1978; and Waller, 1962). Iffert (1956) had found that students from the top one-fifth of their high school class tended to survive in college twice as long as those from the bottom fifth. In 1960, Montana State College students from the lower third of the high school class had a dropout rate nearly three times higher than those from the upper third (Hamilton, 1962). Hamilton noted that the 1960 class had 48.6 percent of the students in the upper third and 13.8 percent in the lower third of their high school graduating class.

Size of high school and the graduating class have favored the larger schools for persistence (Anderson, 1974; Astin, 1975; Brigman and Stager, 1980; Cope, 1972; Correll, 1968; DeVecchio, 1972; and Summerskill, 1962). Students who attended high schools with a graduating class of less than 20 did not persist as well as classes sized 20 and larger (Anderson, 1974). Tweeddale (1978) also noted that a higher percentage of graduating classes of 20 - 99 dropped out. Correll (1968) had found that smaller high schools (less than 500) had a significantly higher dropout rate at Montana State College in 1964.

Type of high school has also been studied as a factor of attrition. Students from public high schools have had a higher rate of persistence than private high schools (Sexton, 1965). Astin (1973), however, concluded the opposite and implied a need for further research in this area.

Scholastic Aptitude

Scholastic aptitude and ability measures have generally received support as contributing significantly in predicting dropouts. Astin (1975) had found that composite scores on the American College Testing Program (ACT) and Scholastic Aptitude Test (SAT) were significant, though not as high a predictor as actual high school grades.

Astin (1973) and Iffert (1957) found that scholastic aptitude was only half as stable a predictor as high school rank. Eichworth (1971) claimed that such test scores were not as beneficial as grades in predicting dropouts, due to their tendency to fluctuate.

Evidence reported by numerous studies support test scores as significant predictors of attrition (Blanchfield, 1971; Howell, 1979; Stefanich, 1971; Stork and Berger, 1978; and Summerskill, 1962). Baier (1974) and Harman (1979) cited ACT scores as significant predictors; Bean (1970), Nichols (1975), and Terenzini and Pascarella (1978) found SAT scores to be significant predictors. Newlon and Gaither (1978) found the SAT Math score to be a better predictor of

freshman persistence than the SAT Verbal score. Belk (1966) also established that scores for the School and College Ability Test (SCAT) and Ohio Psychological Test (OHIO) were significant variables in predicting freshmen attrition. Students with high academic aptitude had a higher persistence rate than those with lower aptitude (Fetters, 1977). Although measures of scholastic aptitude had high predictive abilities, the relationship has not been effective in predicting a sizeable amount of attrition.

Predicted Grade Point Average

Institutions have utilized regression models that key on selected pre-matriculation variables (e.g. high school grades, rank in class and aptitude test scores) to compute a predicted college grade point average (GPA). Summerskill (1962) found such prediction models to be more accurate at the lower end of the grade scale. Astin (1971) claimed that predicted GPA's were slightly more accurate for women. A predicted college GPA established for Montana State University, using selected high school grades and the verbal aptitude score as independent variables, had a correlation of .63 with the actual freshman GPA (Suvak, 1966 and 1968).

Sex

The student's sex has been a source of much disagreement among researchers. Studies by Alfred (1973), Astin (1971), Brigman and

Stager (1980), Newlon and Gaither (1980), and Panos and Astin (1968) found that women had higher dropout rates than men, whereas Demos (1968) reported men as significantly higher in a study at California State College at Long Beach. Fетters (1977), Howell (1979), Iffert (1957), MacMillan (1970) and Summerskill (1962) found neither sex as having a significantly higher dropout statistic. Also, as addressed earlier in this chapter, men tended to dropout for academic reasons while women often gave personal reasons and were voluntary dropouts. Pantages and Creedon (1978), in reviewing college attrition studies, concluded that sex may be a significant predictor in specific institutions, when taken into account with other factors.

Age

Research findings on the age of entering college students also have opposing results. Alfred (1973), Astin (1975), Rose (1980) and Sexton (1965) found older students having lower persistence rates, supporting the concept of the traditionally-aged freshmen, under 21 years of age, as more likely to persist. Eckland (1964), Howell (1979), MacMillan (1970), and Pantages and Creedon (1978) concluded that age is not a primary factor in persistence.

Residency Classification

The student's origin of residence, in-state or out-of-state, has received very little attention in attrition studies. Iffert's

national study found that nonresidents had lower dropout rates than in-state residents (1957). Brigman and Stager (1980), in a study at Indiana University at Bloomington, noted that the dropouts were primarily residents, with a higher proportion of nonresident dropouts categorized as voluntary.

Orientation Attendance

Orientation programs have been considered an institutional characteristic that positively affect retention. Research on the relationship of orientation to predicting attrition has received little attention. Summer orientation attendees at the University of Oregon were found to have a lower freshmen dropout rate than those who did not attend (Carlson and Wegner, 1965). A study of the MSU freshman class of 1979 found that students attending summer orientation had a lower dropout rate than those who did not, 26.8 to 44.9 percent (Dulniak, 1981).

Racial Background

Certain racial categories have been found to have higher dropout rates. Blacks were found to have higher dropout rates than non-Blacks (Greenberg, 1972; and MacMillan, 1970). Alfred (1973) found that a greater proportion of Black and Spanish students drop out than non-Black and non-Spanish students. Astin (1975) determined that Black, Chicano and American Indian students had higher dropout rates than

Oriental and White students. MacMillan (1970) also found that Oriental students had higher persistence rates than all other racial groups. However, Fetter's national longitudinal study found no evidence to support any racial distribution among dropouts (1977).

Post-matriculation Characteristics

All, or even most, potential dropouts cannot be identified by primarily using information available before the student enrolled (Pantages and Creedon, 1978; and Terenzini and Pascarella, 1978). Data available after the student enrolled have been shown to significantly increase the predictiveness of college dropouts.

Academic Performance

In reviewing studies pertaining to the relationship between college grades and rates of persistence, the findings were analogous to those for high school GPA. Summerskill (1962) in reviewing thirty-five studies found consistency in the significant relationship between attrition and first term college grades. The fact that women tended to get better grades than men during the freshmen year (Astin, 1971), may account for the higher rate of academic dropouts among the men. Cumulative grade point averages have also been established as significant predictors of persistence (Astin, 1975; Blanchfield, 1971; Fetter, 1977; Haviland, 1979; and Terenzini and Pascarella, 1978).

Precautions are in order that while low grades were often good predictors of attrition, high grades did not guarantee persistence (Summerskill, 1962).

Scholastic Action

The decision of whether to persist or drop out was not always left up to the student. Suspension or scholastic disqualification may force academic dropouts, although it did not seemingly play a major role in attrition at California State University, Northridge (Newlon and Gaither, 1980). Suspended students and academic dropouts generally exhibited significantly lower high school grade averages than voluntary dropouts or non-dropouts.

Academic probation was also a factor imposed upon students who do not achieve the institution's standards. The effect of probation has been found to negatively affect men, thus increasing their chances of dropping out, and positively affecting women in challenging them to persist (Astin, 1975).

Financial Assistance

Economics was one of the major and most common causes of attrition. When considering the relationship of sources of financial aid and attrition, only scholarships and grants, in contrast to loans and work-study, have been found to increase chances of persistence (Haviland, 1979; and Iffert, 1957).

Curriculum Choice

The decision of what major to pursue has been a predictive characteristic of attrition. Undecided students had significantly higher dropout rates than those who declared a major (Howell, 1979; Iffert, 1957; MacMillan, 1970; Newlon and Gaither, 1980; and Rose, 1980).

Time Status

The number of credits for which a student registered has also been a predictive factor. Part-time students, who carried fewer than twelve credits per term, were found to have a higher attrition rate than full-time students (Alfred, 1973; Brawer, 1963; Cohen and Brawer, 1970; Fetters, 1977; Greenberg, 1972; and Rose, 1980).

Summary

The review of literature focused on attrition research and related findings in predicting college dropouts. Attrition has been found to be a multicausal phenomenon. Rates of attrition vary among types of institutions but remained relatively constant for given institutions. The freshman dropout rate of four-year colleges and universities has been found to be approximately 33 percent. Variability among the definition of a dropout made comparison of research findings difficult.

Dropouts were found to possess significant characteristics for prediction models. Astin developed the most comprehensive investigation of attrition in establishing a prediction model of "dropout-proneness". Other studies also found numerous pre-matriculation characteristics that were significant attrition predictors including high school grades, rank in class and scholastic aptitude tests. Other characteristics received conflicting findings among the research. But most potential dropouts were not identified from information available before the student was admitted. College grades were found to add significantly in predicting attrition. Other factors from information after the student enrolled also improved the prediction models.

Most potential dropouts have not been identified by available prediction equations. Characteristics that have been found to be significant predictors vary among the institutions. Specific institutions were urged to study the attrition at their own school and derive prediction equations appropriate to their unique setting.

Chapter 3

PROCEDURES

The problem of this study was to establish the current freshman dropout rate at Montana State University, obtain information to better understand the dropout phenomenon, and develop equations that predict potential dropouts. Selected institutional data were utilized in the statistical analysis, and interviews with freshmen dropouts were also performed.

This chapter presents the procedures used in the study as follows:

1. Population Description
2. Method of Data Collection
3. Categories for Investigation
4. Statistical Hypotheses
5. Analysis of Data
6. Precaution Taken for Accuracy
7. Summary

Population Description

This study was conducted at Montana State University, a comprehensive land-grant institution with an enrollment of approximately 10,000 students. An open-door admissions policy permits any graduate from an accredited Montana high school to have access to

any state institution of higher education, including Montana State University. Out-of-state graduates of non-Montana high schools are admitted provided that they ranked in the upper 50 percent of their high school graduating class or on the basis of national aptitude tests, high school grades or other evidence of achievement, maturity and motivation. The student population was primarily undergraduate (90 percent), with an average entering freshman class Autumn Quarter of approximately 2,200.

The population of this cross-sectional study consisted of a random sample of first-time freshmen students who matriculated at Montana State University during the 1977, 1978 and 1979 Autumn Quarter. Only sampled students, for whom a complete data set was available, were used in the analyses. A total of 1,159 students used in the analysis were distributed by 402, 392 and 365 for 1977, 1978 and 1979 respectively. These sample sizes exceeded the appropriate number necessary to achieve 95 percent confidence that the result was not off by more than 5 percent, as determined by the Formula for Sample Size of Finite Populations (Cochran, 1977). Through such a representative sample of the population, the researcher was able to employ statistical inference procedures and offer recommendations with a level of confidence that they applied to the whole population.

Method of Data Collection

The data used in the study were collected through files maintained by the Office of the Registrar at Montana State University. The final Student Data Bank and New Student File, two computer files, represented the source from which the sample was randomly chosen. Much of the variable information was also obtained through accessing the appropriate computer file. Each freshman selected was tracked for one academic year to build the student data record for the study. Upon completion of the computerized collection, alphabetical lists and corresponding data cards were prepared. The lists were checked, missing data researched through permanent files, information verified or corrected, and codes not available within the computer files were inserted. The data cards were then corrected and verified. There was no attempt to contact the individual students for further data information.

Students who transferred to another postsecondary institution represented the only intended variable used in the study which was not available from institutional files. In order to collect such information, the permanent record card containing the student's academic record was checked. This was performed to determine whether any transcripts were issued for students who did not enroll at MSU each quarter through Autumn of the second year, excluding Summer. Had

the student requested transcripts to be sent to another school, a letter requesting verification of enrollment was sent to the Registrar of that institution. A copy of this letter appears in Appendix A. A prepaid addressed envelope accompanied the 134 letters that were mailed. There were also ten students who transferred and then returned to MSU, thus being coded as transfers, but not requiring written verification.

All other variables were directly available or derived through statistical methods. Two of the statistically derived variables were Quantitative and Verbal Aptitude Test Scores, converted to a local MSU stanine, a scaled score from one to nine based on a normal distribution curve (Suvak, 1968). Appendix B presents the conversion of national tests to MSU stanines in relation to the normal distribution curve. University Computed High School Grade Point Average, as calculated from the grades of selected high school courses (Suvak, 1966), and the Montana State University Predicted Grade Point Average, as determined from a multiple regression equation using the recomputed high school GPA and verbal stanine (Suvak, 1968), represented the remaining statistically derived variables.

As a means of controlling any contaminating variables, a random sample was taken for each of the three freshmen classes. From this sample, only students with a complete data set were used in the analyses.

Categories for Investigation

The random sample of first-time freshmen students who matriculated at Montana State University during the 1977, 1978 and 1979 Autumn Quarter was followed for one academic year from the quarter of initial enrollment. The information used in the study was obtained exclusively from the institutional files in the Office of the Registrar. There was no attempt to contact students for information used in the statistical analyses.

Dependent Variable

Students in this study were differentiated into specific subgroups of dropouts and non-dropouts, under the advisement of literature that cited weakness in past attrition research. The freshmen students were separated into the following dropout/non-dropout categories:

1. Dropout -- a student who did not enroll for the start of the second academic year. Dropouts were further subdivided into:

a. Academic -- a student who had a cumulative grade point average of less than 2.0; was on scholastic probation; or was ineligible to return due to suspension.

b. Voluntary -- a student who had a cumulative grade point average of 2.0 or greater; or had officially withdrawn through the Honorable Dismissal procedure.

c. Transfer -- a student who transferred to another higher

educational institution within a year of the start of the second academic year. Official verification was required for this status.

2. Non-dropout

a. Persister -- a student who maintained continuous enrollment for each quarter, excluding summer.

b. Stopout -- a student who enrolled at the start of the second academic year, but who had not enrolled for Winter and/or Spring Quarter(s) during the first academic year.

Independent Variables

Following is the complete listing of the independent variables and their respective codings, along with a brief description where deemed appropriate:

1. Sex: dichotomous coding, 1 (male) and 2 (female)
2. Freshman Age: actual years at entry into college
3. Montana High School Class Division: dichotomous coding of 1 (No) and 2 (Yes) for each of the following class divisions: first class, second class, third class, and private. This represented graduating from a Montana high school which had an established classification based on district enrollment.

4. High School Grade Point Average: student's actual grade average coded as follows: 1 (0.00 - 0.69, F), 2 (0.7 - 1.49, D), 3 (1.50 - 2.14, C), 4 (2.15 - 2.49, C+), 5 (2.50 - 2.84, B-),

6 (2.85 - 3.14, B), 7 (3.15 - 3.49, B+), 8 (3.50 - 3.84, A-),
9 (3.85 - 4.00, A).

5. Relative High School Rank: percentile representation of the student's high school graduating class obtained by:

$$\frac{\text{RANK}}{\text{Number of graduating seniors}} \times 100$$

6. High School Class Size: number in graduating class. Coded as follows: 1 (1 - 19), 2 (20 - 49), 3 (50 - 99), 4 (100 - 249), 5 (250+).

7. Residency classification: coding for purposes of fee assessment, as follows: 1 (In-state resident), 2 (Out-of-state/nonresident).

8. Orientation Attendance: participation in freshmen summer orientation. Coded as follows: 1 (No, did not attend summer orientation), 2 (Yes, did attend a summer program).

9. Racial Background: student's ethnicity classified as either: 1 (Oriental or White), or 2 (Black, Hispanic or Native American).

10. University Computed High School Grade Point Average: selected high school courses used in recomputing the High School Grade Point Average. The code was the same as that used for High School Grade Point Average.

11. Verbal Aptitude Test Score: converted raw score from standard national tests. Coding performed with stanine scores established for MSU (1 through 9), see Appendix B.

12. Mathematics/Quantitative Aptitude Test Score: converted raw score from standard national tests. Coding performed with localized stanine scores, see Appendix B.

13. Montana State University Predicted Grade Point Average: regression formula utilizing the University Computed High School Grade Point Average and the Verbal Aptitude Test Score.

14. General Studies Enrollment: student's curriculum/college during the last quarter of attendance of his/her first academic year. Coded as follows: 1 (matriculated in a specific curriculum/college), 2 (undecided, enrolled in General Studies).

15. Scholarship Fee Waiver: whether or not a student received a reduction of fees for academic scholarship. Coded as: 1 (None), 2 (Yes, National Merit or Montana High School Honor Scholarship).

16. Athletic Fee Waiver: whether or not a student received a reduction of fees for athletic participation. Coded as: 1 (None), 2 (Yes, MSU athletic waiver).

17. Scholastic Probation: under University Probation for inadequate academic performance. Coded as: 1 (No), 2 (Yes, University Probation during last quarter of enrollment of the first academic year).

18. Honorable Dismissal: officially withdrew during an academic quarter. Coded as: 1 (No), 2 (Yes, official withdrawal during any quarter of the first academic year).

19. Cumulative Credits Passed: the actual number of credits earned by the end of the first academic year.

20. Quarterly Grade Point Average: the official grade point average recorded for the Autumn, Winter and Spring Quarters of the first academic year. The coded grade point averages were truncated to one decimal point.

21. Last Quarter Grade Point Average: the official grade point average recorded during the student's last quarter of enrollment of the first academic year.

22. Last Quarter Time Status: based on the number of credits for which the student was registered during his/her last quarter of the first academic year. Coded as follows: 1 (Honorable Dismissal), 2 (Part Time, less than 12 credits), and 3 (Full Time, 12 or more credits).

The pre-matriculation characteristics were the independent variables numbered 1 through 13. The full set of characteristics were represented by the entire listing of independent variables. Appendix C lists the abbreviations used for the independent variables.

Descriptive Variables

In addition to the dependent and independent variables that were necessary in the statistical analyses, descriptive variables were also utilized. The following variables were included in the study for comparison and establishment of categories within the dependent

variable.

1. Year of Entry: the specific year that the student enrolled.
Coded as: 7 (1977), 8 (1978), and 9 (1979).

2. Academic Suspension: whether or not the student was suspended following his/her last quarter of enrollment of the first academic year, therefore academically ineligible to return.

3. Transferred: verification of enrollment from another accredited post-secondary institution. Students were coded as transfer students when verification was obtained that they had attended another school within a year after the beginning of their second academic year, except the 1979 class for which the allowable time frame of this study permitted only two quarters.

Statistical Hypotheses

To achieve the purpose of the study and answer some of the general questions, the following null hypotheses were tested.

1. There is no linear relationship between the set of pre-matriculation characteristics (independent variables 1 through 13) and the dependent variable, dropout/non-dropout.

2. There is no linear relationship between the full set of characteristics (independent variables 1 through 22) and the dependent variable, dropout/non-dropout.

3. There is no linear relationship between the set of pre-

matriculation characteristics (independent variables 1 through 13) and the dependent variable, academic/voluntary dropout.

4. There is no linear relationship between the full set of characteristics (independent variables 1 through 22) and the dependent variable, academic/voluntary dropout.

5. There is no linear relationship between the variables suggested by factor analysis and the dependent variable, dropout/non-dropout.

6. There is no linear relationship between the variables suggested by factor analysis and the dependent variable, academic/voluntary dropout.

Analysis of Data

The coded data was scrutinized to insure that the data set accurately reflected the needed information. The data collected in this study was then subjected to both quantitative and qualitative analyses.

Descriptive Analysis

Descriptive statistics were applied to obtain general and comparative information on the sample. The dependent variables were ordered as follows: dropout (academic dropout, voluntary dropout and transfer), non-dropout (persister and stopout), academic dropout, and voluntary dropout (voluntary dropout and

transfer). Questions 1 and 2 concerning the percentage of academic dropouts, voluntary dropouts, persisters, transfers and stopouts and the freshmen dropout rate were answered. Crosstabulations were generated for comparison among the variables of the sample and against the actual population and respective literature findings.

Analysis of Phenomenological Research

In a review of attrition literature, Tinto (1975) found that researchers failed to move beyond the mere description of dropouts and therefore ignored the perspective of the individual student. Tinto also called for the development of theoretical models which attempted to explain the processes that lead to dropping out. Sociological theory has provided the following research strategies which are:

(1) to enable prediction and explanation of behavior; (2) to be useful in theoretical advance in sociology; (3) to be useable in practical applications -- prediction and explanation should be able to give the practitioner understanding and some control of situations; (4) to provide a perspective on behavior -- a stance to be taken toward data; and (5) to guide and provide a style for research on particular areas of behavior.

(Glaser and Strauss, 1967:3)

Applying sociological theory to attrition research permitted additional understanding of the phenomenon of dropouts while providing a basis for the development of theoretical models.

Glaser and Strauss presented a phenomenological method of

quantitative research that could lead toward the discovery or generation of substantive theory pertaining specifically to dropouts. The phenomenological method was used to answer the third question of the study; were there any universals about freshmen dropouts which led to the formulation of substantive theory? The approach called for the joint collection, coding and analysis of data obtained through the field work of in-person interviews. For the theoretical sampling, a wide and diverse group of dropouts were selected, in contrast to statistical (random) sampling in which each member had an equal probability of being selected. An adequate theoretical sample provided a saturation of specific data on dropouts. Theoretical sampling was used to discover universal characteristics of the dropouts in formulating substantive theory.

The process involved the researcher to select and contact freshmen dropouts and to obtain their approval to participate in the interview. Prior to questioning, each person was given an explanation of the study and a copy of the "Approval to Participate in Discussion on Dropping Out" form to sign. The approval form, appearing in Appendix D, was required under MSU's policy of "Protocol for the Use of Human Subjects in Research." The interviews followed a pattern of questioning and discussion that allowed the dropout to freely discuss his/her college experiences. The personal interviews made it possible for the researcher to obtain a deeper meaning of what the dropouts expressed

and continuity by following up on previous statements and pursuing some prepared questions. Comparisons, gathered from information in previous interviews, were also made during the interview. Reviewing the taped interviews allowed reflection, coding and analysis of the information as it pertained to MSU and the established literature.

The phenomenological method supplemented the de-personalized research utilized in the statistical method by humanizing the scope of research through the interviews. The results of the nineteen interviews will be presented through a narrative description in the next chapter.

Factor Analysis

Factor analysis was utilized to determine variable interaction, rearrange variables into clusters and reduce the number of variables to arrive at an efficient prediction model of attrition. This technique has been described as:

The single most distinctive characteristic of factor analysis is its data-reduction capability ... factor analytic techniques enable us to see whether some underlying pattern of relationships exist such that the data may be 'rearranged' or 'reduced' to a smaller set of factors or components that may be taken as source variables accounting for the observed interrelations of the data.

(Nie and others, 1975: 469)

The results were subjected to a quartimax rotation that reduced the complexity of the factorial description. Factors which resulted in

eigenvalues of 1.0 or greater and variables with a factor loading of .40 or greater were then used to determine membership. The newly derived factors were used as potential predictive variables in multiple regression.

Multiple Regression

Questions 4 through 7 and all six hypotheses, addressing whether or not significant prediction models could be found from the pre-matriculation or full set of characteristics for dropouts/non-dropouts and academic/voluntary dropouts, were answered through multiple regression analysis. Multiple regression was used to determine the contribution of independent variables in establishing a prediction equation of the dependent variable. The dependent variables were ordered as follows: dropout (academic dropout, voluntary dropout and transfer), and non-dropout (persister and stopout); academic dropout and voluntary dropout (voluntary dropout and transfer). This ordering was necessary to code the appropriate dependent variables in testing the hypotheses.

Employing stepwise multiple regression analysis, the most efficient regression procedure, indicated each variable's importance in reducing the sum of the squares of errors. Multicollinearity was checked, according to Nie and others (1975), and only one of the variables of the highly correlated sets (intercorrelations of 0.8 to 1.0)

was included in the respective regression analysis. Each variable was sorted into its proper order by significance by a reexamination performed at each stage of the procedure. This procedure was followed in the analysis in order to obtain the most efficient model, using only the variables which independently contributed at least one percent in each regression equation. As a statistician in regression analysis, Wesolowsky (1976) stated that it was most efficient to isolate the significant predictors through stepwise regression.

Multiple regression analysis yielded an R, coefficient of multiple correlation, which represented the relationship between a combination of the independent predictor variables and the dependent variable. The square of R or R^2 , coefficient of determination, represented the percent of variance in the criterion that was accounted for by the independent predictor variables in combination. The significance of R^2 was tested under the F test at .05 percent level of significance, the acceptable statistical level of testing in social science research (Nie and others, 1975).

Double Cross-validation

In order to establish confidence in the predictor models, double cross-validation analyses were performed. These analyses addressed Questions 8 through 11, concerning the efficiency of the respective predictive equations obtained through multiple regression. The

entire sample was randomly divided into two groups of equal size. For each analysis, a regression equation was obtained from one sample group and used to predict the respective attrition group membership from the second sample group. The procedure was then reversed. The percent of accuracy, comparing the predicted scores with the actual scores for each group, were used in evaluating the predictive efficiency of each model.

Within this study, multiple regression analysis determined prediction models that were found efficient in distinguishing between freshmen dropouts and non-dropouts, and voluntary and academic dropouts. These models may be applied as an early warning device to identify potential dropouts.

Precautions Taken For Accuracy

Much of the sampled data information was obtained through computer files maintained by the Office of the Registrar. Specially designed programs were applied to gather the information in this study. Manual verification of the coding and inclusion of data elements were performed. Additional data were obtained manually, updated and proofed on the cards. Finally, the data were stored on disc and reproofed to assure accuracy.

The statistical analyses were performed by the MSU's Computing

Services Center Honeywell Computer Level 66 using the SPSS (Statistical Package for the Social Sciences) subprograms.

Summary

The study investigated the attrition of first-time freshmen students during their first academic year at Montana State University. In addition to categorizing the students into appropriate dropout/non-dropout groups, the study also established predictive attrition models based on institutional data files maintained by the Registrar's Office. In-person interviews supplemented the statistical analysis with in-depth information about students who left the institution.

The sample consisted of 1,159 first-time freshmen students who matriculated at Montana State University during the 1977, 1978, or 1979 Autumn Quarter. The data set included information maintained by files in the Office of the Registrar. Each student was tracked for one academic year from the time of entry and assigned an appropriate dropout/non-dropout category.

Descriptive analyses of the coded information preceded the testing of the statistical hypotheses. Factor analysis was also employed to determine variable interaction and reduce the number of variables into newly formed predictive factors. Stepwise multiple regression was used to obtain the most efficient prediction model. Double cross-validation was then performed for each hypothesis on the

sample to examine the accuracy in the predictor models. The SPSS subprograms were used to perform all statistical analyses.

Qualitative research was also performed by applying the phenomenological method. Nineteen in-person interviews were conducted with freshmen dropouts which supplied information used for an understanding of the attrition phenomenon and attempted to develop attrition theory.

Chapter 4

PRESENTATION AND ANALYSIS OF DATA

The purpose of the study was to examine the attrition of first-time freshmen students during their first academic year at Montana State University. In addition to establishing a current freshman dropout rate, the study also constructed efficient predictive attrition models based on selected data files maintained by the Office of the Registrar. In-person interviews were performed to aid in the understanding of the dropout phenomenon and the furtherance of attrition theory.

The remainder of the chapter will be presented as follows:

1. Population Description
2. Descriptive Analysis
3. Phenomenological Analysis
4. Factor Analysis
5. Multiple Regression Analysis
6. Double Cross-validation
7. Summary

Population Description

The population consisted of all first-time freshmen who matriculated at Montana State University during the 1977, 1978 and 1979 Autumn Quarters. A random sample was taken for each of the freshmen

classes. Upon examination of the data file for each student, only students for whom complete information was available were used in the study, 1,159 first-time freshmen. Table 1 presents the breakdown of the sample in comparison to the actual figures. These sample sizes exceeded the number, as determined by Cochran's Formula for Sample Sizes of Finite Population, necessary to achieve 95 percent confidence that the result is not off by more than 5 percent.

Table 1
Samples and Actual Population by Year

Year	Sampled Population (N = 1159)		Actual Population (N = 6563)	
	N	%	N	%
1977	402	34.7	2248	34.3
1978	392	33.8	2168	33.0
1979	365	31.5	2147	32.7

Descriptive Analysis

Sample statistics were compared to known parameter values. Since a close match was obtained on these comparison values, it can then be assumed that the sample represented the actual population on the variables of interest in this study shown in Table 2. The differences

Table 2

Sampled and Actual Population on
Selected Independent Variables

	% Sampled Population (N = 1159)	% Actual Population (N = 6563)
Sex		
Male	53.3	53.1
Female	46.7	46.9
Residency Classification		
In-State	89.5	87.8
Out-of-State	10.5	12.2
Racial Background		
Oriental or White	98.4	97.8
Black, Hispanic or Native American	1.6	2.2
Time Status*		
Part Time	7.2	3.4
Full Time	92.8	96.6

*Adjusted for Honorable Dismissals who are removed. New N = 1132

between the sampled and actual population are less than one percent for Sex and Racial Background. A percentage difference of 1.7 separated the sample from the population for Residency Classification. The widest difference of 3.8 percent occurred in the sampled population for Time Status.. This may be accounted for by freshmen who dropped classes beyond the date for which the actual population's time status is recorded. The actual figures were reported as of the third week of classes, whereas the time status of the sample reflected the number of credits at the end of the quarter, thus allowing students additional time to adjust their credit load and possibly time status to part-time.

The remainder of this section will present descriptive data obtained from the sample of first-time freshmen. The average age of an MSU first-time freshman, upon entry into college, was computed to be 18.2 years. The 17 year-old represented 8.1 percent of the sample and 1.6 percent were 23 years and older.

Montana State University obtained 10.5 percent of new freshmen recruits from out-of-state. The remainder of the students came from Montana high schools according to the following distribution: First Class (51.7 percent), Second Class (25.6 percent), Third Class (8.7 percent) and Private (2.1 percent). The reported mean high school rank in class was the 30th percentile point.

Table 3 presents data of students categorized by established

Table 3

Relative High School Class Size
of Graduating Seniors

Size Range	N	Relative %	Cumulative %
1-19	52	4.5	4.5
20-49	158	13.6	18.1
50-99	170	14.7	32.8
100-249	215	18.6	51.3
250+	564	48.7	100.0

ranges of graduating class sizes. MSU attracted a sizeable percentage of students from small high schools. Approximately one-third of the students graduated in senior classes of less than 100, with 4.5 percent which came from classes with 19 or less. The highest percentage of enrolled students came from high schools with large senior classes, in excess of 250, an expected finding due to the fact that such schools graduated many more students.

As a requirement for admission to MSU, applicants must have provided results of the ACT or SAT test scores, or take a battery of tests administered by the MSU Testing Service. These test scores were converted to local stanine scores, as listed in Appendix B (Suvak, 1968). Table 4 presents a comparison of first-time freshmen percentages that fell within specified stanines for national aptitude tests with

Table 4

Actual Percentage of Verbal and Quantitative Stanine
Scores with Anticipated Norms

Stanine	Verbal		Quantitative		Anticipated Norms	
	Relative %	Cumulative %	Relative %	Cumulative %	Relative %	Cumulative %
1	5.5	5.5	11.5	11.5	4	4
2	10.4	15.9	11.4	22.9	6	10
3	16.9	32.8	13.5	36.4	13	23
4	18.3	51.1	13.8	50.2	17	40
5	12.3	63.4	10.4	60.6	20	60
6	14.0	77.4	10.7	71.3	17	77
7	11.6	89.0	13.3	84.6	13	90
8	7.9	97.0	9.1	93.7	6	96
9	3.0	100.0	6.3	100.0	4	100

stanine norms. The greatest concentration of scores occurred at the 4th stanine, as opposed to 5th in the anticipated norms. If the actual groups matched the norms, 40 percent would have been expected with stanines of 4 or lower; whereas, 51.1 and 50.2 percent were found for the Verbal and Quantitative areas, respectively. Thus, MSU had many more academically weaker students than would have been anticipated.

The first two general questions of this study addressed the percentage of academic dropouts, voluntary dropouts, transfers, persisters and stopouts, and the dropout rate for MSU first-time freshmen. Table 5 presents the findings. The results indicated that MSU had a first-time freshmen dropout rate of 31.4 percent. This was further broken down into academic dropout, voluntary dropout and transfer students, all of whom did not enroll at MSU during the Autumn Quarter of their second academic year. The data indicated that 7.8 percent of the sample were verified as transfers to another school within two years after starting at MSU. Of the 134 letters (Appendix A) sent to other Registrars who received transcripts as requested by MSU freshmen students in the study, 131 (97.7 percent) were returned.

In addition to the letters verifying students who transferred, ten students were classified as transfers based on their MSU record which reflected credits earned at another school before returning to MSU. Appendix E lists the schools to which the sample

Table 5

Number and Percentages of First-time Freshmen
Dropouts and Non-dropouts

Category	N	%
Dropout		
Academic Dropout	153	13.2
Voluntary Dropout	121	10.4
Transfer	<u>90</u>	<u>7.8</u>
Subtotal	364	31.4
Non-Dropout		
Persister	734	63.3
Stopout	<u>61</u>	<u>5.3</u>
Subtotal	<u>795</u>	<u>68.6</u>
Total	1159	100.0

transferred. Transfers to institutions in Montana accounted for 61.1 percent, with 38.9 percent transferred to schools outside of Montana. Voluntary dropouts (10.4 percent) represented nearly one-third of the students who dropped out, with the highest attrition contributor being the academic dropout (13.2 percent). The attrition rate from higher education, not counting transfers, was 23.6 percent.

This study treated stopouts as non-dropouts who returned to MSU by the Autumn Quarter of the second academic year, although they did not maintain continuous enrollment. When combining the 5.3 percent of stopouts with the 63.3 percent persister rate, a non-dropout rate of 68.6 percent was obtained.

Table 6 provides information concerning the quarterly dropout rate during the first year for freshmen. The highest proportion was

Table 6
Dropout Rate by Quarter

Dropouts	Relative %	Cumulative %
After 1 Quarter (Autumn to Winter)	9.8	9.8
After 2 Quarters (Autumn to Spring)	9.5	19.3
After One Academic Year (Autumn to Autumn)	12.1	31.4

between the Spring and Autumn Quarters when an additional 12.1 percent did not re-enroll.

Additional analysis obtained through crosstabulations are provided.

- Sex: Males had a higher academic dropout and stopout rate than females (15.5 to 10.5, and 6.6 to 3.5 percent, respectively). Females had a higher freshmen persistence rate than males (65.3 to 61.8 percent). See Appendix F for full comparisons by dropout/non-dropout category.

- High School Class Division: Students from second class high schools had a higher persistence rate than students not in the second high school class division (66.0 to 62.5 percent). Third class high school students displayed the greatest variability and had fewer academic dropouts (9.9 to 13.5 percent), a higher voluntary dropout rate (13.9 to 10.1 percent) and a higher rate of transfers (11.0 to 7.4 percent) than students not in the third class division. Appendix G provides full comparisons by dropout/non-dropout for the high school class divisions.

- High School Class Size: When compared to the total population, students from schools whose graduating class size was between 20 and 49 had an appreciably lower persistence rate (57.6 to 63.3 percent) and a higher voluntary dropout rate (18.2 to 10.4 percent), Appendix H.

- High School Grades: The University Computed High School Grade

Point Average, calculated from selected academic high school courses, was only slightly lower than the actual high school GPA (approximately 2.91 to 2.94).

- Relative High School Rank: Approximately 23 percent of the in-state and out-of-state freshmen came from the top 10 percent of their graduating class. Also, although admission standards stated that non-Montana high school graduates needed to rank in the upper 50 percent, 13 of 122 (10.7 percent) were in the lower half of the graduating class, compared to 20.9 percent for Montana graduates.

- Residency Classification: Non-residents had a higher transfer rate (13.1 to 7.1 percent) and lower rate of academic dropouts (9.8 to 13.6 percent), than in-state students (Appendix I).

- Orientation Attendance: A smaller proportion of students who attended summer orientation were freshmen dropouts than those who did not attend (27.9 to 35.4 percent), Appendix J. Older students were also more likely to not attend the summer program (Appendix K).

- Racial Background: The racial categories of Black, Hispanic or American Indian had a higher dropout rate than Oriental or White students (55.6 to 31.0 percent). However, any interpretation of the findings should be viewed lightly due to the fact that only 1.6 percent of the sample was comprised of Black, Hispanic or American Indian students.

- Stanine Aptitude Test Scores: There was a higher rate of

voluntary dropouts and greater persistence among students with scores that fell in the low Quantitative stanines than low Verbal stanines (3 or lower). A smaller proportion of students with Verbal stanines of 1 and 2 persisted than students with the same low Quantitative stanines (11.4 to 17.4 percent), Appendices L and M.

- General Studies Enrollment: Undecided students registered in General Studies their last quarter of attendance had a higher dropout rate than students matriculated in a specific curriculum/college (44.1 to 29.0 percent), Appendix N.

- Fee Waivers: Students receiving an athletic fee waiver had a higher rate of persistence than scholarship recipients and students who were not receiving an athletic or scholastic fee waiver (90.0, 83.1 and 59.0 percent, respectively), Appendix O.

- Scholastic Probation: Only 35.6 percent of the first-time freshmen on university probation registered in the fall of their second academic year.

- Honorable Dismissals: Only 14.8 percent of the freshmen students who officially withdrew during a quarter returned as stopouts the following Autumn Quarter.

- Cumulative Credits Earned: The mean number of credits earned during the first academic year was 38.1. Less than one percent (0.9) left school without earning any credit.

- MSU Predicted Grade Point Average: Students for whom the

predicted GPA was 1.4 or lower had a higher dropout rate than students with a higher predicted GPA (64.7 to 29.3 percent), Appendix P. The prediction equation for college GPA used the University Computed High School GPA and Verbal stanine as variables, and did not compute any GPA below 0.7 or above 3.4.

- Quarterly Grade Point Averages: For all sampled freshmen, the mean Autumn, Winter and Spring Quarter GPAs were 2.51, 2.56 and 2.57, respectively.

- Transfers: Students who transferred had a greater proportion with a predicted GPA ≤ 2.1 , than non-transfers (52.2 to 32.6 percent). The data also showed that a higher rate of transfers had stanines of 5 or less than non-transfers (74.4 to 60.6 percent for Quantitative and 76.6 to 63.4 percent for Verbal stanine scores), Appendices L and M.

- Suspensions: First-time students suspended during their freshmen year accounted for 7.9 percent of the sample. Suspensions accounted for over half, 52.3 percent, of the academic dropouts. Of the students who transferred, 13.3 percent were suspended, but were still classified as transfers.

Phenomenological Analysis

A phenomenological approach was undertaken to gain an understanding of the attrition phenomenon which led toward the generation

of substantive theory. The researcher called twenty-nine dropouts, whose names were obtained from the sample. Of the twenty-one dropouts who volunteered and scheduled interviews, nineteen took place with two cancelled due to inconvenience to the dropout. Only one student refused to talk about dropping out and politely excused himself. Most of the interviews were in-person and took place in Bozeman, Montana with others in Kalispell, Montana; Reno, Nevada; and Willets, California. Two of the contacts preferred to have the discussion over the phone. All of the dropouts, except one phone interviewee, signed the "Approval to Participate in Discussion on Dropping Out" form appearing in Appendix D, as required by MSU's Policy of Protocol for the Use of Human Subjects in Research.

The dropouts were chosen by theoretical sampling, selecting the interviewees based on the continual analysis of the information collected and a perceived need for additional data from dropouts of varying backgrounds. Although fifteen of the dropouts still resided in the Bozeman area, the total group interviewed represented a wide variation of the sample, broadly distributed by academic ability, college achievement, credits earned, probation, suspension, year of entry, residency, ethnicity, age and sex. This wide diversity provided the numerous perspectives necessary for analysis and formulation of substantive theory in phenomenological research.

The interviews allowed the dropouts to freely discuss their

experiences in confidence. Upon explaining the nature of the study and having the volunteers sign the approval form, the taped interviews proceeded. The dropouts were asked to recall their experiences when deciding to go to college, their first contacts with MSU and whatever else they wanted to discuss up to and including the process of dropping out. The researcher also supplemented the discussion with some prepared questions that were asked of each dropout. The interviews allowed follow-up questions in obtaining a deeper meaning into what the dropouts were feeling during their experiences. The primary intent was to gain information to aid the analytical synthesis, while also allowing those who participated an opportunity to gain a better understanding of themselves and their decision to drop out of college. The remainder of this section will contain a narrative description of the findings from the phenomenological approach.

The interviews provided the researcher with an understanding and appreciation for the individual who dropped out. Nearly all of the subjects contacted were extremely helpful and open in discussing their experiences.

The researcher observed that students with low aptitude test scores, stanines of 3 and below, mentioned comprehension problems in class with note taking, textbooks and other instructional material. It was noted that two of the individuals, although claiming to have benefitted from a university sponsored study skills and techniques

X

X workshop, did not place adequate emphasis on studying to perform successfully in classes. They expressed weakness in study skills and X indicated that a lack of motivation for self-improvement was a chief factor in their failure to obtain satisfactory grades. Also, students with quarterly GPA's of 2.5 or lower tended to overestimate their academic performance, whereas students with higher quarterly GPA's were either accurate or modest in estimations of their grades.

Personal commitment was often mentioned as a factor that influenced the student's decision to drop out. Procrastination, X laziness, and an attitude to "just try college" were factors that interfered with persistence. Parental pressure and expectations were also mentioned as strong negative factors. One student went so far as to have herself suspended as the only way, given parental pressure, to stay out of college. Two students expressed dissatisfaction with the lack of a textbook for an introductory level class, which severely impacted their ability to understand the class material. Three of the dropouts were offered full time jobs directly related to their stated career goals, thus they were prime candidates for leaving school. Students who mentioned work as a primary factor had indicated that they were employed off-campus for 30 to 40 hours per week. Students who lived off-campus repeatedly expressed a lack of involvement with MSU and its academic atmosphere. Many students commented

that they thought things would have been different if they had had the opportunity to live on campus. Students' peers also were an influence. Students who did not have a strong personal relationship with another MSU student or faculty member mentioned little social contact with the college environment. Excessive peer influence provided a negative influence by detracting from study and class time. Each of the factors mentioned had an effect on the students' commitment to studying and continuing their education.

In discussing their reasons for dropping out, the interviewees gave numerous reasons, including personal, financial and academic. These factors were similar to the published studies on attrition, and thus reinforce a multicausal approach. The information supported the concept that attrition is a complex phenomenon. It was, however, most intriguing that once they decided to drop out, all had high confidence in their decision and expressed that little could have been done to intervene and change their minds. Some dropouts spoke of a stage of depression and embarrassment that they were seen as "failures" by others. But most were still confident that they had made the right decision.

The underlying theme obtained from the interviews was a sense of commitment for students to continue their college education. The universal suggesting substantive theory was this personal sense of primary commitment to education at the time the decision was considered

or made to drop out. Each student mentioned factors which interfered with their commitment to college or clearly stated that their level of commitment was never very high.

The personal interviews provided the researcher a chance to maintain continuity in the discussion and obtain deeper feelings, often missing in questionnaires. The experience was a means that permitted greater understanding and appreciation of attrition. The interviews humanized this study by providing other perspectives from which to analyze attrition.

Factor Analysis

This section addresses the results of factor analysis performed on the full set of independent variables. The technique determined variable interaction, rearranged variables into clusters, and based on the factors acquired, were used to develop additional prediction models of attrition.

A quartimax rotation on the coded set of twenty-seven independent variables was applied to a final solution. Factors with eigenvalues of 1.0 and a factor loading of .40 or greater were used to identify factor membership. The results produced the five factors presented in Table 7. Through factor analysis, Factor I achieved the highest eigenvalue of 7.456 with interaction among thirteen independent variables accounting for 45 percent of the variation. Reviewing the

Table 7

Results of Factor Analysis --
 Quartimax Rotated Factor Loadings
 (N = 1159)

Factor	Independent Variables	Factor Loading
I	HSGPA	.84800
	HSRANK	-.81090
	UCHSGPA	.85439
	VSTAN	.62318
	QSTAN	.58001
	PREDGPA	.85026
	SCHLWAIV	.49292
	SCHLPROB	-.52344
	CUMCRED	.77681
	AUTGPA	.80521
	WTRGPA	.74847
	SPRGPA	.75310
	LASTGPA	.79907
	Eigenvalue	7.456
	% of Variance	45.0
II	FRSTCLAS	.82449
	SECNDCLS	-.93431
	RELSIZE	.62164
	Eigenvalue	2.297
	% of Variance	13.9
III	THRDCLAS	-.93078
	RELSIZE	.53001
	Eigenvalue	1.719
	% of Variance	10.4
IV	HOMDISMS	-.74542
	TIMESTAT	.74805
	Eigenvalue	1.24
	% of Variance	7.5
V	RESIDNCY	.91433
	Eigenvalue	1.137
	% of Variance	6.9
Total Variance Explained		83.6

variables, for which factor loading exceeded the established minimum, there was a direct relationship among the variables concerned with aptitude and scholastic achievement. Factors II and III included variables which described high school size, with the former placing higher weight on the larger schools. Factor IV established a relationship for students who withdrew during a quarter. Factor V included the single variable of residency.

The results showed that 83.6 percent of the variability can be accounted for by five factor groupings, a reduction from the twenty independent variables that formed the clusters. Regression analysis tested Hypotheses 5 and 6 based on these findings. A comparison was then made with the regression analyses performed on Hypotheses I through 4.

Multiple Regression Analysis

This section addresses the multiple regression analyses performed to test Hypotheses 1 through 6. Stepwise regression was employed to establish the most efficient restrictive prediction equation. The effect of multicollinearity, in which some of the independent variables were very highly intercorrelated, made it necessary for the researcher to remove the following variables from regression analysis: HSGPA, HSRANK, PREDGPA, and SPRGPA. Only the highest correlated variables were used, excluding any additional variables that had intercorrelations

in the 0.8 to 1.0 range.

Each of the tables in this section present the results of the regression analysis. Only those independent variables contained in the most efficient stepwise model were listed, which contributed at least .01 addition to R^2 , the coefficient of determination. Stepwise regression selected independent variables for the equation based on which gave the greatest reduction in the regression error sum of squares, not added by the previous step(s). The tables also list the following statistics used in analyzing the results: the variable's coefficient of determination (R^2), increase in R^2 , simple R, B, F values and any significance at the .05 level. R^2 indicated the proportion of variability in the criterion variable explained by the independent variable(s) listed. R^2 indicated the overall accuracy of the prediction equation. The increase in R^2 referred to the unique contribution of the variable that explained additional variance in the criterion variable. The sign of the simple R denoted the direction of contribution for the independent variable. B represented the unstandardized regression coefficient. The individual F values measured whether each of the independent variables made significant unique contributions to the prediction of the criterion variable. The F values were tested with the appropriate critical value at the .05 level of significance. The standard error of estimate represented the index of variation of the predicted values about the regression that

allowed an evaluation to be made concerning the accuracy of the predicted equation.

• Hypothesis 1 -- There is no linear relationship between the set of pre-matriculation characteristics and the dependent variable, dropout/non-dropout.

The calculated F value of 61.15 obtained in the overall test, shown in Table 8, was greater than the critical F value of 3.00; thus the null hypothesis was rejected. Pre-matriculation characteristics did have a significant linear relationship in predicting dropouts. Based on the results of Table 8, two of the thirteen pre-matriculation characteristics contributed the most value as predictors of academic dropouts. The two variables, University Computed High School GPA (UCHSGPA) and Verbal stanine (VSTAN), had a combined R^2 value of .09567. This stepwise regression model accounted for approximately 10 percent of the variance in the dependent variable, dropout/non-dropout. Both variables were found to be individually significant in the prediction model at the .05 level. University Computed High School GPA proved to be the strongest predictor, accounting for nearly 8 percent of the variability. Verbal stanine added 1.5 percent to the prediction model, as the only other variable included.

In summation, this model of predicting attrition based on pre-matriculation characteristics was most efficient by using just two of the thirteen variables. The remaining eleven pre-matriculation characteristics would have increased the predictive efficiency only

Table 8

Stepwise Regression Analysis --
 Dropout/Non-Dropout: Pre-matriculation Characteristics
 (N = 1159)

Step Number	Variable	R ²	Increase in R ²	Simple R	B	F Value
1	UCHSGPA	.07985	.07985	.28257	.05069677	37.87*
2	VSTAN	.09567	.01582	.25700	.03298518	20.23*
	Constant				.2418953	

At .05 level, critical value for F = 3.00
 (df = 2, 1156).

Calculated F = 61.15

Standard Error = .44195

*Significant at .05 level

marginally from an R^2 value of .09567 to .10942 (Appendix Q).

Hypothesis 2 -- There is no linear relationship between the full set of characteristics and the dependent variable, dropout/non-dropout.

The calculated F value listed in Table 9 exceeded the critical F value; thus the null hypothesis was rejected. A linear relationship existed that was significant between the institutional data examined and the criterion variable of freshmen dropouts. The results of Table 9 show that only one independent variable, cumulative credits earned (CUMCRED), was a significant predictor of attrition. This variable had an R^2 value of .29237, accounting for over 29 percent of the variance. None of the other twenty-two variables were able to add significantly to the model that included a single predictor variable. It was logical that the amount of credits earned may affect a student's likelihood of persistence. The other twenty-two variables would have only increased the predictive efficiency from an R^2 value of .29237 to .31900 (Appendix R).

The resulting equation from the analysis was a simple bivariate regression as follows:

$$Y' = -.01230094 + .01831561 (\text{CUMCRED}) \quad (1)$$

where Y' = criterion variable

The analytical design assigned criterion values of 0 to dropout and 1 to non-dropout. By figuring a mean of .50 for the criterion variable, one could solve equation (1) and arrive at a break-even point in

Table 9

Stepwise Regression Analysis --
 Dropout/Non-dropout: Full Set of Characteristics
 (N = 1159)

Step Number	Variable	R ²	Increase in R ²	Simple R	B	F Value
1	CUMCRED	.29237	.29237	.54071	.01831561	430.93*
	Constant				-.01230094	

At .05 level, critical value for F = 3.85
 (df = 1, 1043)

Calculated F = 430.93

Standard Error = .39080

*Significant at .05 level

credits earned between dropouts and non-dropouts. Calculation resulted in a cumulative credit total of 28. Thus, employing this regression model in arbitrary fashion, it can be concluded that students who earn less than 28 credits by the start of the second academic year are predicted to drop out or not enroll at MSU one year after they started.

Hypothesis 3 -- There is no linear relationship between the set of pre-matriculation characteristics and the dependent variable, academic/voluntary dropout.

The calculated F value of 15.44 obtained in the overall test, shown in Table 10, was greater than the critical F value of 2.24; thus, the null hypothesis was rejected. Pre-matriculation characteristics did have a significant linear relationship to the type of dropout predicted. Based on the analysis presented in Table 10, five of the thirteen pre-matriculation characteristics, University Computed High School GPA (UCHSGPA), Sex, Verbal stanine (VSTAN), Freshman age (FRSHAGE) and Quantitative stanine (QSTAN), contributed the most value as predictors of academic dropouts over voluntary dropouts, represented by voluntary dropouts and transfers. These five variables had a combined R^2 value of .17737. This stepwise regression model accounted for approximately 18 percent of the variance of freshmen who dropped out of MSU with a cumulative GPA of less than 2.0 prior to the start of the second academic year and did not transfer to another school. All five variables were found to be positive contributors and individually significant in the prediction model at the .05 level.

Table 10

Stepwise Regression Analysis --
Academic/Voluntary Dropout: Pre-matriculation Characteristics
(N = 364)

Step Number	Variable	R ²	Increase in R ²	Simple R	B	F Value
1	UCHSGPA	.12035	.12035	.34691	.07978179	23.99*
2	SEX	.13331	.01297	.15663	.1145394	4.77*
3	VSTAN	.15210	.01878	.27541	.06685889	12.91*
4	FRSHAGE	.16652	.01442	.03650	.05442060	5.96*
5	QSTAN	.17737	.01085	.15191	-.03662029	4.72*
	Constant				-1.176235	

At .05 level, critical value for F = 2.24
(df = 5, 358)

Calculated F = 15.44

Standard Error = .45144

*Significant at .05 level

University Computed High School GPA was the strongest predictor, accounting for 12 percent of the variability.

In summation, this model of predicting the type of dropout based on pre-matriculation characteristics was most efficient by using just five of the thirteen variables. The remaining variables would have increased the predictive efficiency from an R^2 value of .17737 to .19683 (Appendix S).

Hypothesis 4 -- There is no linear relationship between the full set of characteristics and the dependent variable, academic/voluntary dropout.

The calculated F value listed in Table 11 exceeded the critical F value; thus the null hypothesis was rejected. Characteristics were available that did have a significant linear relationship as predictors of academic/voluntary dropouts. Four of the twenty-three independent variables, Last Quarter GPA (LASTGPA), Winter Quarter GPA (WTRGPA), Quantitative stanine (QSTAN) and Scholastic Probation (SCHLPROB), contributed the most value as predictors. These four variables had a combined R^2 of .56449. This stepwise regression model accounted for over 56 percent of the variability in academic and voluntary dropouts.

All four of the variables were found to be individually significant at the .05 level. As might be anticipated under the criteria that cumulative GPA be less than 2.0 for an academic dropout, the last quarter grade point average was the strongest predictor, accounting for nearly 46 percent of the variability. Winter Quarter grades also

Table 11

Stepwise Regression Analysis --
Academic/Voluntary Dropouts: Full Set of Characteristics
(N = 364)

Step Number	Variable	R ²	Increase in R ²	Simple R	B	F Value
1	LASTGPA	.45924	.45924	.67767	.1926678	41.86*
2	WTRGPA	.51947	.06022	.65877	.2041232	31.03*
3	QSTAN	.54173	.02226	.15191	-.03462527	14.65*
4	SCHLPROB	.56449	.02276	-.52659	-.2424979	13.75*
	Constant				.04733491	

At .05 level, critical value for F = 2.40
(df = 4, 263)

Calculated F = 85.22

Standard Error = .32867

*Significant at .05 level

contributed significantly with an additional 6 percent. Students who were on scholastic probation figured to be a significant predictor of dropping out, due to poor academic performance. The minus sign for the simple R of scholastic probation indicated that this variable had a negative contribution to the criterion variable, thus students on scholastic probation were more likely to be academic dropouts.

In summation, this model of predicting the type of dropout based on the institutional data examined was most efficient by using just four of the twenty-three variables. The remaining nineteen variables would have increased the predictive efficiency only modestly from an R^2 of .56449 to .62152 (Appendix T).

Hypothesis 5 -- There is no linear relationship between the variables suggested by factor analysis and the dependent variable, dropout/non-dropout.

The calculated value F of 158.54 in the overall test, shown in Table 12, was greater than the critical value of 3.00; thus the null hypothesis was rejected. Factors suggested by factor analysis did have a significant linear relationship in predicting dropouts. Based on the results of Table 12, two of the five factors contributed the most value as predictors of dropouts. The two factors had a combined R^2 value of .21525. This stepwise regression model accounted for over 21 percent of the variance of first-time freshmen matriculating Autumn Quarter, who dropped out of MSU prior to the start of the second academic year. Both factors were found to be individually significant

Table 12

Stepwise Regression Analysis --
 Dropout/Non-dropout: Factor Analysis Findings
 (N = 1159)

Step Number	Variable/ Factor	R ²	Increase in R ²	Simple R	B	F Value
1	I	.19831	.19831	.44532	.005573899	210.65*
2	IV	.21525	.01694	.26879	.1656514	24.96*
	Constant				.2827717	

At .05 level, critical value for F = 3.00
 (df = 2, 1156)

Calculated F = 158.54

Standard Error = .41170

*Significant at .05 level

in the prediction model at the .05 level. Factor I, the cluster of aptitude and scholastic achievement variables, accounted for most of the variance, 19.8 percent. The only other variable was Factor IV, withdrawing students, which added 1.7 percent to the prediction model.

In comparison to the analysis performed on Hypotheses 1 and 2, the results of factor analysis did not improve the variance of the full set of characteristics, 21.5 to 29.2 percent. It appeared that the most efficient model of predicting attrition was suggested by the analysis on Hypothesis 2, which accounted for the highest variance utilizing a single variable, cumulative credits passed. Multiple regression on the full set of characteristics also had a lower standard error of estimate than factor analysis, .39080 to .41170, thus was also more accurate.

In summation, this model of predicting attrition based on the findings of factor analysis was most efficient by using just two of the five factors suggested. The remaining three factors would have increased the predictive efficiency only minutely from an R^2 value of .21525 to .21643. It was also found that factor analysis did not provide the basis of a more efficient model of predicting dropouts than determined from regression analysis on the full set of characteristics.

Hypothesis 6 -- There is no linear relationship between the variables suggested by factor analysis and the dependent variable, academic/voluntary dropout.

The calculated F value in Table 13 exceeded the critical F value; thus the null hypothesis was rejected. A significant linear relationship did exist between the variables suggested by factor analysis and the type of dropout predicted. The results of Table 13 showed that only one variable, Factor I, the cluster of academic and achievement variables, was a significant predictor of academic/voluntary dropouts. This factor had a combined R^2 value of .24516, accounting for over 24 percent of the variance. None of the other factors were able to add significantly to the model.

When compared to the analysis performed on Hypotheses 3 and 4, the regression on factor analysis did not show improvement over the full set of characteristics, 24.5 to 56.4 percent. The most efficient model of predicting academic dropouts was suggested by the analysis on Hypothesis 4. The standard error listed from analysis on Hypothesis 4 was also smaller, .32867 to .43004, indicating that the prediction model on the full set of characteristics was much more accurate.

In summation, this model of predicting academic/voluntary dropouts was most efficient by using just one of the five factors suggested by factor analysis. The remaining four factors would have increased the predictive efficiency from an R^2 value of .24516 to .26584. It was also found that factor analysis did not provide the basis of a more efficient model of predicting academic dropouts than determined from regression analysis in the full set of characteristics.

Table 13.

Stepwise Regression Analysis --
Academic/Voluntary Dropout: Factor Analysis Findings

Step Number	Variable/ Factor	R^2	Increase in R^2	Simple R	B	F Value
1	I	.24516	.24516	.49514	.007340683	117.57*
	Constant				.3513335	

At .05 level, critical value for $F = 3.87$
(df = 1, 362)

Calculated $F = 117.57$

Standard Error = .43004

*Significant at .05 level

Double Cross-validation

This section discusses double cross-validation used in answering questions 8 - 11, which concerned the predictive efficiency of the multiple regression models obtained from Hypotheses 1 - 4.

Stepwise multiple regression was run on the pre-matriculation and full set of characteristics as predictors of dropout/non-dropout and academic/voluntary dropout. Table 14 summarized the R^2 resulting from the models, all of which were significant at the .05 level.

Table 14

Summary of Variability from Prediction Models

Model Number	Criterion Variable	Characteristics Set	R^2
1	Dropout/Non-dropout	Pre-matriculation	.09567
2	Dropout/Non-dropout	Full	.29237
3	Academic/Voluntary Dropout	Pre-matriculation	.17737
4	Academic/Voluntary Dropout	Full	.56449

Double cross-validation was performed by dividing the sample into two equal groups. Stepwise regression analysis was then applied on each of the two sample groups for each of the four models. The significant variables, unstandardized regression

coefficients and constants were obtained for the eight equations. In order to compute the predictive efficiency, the prediction equations obtained from the samples were applied on each other for the four models using the following equation:

$$Y' = B_1X_1 + B_2X_2 + \dots + B_NX_N + a \quad (2)$$

where Y' = predicted value

$B_1, B_2 \dots B_N$ = unstandardized regression coefficients

$X_1, X_2 \dots X_N$ = independent variables

a = constant

Table 15 presents the results of this analysis.

The R^2 represented the variability of the equations derived from that sample. To allow for correlational comparisons, between a dichotomous actual value (0 and 1) and a continuous range of predictive scores, an arbitrary midpoint cutoff of .50 was applied on the predicted values (Y'). Values of Y' above .50 were assigned a value of 1, .50 or less were assigned a 0. The percent of accuracy was used to evaluate the predictive efficiency of each model. The accuracy level was obtained by crosstabulating the actual criterion scores with the adjusted predicted scores for each group, listing the percentage of correct matches (Dropout to Dropout, Non-dropout to Non-dropout, Academic Dropout to Academic Dropout and Voluntary Dropout to Voluntary Dropout).

Table 15

Results of Double Cross-validation

Model	R^2		Percent of Accuracy	
	Sample 1 (N = 579)	Sample 2 (N = 580)	Sample 1 (N = 579)	Sample 2 (N = 580)
Dropout/Non-dropout, Pre-matriculation	.08346	.13656	67.9	72.9
Dropout/Non-dropout, Full Set	.29797	.28880	78.2	79.0
Academic/Voluntary Dropout, Pre-matriculation	.16227	.11886	69.1	65.3
Academic/Voluntary Dropout, Full Set	.50385	.49279	80.9	75.3

In comparing the proportions of variability from Tables 14 and 15, the full set models better maintained their values than the pre-matriculation models. The R^2 of the Dropout/Non-dropout, full set model maintained the closest value for each group, Sample 1 and Sample 2, than obtained from the entire sample, .29797, .28880, and .29237 respectively. Only Sample 2 for the Dropout/Non-dropout, pre-matriculation set was the other group, besides Sample 1 of the full set mentioned above, whose R^2 exceeded that of the entire sample, .13656 to .09567 respectively, thus improving the accuracy of the model by four percent.

The percent of accuracy indicated a favorable evaluation that the models proposed were effective predictors of attrition. The pre-matriculation models found a percent of accuracy between 65.3 to 72.9 percent. The full set models were able to predict resultant categories between 75.3 and 80.9 percent of accuracy. This high accuracy level and the R^2 maintained in each sample and model supported the efficiency of the prediction models. The full set models, based on data available one year after the freshman first enrolled were better predictors of attrition than the pre-matriculation models. The pre-matriculation models, although lower in R^2 and percent of accuracy, also proved to be efficient predictors of attrition.

Summary

In this chapter, the results of the analysis of the sample of 1,159 first-time freshmen students who matriculated at Montana State University during the Autumn Quarter of 1977, 1978 or 1979 were presented, analyzed and interpreted.

The purpose of this study was to examine the selected institutional data maintained by the Office of the Registrar, determine the current freshmen dropout rate and establish efficient predictive models of potential freshmen dropouts. The phenomenological method was also applied to theoretical samples of dropouts for additional understanding of the attrition phenomenon.

The sample exceeded the number needed to achieve a 95 percent confidence level. In order to verify the representativeness of the sample, comparisons were made to known parameter values. Based on comparative data, the sample closely represented the actual population on percentage by year, sex, residency classification, racial background and time status.

The descriptive information calculated the average age at college entry to 18.2, with a mean high school rank in class at the 30th percentile point. One-third of the entering freshmen came from high schools with less than 100 in the graduating class. Scholastically, test scores converted to stanine scores indicated that MSU had far

more students with low stanine scores (4 or lower) in both Quantitative and Verbal areas, than would be anticipated by local stanine norms.

The study found that MSU had a dropout rate of 31.4 percent distributed by the following categories: academic dropout (13.2 percent), voluntary dropout (10.4 percent) and transfer (7.8 percent). The non-dropout rate of 68.6 percent was formed by the persister (63.3 percent) and the stopout (5.3 percent). The highest quarterly dropout rate occurred between the Spring and Autumn Quarters when an additional 12.1 percent of the sample dropped out.

Additional descriptive analyses highlighted noteworthy findings on other independent variables.

The phenomenological approach involved nineteen interviews with dropouts from the sample. The subjects represented a diverse sample chosen theoretically to be broadly distributed across measurable factors. The interviews supported the claim that attrition is a complex multicausal phenomenon. The reasons given for dropping out were similar to those reported in the research. Many of the subjects discussed the various factors leading to their departure from the institution, including: lack of commitment, poor study skills, excessive parental pressure, definite career opportunities, heavy off-campus work load, peer influence and social involvement. The subjects expressed a high degree of confidence that once the firm decision was made to drop out, there was little that could have been

done to intervene. The underlying universal suggesting substantive theory was a personal sense of primary commitment to college at the time the decision was formulated to drop out. The experience allowed the researcher to develop a better understanding of attrition, especially of the individual who faced the decision of dropping out.

Factor analysis resulted in obtaining five clusters of factors that included variables which were interrelated. Thirteen independent variables that pertained to aptitude and scholastic achievement represented the largest cluster and accounted for 45 percent of the variation in responses. The five factors, as a whole, explained 83.6 percent of the variance.

Hypotheses 1 through 4 were rejected on the basis that stepwise multiple regression established significant linear relationship with the dependent variables of dropout/non-dropout and academic/voluntary dropouts; and both sets of independent variables, pre-matriculation and full set of characteristics. Each regression model computed the most efficient restrictive prediction equation, within which each independent variable provided a significant unique contribution.

It was found that by using two of the thirteen pre-matriculation characteristics, University Computed High School Grade Point Average and Verbal stanine, 9.567 percent of the variance was explained for freshmen dropouts. Only one variable, cumulative credits earned, was a significant predictor when employing the full set of characteristics

to the freshmen dropout. Cumulative credits accounted for 29.2 percent of the variability.

When analyzing the relationship of the academic/voluntary dropouts, the pre-matriculation characteristics accounted for 17.7 percent of the variance of the five variables: University Computed High School GPA, sex, Verbal stanine, freshman age and Quantitative stanine. The most variance was determined in the full set of characteristics model in academic dropouts. Four of the variables, last quarter GPA, Winter Quarter GPA, Quantitative stanine and Scholastic Probation, explained 56.4 percent of the variance.

Hypotheses 5 and 6 were rejected on the basis that stepwise multiple regression established significant linear relationships with the factors suggested by factor analysis and the attrition/retention criterion of dropout/non-dropout and academic/voluntary dropout. It was found, however, that the models determined from the findings of factor analysis did not provide the basis of a more efficient model of predicting dropouts. In both cases of dropout/non-dropout and academic/voluntary dropout, the regression analysis using the full set model had a higher percentage of variance and lower standard error of estimate than that suggested by factor analysis.

Double cross-validation was also applied to evaluate the predictive efficiency of the models obtained through multiple regression. The findings supported the use of each regression equation in predicting

the dependent variables tested. Through the application of an arbitrary midpoint cut-off of the predicted value, a comparison was made with the actual values. Percents of accuracy, ranging from 65.3 to 80.9 percent were determined among the four models. Thus, the models were found to be efficient predictors of freshman attrition at MSU.

Chapter 5

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

Concern with college attrition has grown over the threat of significant declines in enrollment. Although the U.S. Census Bureau reported that the percentage of 18-year-olds has declined 3.4 percent since 1979, enrollments have not decreased and there has been an increase in the college applications at many institutions (Magarrell, 1981a). It is anticipated, though, that such increases are short-lived, declines are imminent, and that retention efforts should continually be planned as an institutional focus.

Montana State University has had very little recent research on the current attrition rate of its freshmen students. It has been strongly recommended that institutions conduct their own local studies to understand and confront the issues of attrition in an appropriate manner (Brigham and Stager, 1980). This chapter summarizes the findings as follows:

1. Summary of Findings
2. Findings and Discussion
3. Conclusions
4. Recommendations

Summary of Findings

Statement of the Problem

College dropouts have not been found to be a homogeneous group and there has been no single set of characteristics known to confidently predict who will drop out. Certain predictive variables have been found significant in varying degrees from local and national studies. The intent of this research was to study freshman attrition as it related to Montana State University and to develop and test the effectiveness of prediction models for freshmen dropouts, based on selected institutional data.

Need for the Study

In anticipation of a shrinking base of traditional first-time freshmen, reducing attrition by retaining currently enrolled students remains a central feature of any retention program. A determination was made that Montana State University, an open-door admissions institution, had little knowledge of its freshman attrition rate. It had also been established that MSU collected and maintained in computer files, data that have been shown in other studies, to be effective predictors of attrition. In order to aid the institution's retention effort, extensive research was needed to examine the data for attrition rates, prediction models and additional understanding of freshmen students who dropped out. Through such a study, MSU may be able to

develop an early warning system to identify potential dropouts and begin an institutional retention program.

General Procedures

A random sample was taken of first-time freshmen students who matriculated at Montana State University during the 1977, 1978 and 1979 Autumn Quarters. A total of 1,159 students, for whom a complete data set was available, was used in the analyses. The data collected were obtained through computer and permanent files maintained by the Office of the Registrar. Verification of transfer students was obtained from the other Registrars who had transcripts sent to them as requested by MSU dropouts.

For purposes of comparison, the dependent variable was separated into the following dropout/non-dropout categories: academic dropout, voluntary dropout, transfer, persister and stopout. The independent variables coded were: sex, freshman age, Montana high school class division, high school grade point average, rank, and class size, residency classification, orientation attendance, race, university computed high school grade point average, rank, and class size, residency classification, orientation attendance, race, university computed high school grade point average, verbal and quantitative aptitude stanines, MSU predicted grade point average, general studies enrollment, scholarship or athletic fee waiver, scholastic probation,

honorable dismissal, cumulative credits passed, and autumn, winter, spring and last quarter grade point average. Year of entry, suspension and transferred were also coded as descriptive variables.

Descriptive analyses obtained the attrition rate and allowed for comparisons within the sample and with figures reported in literature. Factor analysis determined variable interaction, rearranged variables into clusters and suggested a reduction in the number of variables in testing for a more efficient prediction model. Stepwise multiple regression established the most efficient restrictive prediction model to test the hypotheses. Double cross-validation was then employed to test the confidence of the prediction equations.

The phenomenological method of quantitative research involved interviewing nineteen dropouts from the sample. This method supplemented the de-personalized research, utilized in the pure statistical analyses, that humanized the scope of the research and provided information useful in understanding the attrition phenomenon.

Findings and Discussion

The sample of 1,159 was representative of the first-time freshmen who matriculated at Montana State University during the 1977, 1978 and 1979 Autumn Quarters. The average age of an MSU freshman was computed to be 18.2 years, with 1.6 percent classified as the older non-traditional population, 23 years and older. MSU had not experienced

an increase in either the non-traditional student, represented by an age of 23 and older, or the proportion of female students.

The study found that MSU had a freshman dropout rate of 31.4 percent. This figure compared favorably with the 32 - 33 percent range reported by Cope and Hannah (1975), Haviland (1979) and Newlon and Gaither (1978) for four-year public universities. The current dropout rate showed a marked increase over the 20 percent dropout rate reported by Boyd (1969), Correll (1968), and Hamilton (1962) for MSU/MSC in the 1960's. This drastic increase in the dropout rate did not support Summerskill (1962) and Astin (1975), who found that the percentage of students lost from a given institution had not changed over time. This increase may have been due in part to the effects of the selective service draft that was still operative in the 1960's.

The current attrition rate was further differentiated into academic dropout (13.2 percent), voluntary dropout (10.4 percent) and transfer (7.8 percent). The fact that academic dropouts, generally students whose cumulative grade point averages were less than 2.0, represented 42 percent of all dropouts was very comparable to the literature (Brigman and Stager, 1980). This implied, however, that over half of the dropouts were performing up to institutional standards. Transfer students made up 24.8 percent of the dropouts, which was comparable to the findings of Boyd (1969), Iffert and Clarke

(1965) and Stefanich (1971). Of MSU's transfers, 61.1 percent entered another Montana institution, as compared to 87 percent of transfers who did so from the University of Montana (ibid).

The non-dropout rate of 68.6 percent was also determined. It was separated into persister (63.3 percent) and stopout (5.3 percent). Stopouts, which under traditional studies were incorrectly classified as dropouts for not maintaining continuous enrollment, represented an important category of students to recognize. For this study, a stopout was enrolled at MSU one year after first attending, but missed one or two quarters excluding summer. Had they been classified under a dropout category, the attrition rate would have risen to nearly 37 percent. Stopouts are, however, students who temporarily leave college and return at some future time. These students were counted as non-dropouts, since they were registered and continued with their coursework.

Comparatively, sex was found to be a notable factor, concurring with Demos (1968) that females had a higher freshmen persistence rate than males. The study also was in accord with numerous authors who found that males had a higher academic dropout rate than females (Astin, 1972; Cope and Hannah, 1975; Pantages and Creedon, 1978; and Tinto, 1975).

Whether a student was a Montana resident or from out-of-state had no overall effect on the attrition rate. This was contradictory to

Brigman and Stager (1980) who indicated a higher dropout rate for in-state residents. For MSU, the largest difference occurred with out-of-state students who had a higher rate of transfer (13.1 to 7.1 percent).

The study did not support previous findings concerning high school size. The dropout rate of students, with a graduating class of less than 20, failed to concur with Anderson's claim of lower persistence (1974). The study also conflicted with Correll's (1968) finding that MSC students from small schools had a significantly higher dropout rate than those from larger schools. The figures also did not agree with Tweeddale's (1978) claim that high school graduates from classes of under 100 students had higher dropout rates. These findings strongly suggested that the first-time freshmen had similar persistence rates, regardless of high school class size.

The study had calculated the mean high school rank in class as the 30th percentile point. A direct comparison was made on Table 16 with Hamilton's study performed on MSC freshmen from the class of 1960. The figures showed that freshmen classes for 1977 - 1979 had a greater proportion of students in the higher high school ranks than the freshmen classes from 1960.

Montana State University has an open-door admission policy to admit any graduate from an accredited Montana high school. It was found that MSU had more academically weaker students (stanines of 4

Table 16

Comparison of High School Rank for First-Time Freshmen

Percentile	Present Study %	Hamilton* %
10 - Upper 10%	23.6	NA
25 - Upper Quarter	48.8	NA
33 - Upper Third	59.7	49.6
50 - Upper Half	80.1	NA
66 - Upper Two-Thirds	92.4	84.8
75 - Upper Three-Quarters	95.6	NA

*Hamilton, 1962: 17

NA -- Not Available

and lower) than the anticipated stanine norms. Many of the weaker students were in-state residents. There was also a higher proportion of dropouts among students with stanines of 3 and lower. O'Donnell (1968) stated that some students had neither the requisite intellectual ability nor the appropriate academic preparation to enter college. These figures supported that statement, but an open-door admissions institution cannot be selective. Poor academic performance resulted in students being placed on scholastic probation, and/or suspended, and thus creating additional attrition. As an open-door admissions institution that maintained a quality educational program, a higher academic dropout rate should be expected.

The finding that undecided students registered in General Studies had a higher dropout rate (44.1 to 29 percent) concurred with numerous authors (Howell, 1979; Iffert, 1957; MacMillan, 1970; Newlon and Gaither, 1980; and Rose, 1980). Students who were uncertain about their career or future may not have had as strong a commitment to continue their education.

The phenomenological approach employed through interviewing nineteen dropouts provided the researcher with a better understanding of students who did not continue their education. The findings were consistent with research in suggesting that attrition was a complex multicausal phenomenon. The information obtained concurred with much of what had been written about attrition, including the reasons

given for dropping out. These students discussed the decision making process and expressed a high degree of confidence once dropping out became their choice. Many of the interviewees stated that very little could have been done to intervene and change their minds, and that they had no regrets about their decision. Many students indicated that they did not discuss their decisions or alternatives with faculty or university support personnel. They made their decision to drop out by intensive internal reflection, and discussion with peers or people not affiliated with MSU.

It was found that the student's sense of commitment was universal among dropouts. A lack or absence of commitment to college permitted students to consider dropping out. The interviews led to the formulation of substantive theory that suggested the level of commitment was a key factor to dropping out. The phenomenological method brought other variables not coded in the study into consideration. These additional factors mentioned as main reasons for dropping out besides commitment included institutional characteristics, social and economic attributes, and integration within social and academic influences. The interviews suggested certain recommendations that will be addressed in the next section of this chapter.

The statistical analyses performed included factor analysis and multiple regression. All hypotheses were tested at the .05 level of significance.

Factor analysis was performed on the coded set of twenty-seven independent variables. It resulted in interaction of twenty variables among five factor clusters. These five factors accounted for 83.6 percent of the variance.

Multiple regression tested Hypotheses 1 through 6. Stepwise regression established the most efficient restrictive prediction equation. All hypotheses were rejected and significant prediction models were established. Pre-matriculation characteristics were found to have a significant linear relationship with dropout/non-dropout and academic/voluntary dropout, Hypotheses 1 and 3 respectively. The dropout/non-dropout model accounted for 9.6 percent of the variance through two variables: University Computed High School Grade Point Average and Verbal stanine score. These two significant variables in predicting dropouts were the same variables utilized in the predicted MSU grade point average equation established by Suvak in 1968. The academic/voluntary dropout model accounted for 17.7 percent of the variance through five variables: University Computed High School GPA, Sex, Verbal stanine, Freshman age and Quantitative stanine. The fact that University Computed High School GPA was the primary variable accounting for the highest variance supported the finding that high school grades represented the best predictor of college performance (Astin, 1975; Stork and Berger, 1978; and Suvak, 1966). With aptitude stanine scores also included as significant variables in the prediction

equation, concurrence was again made with numerous authors (Baier, 1974; Bean, 1970; Blanchfield, 1971; Harman, 1979; Howell, 1979; Nichols, 1975; Stork and Berger, 1978; Summerskill, 1972; and Ternezini and Pascarella, 1978). It was concluded that high school grades were stronger predictors than test scores. The fact that age and sex were significant predictors of type of dropout disputed Howell who found no significance for either factor (1979). These findings concerning predicting academic dropouts should be viewed carefully. The model was performed ex post facto to predict the type of dropout.

Using the full set of characteristics was also found to establish a significant linear relationship with dropout/non-dropout and academic/voluntary dropout, Hypotheses 2 and 4 respectively. The dropout/non-dropout model resulted in a simple bivariate equation using cumulative credits earned, the only significant predictor of attrition. Cumulative credits earned accounted for over 29 percent of the variance. The academic/voluntary dropout model accounted for 56.4 percent of the variance through four variables: last quarter GPA, Winter Quarter GPA, Quantitative stanine and scholastic probation. These findings discounted claims that pre-matriculation characteristics continued to be strong predictors. Only one pre-matriculation characteristics, Quantitative stanine, continued as a significant predictor variable in the models, but was overtaken by college academic performance variables.

Of all prediction models, the academic dropout obtained from the

full set of characteristics was most predictable. Such findings supported Sexton (1965) who stated that freshmen dropouts were largely due to poor academic performance and subjected to a higher degree of predictiveness than those who voluntarily dropped out.

Significant prediction models were found for dropout/non-dropout and academic/voluntary dropout from the results suggested by factor analysis, Hypotheses 5 and 6 respectively. The dropout/non-dropout model was most efficient by using two of the five factors and accounted for 21.5 percent of the variance by a single cluster grouping. Both models found the cluster of aptitude and scholastic achievement variables to be most significant in predicting attrition. It was determined that factor analysis did not provide the basis of a more efficient model of predicting dropouts and academic dropouts than established by the full set of characteristics.

Double cross-validation evaluated the predictive efficiency of the models obtained through multiple regression. The results suggested that the full set of characteristics represented efficient prediction models of attrition. The full set models were better predictors of attrition than the pre-matriculation models.

It can thus be concluded that efficient attrition prediction equations appropriate to Montana State University were available utilizing institutional data maintained by the Office of the Registrar.

Conclusions

The review of literature, descriptive analyses, crosstabulations, stepwise regression analysis, factor analysis, double cross-validation and the phenomenological approach to research on the sample of 1,159 first-time freshmen who matriculated at Montana State University during the 1977, 1978 and 1979 Autumn Quarters, made possible the following conclusions:

1. MSU had a freshman dropout rate of 31.4 percent distributed as follows:
 - a. Academic dropout -- 13.2 percent
 - b. Voluntary dropout -- 10.4 percent
 - c. Transfer -- 7.8 percent
2. MSU had a freshman non-dropout rate of 68.6 percent distributed as follows:
 - a. Persister -- 63.3 percent
 - b. Stopout -- 5.3 percent
3. The freshmen class was represented by a higher proportion of low aptitude students, based on the Quantitative and Verbal stanines, than anticipated by local stanine norms.
4. MSU dropouts gave similar reasons for dropping out as that of published studies, indicating a multicausal phenomenon.
5. Dropouts expressed a lower level of commitment to college and

were confident of their decision to leave school.

6. Twenty variables were found to be interrelated under five factor clusters.

7. Models derived through stepwise regression were found to be significant in predicting a linear relationship between the dropout/non-dropout as follows:

a. Two of the thirteen pre-matriculation characteristics were found to predict significantly. University Computed High School Grade Point Average and Verbal stanine had a combined $R^2 = .09567$.

b. One of the twenty-three full set of characteristics was found to predict significantly. Cumulative credits earned had an $R^2 = .29237$.

8. Models derived through stepwise regression were found to be significant in predicting a linear relationship between the academic/voluntary dropout as follows:

a. Five of the thirteen pre-matriculation characteristics were found to predict significantly. University Computed High School GPA, Sex, Verbal stanine, freshman age and Quantitative stanine had a combined $R^2 = .17737$.

b. Four of the twenty-three full set of characteristics were found to predict significantly. Last quarter GPA, Winter Quarter GPA, Quantitative stanine and scholastic probation had a combined $R^2 = .56449$.

9. The following stepwise regression models using the five cluster groupings suggested by factor analysis resulted in the following:

a. Two of the factors were found to have a significant linear relationship with dropout/non-dropouts. The prediction model had a combined $R^2 = .21525$.

b. One of the factors was found to have a significant linear relationship with academic/voluntary dropouts, with an $R^2 = .24516$ for the prediction model.

10. Factor analysis, although reducing the variables into five clusters, did not establish a more efficient model of predicting dropouts and academic dropouts than determined by the full set of characteristics.

11. Double cross-validation suggested that there were effective predictors of attrition. The full set models were found to be better predictors of attrition than the pre-matriculation models.

Recommendations

The recommendations provided reflect a composite from the review of literature, analysis of data and effect of the interview conducted. This section will present recommendations in three sections:

1. Based on Phenomenological Findings

2. General Recommendations

3. Further Research

Based on Phenomenological Findings

The experience of interviewing dropouts provided another perspective from which to evaluate the results. The effect of the interviews was to offer sincere support for the individual rather than studying them for the purpose of dropout intervention. [Dropping out should not be viewed as failure or an action that institutions need to eliminate.] Higher education offers a service to its students to help them reach their personal goals. [Students in college should continue to have the freedom of choosing among the numerous alternatives. There needs to be a greater effort in offering resources to help students decide whether to persist, transfer, stopout or dropout. With this philosophy, more students may be encouraged to leave, resulting in fewer students, but it would encourage the entire institution to help students solidify their goals and direct their energies appropriately. It is better to help students reach the decision of dropping or stopping out sooner, than having them struggle and arrive at the same judgment later. While being assisted, the student should be given the information about returning to school and the ease and commonness of such action.]

In line with the above stated philosophy and based on the finding that the student's personal commitment represents a crucial universal

of deciding whether or not to drop out, the following recommendations were offered:

1. Increase the amount of contact that first-time freshmen have with their advisers, especially during the first term. Sound academic counseling and planning are advised as the cornerstone of a collegiate program aimed at retention (Muskat, 1979). Students who establish relationships with faculty are more likely to be more comfortable in the academic environment and seek academic assistance.

2. Encourage or require faculty to use textbooks in general survey classes. Students who enroll in general classes do not have the background and basic principles that may be assumed by certain instructors. Assigned texts provide the basis of the information that underlie the course of instruction and increase student interest in learning the material.

3. Have the instructors or advisers promote classroom acquaintances by encouraging classmates to obtain the name, address and phone number of one or two students in each class who are unknown to them. This action provides additional social contact and the means for obtaining notes and keeping up with the class in case of absence.

4. Educate faculty and staff to be sensitive to student problems and aware of appropriate referral routines for counseling. Encourage counseling services to publicize their services and offer active out-reach programs.

5. Make the issuance of probation have some bearing and effect, rather than a meaningless paper warning. Sexton found that the survival rate tripled for probationary students who received counseling compared to such students who were not counseled (1965). Students on probation should be called in by their adviser or assistant dean to discuss various matters, including course schedules, study aids, and additional assistance. There is a need for probation to have more significance to the students and to be a means for greater institutional interest in individual students.

6. Re-establish a Commuter Club, especially for new students who live off-campus. This service should include social events, informational activities and a regularly scheduled time and location on-campus for encounters. This club could provide an important source of social contact for students who only use the campus to attend class.

7. Encourage students who are now dropouts to become stopouts. Begin a new recruiting program designed to bring students back to campus and have "a new beginning". There is a definite need to ease the transition back to school. This program should also include students who transferred, who may be encouraged to come back to MSU. This campaign should include a brochure and an "Intent to Register" form.

8. Open-door admissions should not bring about a decline in

academic standards. Students who decided to attend MSU and were admitted should be given every opportunity and informed of support services to help them achieve their personal goals. Educational quality should not be compromised. Additional publicity and outreach programs should be developed to inform students of available support services, and academic/career options. Harold Enarson, president of Ohio State University, stated that open-door public universities should avoid becoming "the revolving door of failure" by sharpening a sense of shared responsibility within an institution where students may find a genuine opportunity to succeed (1978).

9. Expand the current orientation program to offer programs at critical points throughout the year. Potential dropouts face the crucial decision of dropping out at grading time (mid-terms) and at the end of the term. Programs to offer services and explore opportunities should be made available at times other than just prior to the start of the quarter. Potential dropouts should be sent information (especially during the summer between freshman and sophomore year) explaining the services available and how they may utilize them in the fall.

10. Interview persisters to provide comparisons/similarities between students who maintain continuous enrollment and the dropouts.

General Recommendations

Aside from the suggestions and ideas gathered from the interviews, the following advice is also given:

1. Review environmental and institutional factors for the enhancement of retention capabilities. Studies have found that numerous mechanisms are available to increase student participation, and thus retention (Astin, 1975; Lenning, et al., 1980). Although students cannot be forced to persist, institutions can create environments that enhance the likelihood that students will persist. Institutions should design intervention programs to minimize unnecessary attrition, and improve the positive image of the institution. Noel (1978) stated that retention is a campus-wide responsibility which starts with an attitude that the institution exists to serve students.

2. Initiate a review of computerized record keeping files of the Office of the Registrar. Plan and determine the future course of computer assisted/driven record keeping. The current system, although functioning, contains inconsistencies of data on computer files versus permanent files, and is antiquated by a design that does not permit updating of past academic quarters' data (e.g. grade changes, repeated courses, challenged courses).

3. The prediction models proposed should be tested and applied for freshmen who began Autumn Quarter 1980 and those who will begin.

Autumn 1981. The appropriate equations should be run against the respective populations to validate the findings and to identify potential dropouts. A retention program should be designed to make everyone aware of existing support services and opportunities.

4. The Office of Admissions will need to do additional recruiting of women and older students to offset the decline in the general population of traditional 18-year-olds. Although it had been reported that the non-traditional aged student, 23 years and older, and the number of female students had increased across the nation (Magarrell, 1981b), MSU had not experienced such an increase. MSU will also need to make program revisions (e.g. additional evening classes) to attract such a population.

5. Reevaluate the honorable dismissal process to obtain more information about the students who withdraw from school during the quarter. A study should be designed to gather the reasons for withdrawing and the personal goals of such students to try to understand why such a high proportion of these students do not return to MSU. These students should also be informed of the routine for returning to school and of available campus services.

Further Research

1. The institution should commit resources to continue this study or conduct more appropriate research on a longitudinal design.

The current study has much of the preliminary data collected to continue tracking the sample for four or more years.

2. A similar study may be conducted on first-time freshmen who matriculated during the Winter, Spring or Summer quarters, comparing the findings with the current study.

3. Compare students who apply to MSU but do not enroll with those who do attend. Can a prediction model be developed for "No Shows", for additional recruiting techniques (e.g. special orientation programs)?

4. Test the prediction models at other colleges and universities.

5. Additional analyses should be performed on the current data to establish prediction models developed in this study for different combinations of the criterion variable (e.g. academic dropout versus non-academic dropout, transfers versus non-transfer, stopout versus non-stopout).

6. A study should be performed to review the established conversions of test scores to MSU stanines, in line with established norms.

7. A study should be performed to review the appropriateness of the courses selected to calculate the University Computed High School Grade Point Average.

8. Upon completion of general recommendations 6 and 7, a study should be conducted to review and reestablish an efficient prediction model of academic performance at MSU. It has been ACT policy to

recommend that colleges update their prediction equation at least every three years (Sawyer and Maxey, 1979). MSU is still using the same predicted grade point equation developed over thirteen years ago.

9. Consider additional institutional variables not included to supplement the prediction equations established (e.g. housing location, employment). Identify and assess aspects of the environment which create dissatisfaction and take appropriate action to reduce such influences.

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APPENDICES

APPENDIX A

Verification of Transfer Letter



OFFICE OF THE REGISTRAR AND ADMISSIONS

MONTANA STATE UNIVERSITY, BOZEMAN 59717

February/March, 1981

Dear Registrar:

Your assistance is requested in a research project being conducted at Montana State University.

I am currently engaged in a doctoral dissertation studying the extent of freshmen attrition and testing an institutional model of predicting dropouts. One phase of the research is to obtain verification of MSU dropouts who may have enrolled in another postsecondary institution (transfers). The student listed below has been identified as a potential transfer, since he/she requested a transcript be sent to your institution.

Your cooperation is needed to make this study a success. Please take a few moments to check and complete the section at the bottom of this sheet. A prepaid addressed envelope is enclosed for the return of this inquiry.

Thank you in advance for your help and cooperation.

Sincerely,

Dennis J. Dulniak
Assistant Registrar and
Doctoral Candidate

_____ has:

(✓) Check where appropriate

_____ Enrolled from _____ 19____ to _____ 19____, and _____ 19____
to _____ 19____.

_____ Registered for the current term. Student's address: _____

Telephone: (____) _____.

_____ Never enrolled.

Signature of Official_____
Title

APPENDIX B. Conversion of National Tests
to Montana State University Stanines

MSU Stanine	1	2	3	4	5	6	7	8	9
Anticipated percentage within each stanine	4	6	13	17	20	17	13	6	4
ACT Math	-11	12-14	15-17	18-20	21-23	24-26	27-29	30-32	33+
ACT Composite (Verbal)	-12	13-15	16-18	19-21	22-23	24-25	26-27	28-29	30+
PSAT Quantitative	-29	30-34	35-40	41-45	46-50	51-55	56-60	61-66	67+
PSAT Verbal	-25	26-32	33-36	37-41	42-45	46-50	51-55	56-60	61+
SAT Quantitative	-320	321-370	371-430	431-490	491-540	541-580	581-630	631-680	681+
SAT Verbal	-300	301-340	341-390	391-430	431-470	471-510	511-560	561-620	621+
SCAT Quantitative	-7	8-12	13-17	18-22	23-27	28-31	32-36	37-41	42+
OHIO Verbal	-19	20-26	27-33	34-39	40-46	47-53	54-60	61-67	68+

APPENDIX C. Abbreviations used for
the Independent Variables

Independent Variable	Abbreviation
1. Sex	SEX
2. Freshman Age	FRSHAGE
3. First Class High School	FRSTCLAS
4. Second Class High School	SECNDCLS
5. Third Class High School	THRDCLAS
6. Private High School	PRIVATE
7. High School Grade Point Average	HSGPA
8. Relative High School Rank	HSRANK
9. High School Class Size	RELSIZE
10. Residence Classification	RESIDNCY
11. Orientation Attendance	ORIENTN
12. Racial Background	RACIAL
13. University Computed High School Grade Point Average	UCHSGPA
14. Verbal Aptitude Test Score	VSTAN
15. Quantitative/Mathematics Aptitude Test Score	QSTAN
16. Montana State University Predicted Grade Point Average	PREDGPA
17. General Studies Enrollment	GENSTDS
18. Scholarship Fee Waiver	SCHLWAIV
19. Athletic Fee Waiver	ATHLWAIV
20. Scholastic Probation	SCHLPROB
21. Honorable Dismissal	HONDISMS
22. Cumulative Credits Passed	CUMCRED
23. Autumn Quarter Grade Point Average	AUTGPA
24. Winter Quarter Grade Point Average	WTRGPA
25. Spring Quarter Grade Point Average	SPRGPA
26. Last Quarter Grade Point Average	LASTGPA
27. Last Quarter Time Status	TIMESTAT

APPENDIX D

"Approval to Participate in Discussion on Dropping Out" Form

MONTANA STATE UNIVERSITY

Approval to Participate in Discussion on Dropping Out

Title of Project: Doctoral Dissertation -- "An Institutional Predictive Model of
Freshmen Dropouts at Montana State University"

Name of Researcher: Dennis J. Dulniak

Name of Person Briefing Subject: Dennis J. Dulniak

I, _____, am a willing participant in this
(Name of Participant)
project and have been informed of the following:

- I. General Description: Freshmen who dropped out of Montana State University will be asked to discuss their experiences surrounding college and the decision to dropout. The information will be used to develop attrition theory. Participants may obtain a better understanding of themselves and their decision to drop out of college.
- II. Selected Participants: Persons to be interviewed have been chosen from a sample of students who have dropped out of Montana State University. Their involvement in the program will represent a diverse sampling from the population of dropouts.
- III. Involvement: Participants will be encouraged to verbally review the process of college, from the decision of attending to dropping out.
- IV. Rights: All information obtained in the interview will be kept confidential. Participants will permit the taping of the session and may elect to withhold responses from the interview at any time.

I have been given the opportunity to ask questions about the interview, and these questions have been answered to my satisfaction.

Signature

Date

APPENDIX E. Schools to Which MSU Freshmen Dropouts Transferred.

School	Number
<u>Montana Institutions</u>	
Eastern Montana College	19
University of Montana	17
Northern Montana College	8
Miles Community College	3
Carroll College	2
Big Sky Bible College	1
Billings Vo Tech Center	1
Flathead Valley Community College	1
Montana College of Mineral Science & Technology	1
Rocky Mountain College	1
Western Montana College	1
Montana Subtotal	55 (61.1 percent)
<u>Non-Montana Institutions</u>	
Arizona State University	2
Northwest College	2
Sheridan College	2
Bowling Green State University	1
Brigham Young University	1
California State University at Long Beach	1
Christ for the Nations Institute	1
Concordia College	1
Ft. Lewis College	1
Fullerton College	1
Humbolt State University	1
Mankato State University	1
Marquette University	1
Multnomah School of the Bible	1
North Dakota State University	1
Rochester Community College	1
Santa Barbara City College	1
Seattle Pacific University	1
South Dakota State University	1
University of Colorado	1
University of Denver	1
University of Maryland at College Park	1
University of Minnesota	1
University of Mississippi	1
University of Nevada at Reno	1
University of Northern Iowa	1
University of Oregon	1
University of Toledo	1
University of Wisconsin at Green Bay	1
University of Wyoming	1
Washington State University	1
Western Kentucky University	1
Non-Montana Subtotal	35 (38.9 percent)
Grand Total	90

APPENDIX F. First-time Freshmen Dropouts and Non-dropouts by Sex

Category	% Male (N = 618)	% Female (N = 541)
Dropout		
Academic Dropout	15.5	10.5
Voluntary Dropout	8.9	12.2
Transfer	<u>7.1</u>	<u>8.5</u>
Subtotal	31.5	31.2
Non-dropout		
Persister	61.8	65.3
Stopout	<u>6.6</u>	<u>3.5</u>
Subtotal	68.4	68.8

APPENDIX G. First-time Freshmen Dropouts
and Non-dropouts by High School Class Division

Category	% First Class (N = 599)	% Second Class (N = 297)	% Third Class (N = 101)	% Private (N = 24)
Dropout				
Academic Dropout	13.9	13.8	9.9	25.0
Voluntary Dropout	10.5	9.1	13.9	16.7
Transfer	<u>6.5</u>	<u>6.1</u>	<u>11.9</u>	<u>16.7</u>
Subtotal	30.9	29.0	35.7	58.4
Non-dropout				
Persister	63.3	66.0	59.4	41.7
Stopout	<u>5.8</u>	<u>5.1</u>	<u>5.0</u>	<u>0</u>
Subtotal	68.9	71.1	64.4	41.7

APPENDIX H. First-time Freshmen Dropouts and Non-dropouts by Graduating Class Size

Category	% 1-19 (N = 52)	% 20-49 (N = 158)	% 50-99 (N = 170)	% 100-249 (N = 215)	% 250+ (N = 564)
Dropout					
Academic Dropout	11.5	12.7	15.3	13.5	12.8
Voluntary Dropout	13.5	13.9	7.6	9.3	10.5
Transfer	<u>9.6</u>	<u>8.9</u>	<u>7.1</u>	<u>9.8</u>	<u>6.7</u>
Subtotal	34.6	35.5	30.0	32.6	30.0
Non-dropout					
Persister	61.5	57.6	65.3	62.8	64.9
Stopout	<u>3.8</u>	<u>7.0</u>	<u>4.7</u>	<u>4.7</u>	<u>5.1</u>
Subtotal	65.3	64.6	70.0	67.5	70.0

APPENDIX I. First-time Freshmen Dropouts
and Non-dropouts by Residency Classification

Category	% In-State Resident: (N = 1037)	% Nonresident (N = 122)
Dropout		
Academic Dropout	13.6	9.8
Voluntary Dropout	10.7	8.2
Transfer	<u>7.1</u>	<u>13.1</u>
Subtotal	31.4	31.1
Non-dropout		
Persister	63.3	64.8
Stopout	<u>5.3</u>	<u>4.1</u>
Subtotal	68.6	68.9

APPENDIX J. First-time Freshmen Dropouts
and Non-dropouts by Orientation Attendance

Category	% Summer Orientation (N = 625)	% September Orientation (N = 534)
Dropout		
Academic Dropout	12.3	14.2
Voluntary Dropout	7.8	13.5
Transfer	<u>7.8</u>	<u>7.7</u>
Subtotal	27.9	35.4
Non-Dropout		
Persister	66.9	59.4
Stopout	<u>5.1</u>	<u>5.2</u>
Subtotal	72.0	64.6

APPENDIX K. Age of First-time Freshmen by
Orientation Attendance

Age	% Summer Orientation (N = 625)	% September Orientation (N = 534)
17	9.9	6.0
18	81.0	75.5
19	7.0	9.9
20	0.5	2.8
21	0.0	2.2
22	0.3	1.7
23	0.6	0.6
24	0.3	1.7
25	0.0	0.2
26	0.2	0.7
27	0.0	0.4
28	0.2	0.0

APPENDIX L. First-time Freshmen Dropouts and Non-Dropouts by Quantitative Stanine.

Category	% 1 (N = 133)	% 2 (N = 132)	% 3 (N = 157)	% 4 (N = 160)	% 5 (N = 120)	% 6 (N = 124)	% 7 (N = 154)	% 8 (N = 106)	% 9 (N = 73)
Dropout									
Academic Dropout	24.1	23.5	15.9	13.8	15.0	8.1	5.8	3.8	2.7
Voluntary Dropout	9.8	14.4	14.7	10.6	10.0	6.5	13.0	3.8	6.8
Transfer	<u>11.3</u>	<u>13.6</u>	<u>8.3</u>	<u>5.6</u>	<u>10.0</u>	<u>6.5</u>	<u>5.8</u>	<u>3.8</u>	<u>2.7</u>
Subtotal	45.2	51.5	38.9	30.0	35.0	21.1	24.6	11.4	12.2
Non-dropout									
Persister	50.4	46.2	54.1	60.6	60.0	75.0	70.8	84.0	84.9
Stopout	<u>4.5</u>	<u>2.3</u>	<u>7.0</u>	<u>9.4</u>	<u>5.0</u>	<u>4.0</u>	<u>4.5</u>	<u>4.7</u>	<u>2.7</u>
Subtotal	54.9	48.5	61.1	70.0	65.0	79.0	75.3	88.7	87.6

APPENDIX M. First-time Freshmen Dropouts and Non-dropouts by Verbal Stanine

Category	% 1 (N = 64)	% 2 (N = 120)	% 3 (N = 196)	% 4 (N = 212)	% 5 (N = 143)	% 6 (N = 162)	% 7 (N = 135)	% 8 (N = 92)	% 9 (N = 35)
Dropout									
Academic Dropout	43.8	25.0	15.8	14.6	11.2	4.9	3.7	4.3	0
Voluntary Dropout	4.7	10.0	12.8	11.8	12.6	9.3	11.1	7.6	2.9
Transfer	<u>9.4</u>	<u>12.5</u>	<u>9.2</u>	<u>9.0</u>	<u>7.7</u>	<u>7.4</u>	<u>3.7</u>	<u>2.2</u>	<u>5.7</u>
Subtotal	57.9	47.5	37.8	35.4	31.5	21.6	18.5	14.1	8.6
Non-dropout									
Persister	39.1	49.2	54.1	59.4	62.9	74.1	77.0	80.4	88.6
Stopout	<u>3.1</u>	<u>3.3</u>	<u>8.2</u>	<u>5.2</u>	<u>5.6</u>	<u>4.3</u>	<u>4.4</u>	<u>5.4</u>	<u>2.9</u>
Subtotal	42.2	52.5	62.3	64.6	68.5	78.4	81.4	85.8	91.5

APPENDIX N. First-time Freshmen Dropouts
and Non-dropouts by General Studies Enrollment

Category	% Enrolled in Academic College (N = 973)	% Undecided - Enrolled in General Studies (N = 186)
Dropout		
Academic Dropout	12.3	17.7
Voluntary Dropout	9.5	15.6
Transfer	<u>7.2</u>	<u>10.8</u>
Subtotal	29.0	44.1
Non-dropout		
Persister	66.0	50.0
Stopout	<u>5.0</u>	<u>5.9</u>
Subtotal	71.0	55.9

APPENDIX O. First-time Freshmen Dropouts and
Non-dropouts by Fee Waiver

Category	% National Merit or Montana High School Honor Scholarship (N = 183)	% Athletic Waiver (N = 22)
Dropout		
Academic Dropout	2.2	4.5
Voluntary Dropout	8.7	4.5
Transfer	<u>3.5</u>	<u>0</u>
Subtotal	14.4	9.0
Non-dropout		
Persister	83.1	90.9
Stopout	<u>2.7</u>	<u>0</u>
Subtotal	85.8	90.9

APPENDIX P. First-time Freshmen Dropouts and Non-dropouts by Predicted MSU Grade Point Average.

Category	% 0.7 - 1.4 (N = 68)	% 1.5 - 2.1 (N = 378)	% 2.2 - 2.4 (N = 268)	% 2.5 - 2.8 (N = 160)	% 2.9 - 3.1 (N = 160)	% 3.2 - 3.4 (N = 58)
Dropout						
Academic Dropout	45.6	22.8	8.8	3.7	3.1	1.7
Voluntary Dropout	5.9	11.1	13.7	9.7	10.6	1.7
Transfer	<u>13.2</u>	<u>10.1</u>	<u>6.2</u>	<u>7.1</u>	<u>4.4</u>	<u>5.2</u>
Subtotal	64.7	44.0	28.7	20.5	18.1	8.6
Non-dropout						
Persister	25.0	50.0	64.3	75.7	80.6	86.2
Stopout	<u>10.3</u>	<u>6.1</u>	<u>7.0</u>	<u>3.7</u>	<u>1.3</u>	<u>5.2</u>
Subtotal	35.3	56.1	71.3	79.4	81.9	91.4

APPENDIX Q. Complete Results of Stepwise Regression
Analysis for Pre-matriculation Characteristics
on Dropout/Non-dropout

Step	Variable	R^2	Increase in R^2	Simple R
1	UCHSGPA	.07985	.07985	.28257
2	VSTAN	.09567	.01582	.25700
3	PRIVATE	.10130	.00563	-.08436
4	ORIENTN	.10406	.00276	.07940
5	QSTAN	.10615	.00209	.24992
6	RACIAL	.10740	.00125	-.06535
7	THRDCLAS	.10823	.00083	-.02821
8	SECNDCLS	.10860	.00037	.03099
9	RELSIZE	.10889	.00029	.03478
10	FRSHAGE	.10911	.00022	-.05003
11	RESIDNCY	.10919	.00008	.00191
12	FRSTCLAS	.10936	.00017	.01162
13	SEX	.10942	.00006	.00339

APPENDIX R. Complete Results of Stepwise Regression Analysis
for the Full Set of Characteristics on Dropout/Non-dropout

Step	Variable	R ²	Increase in R ²	Simple R
1	CUMCRED	.29237	.29237	.54071
2	LASTGPA	.29923	.00686	.41951
3	WTRGPA	.30807	.00884	.30651
4	PRIVATE	.31137	.00330	-.08436
5	ORIENTN	.31321	.00184	.07940
6	ATHLWAIV	.31526	.00205	.06688
7	QSTAN	.31673	.00147	.24992
8	SECNDCLS	.31716	.00043	.03099
9	FRSTCLAS	.31746	.00030	.01162
10	SCHLPROB	.31772	.00026	-.21945
11	AUTGPA	.31807	.00035	.39031
12	RACIAL	.31825	.00018	-.06535
13	UCHSGPA	.31843	.00018	.28257
14	RELSIZE	.31857	.00014	.03478
15	HONDISMS	.31870	.00013	-.17815
16	GENSTDS	.31878	.00008	-.11944
17	SCHLWAIV	.31883	.00005	.16045
18	VSTAN	.31887	.00004	.25700
19	FRSHAGE	.31891	.00004	-.05003
20	THRDCLAS	.31894	.00003	-.02821
21	SEX	.31897	.00003	.00339
22	TIMESTAT	.31899	.00002	.27693
23	RESIDNCY	.31900	.00001	.00191

APPENDIX S. Complete Results of Stepwise
Regression Analysis for the Pre-Matriculation
Characteristics on Academic/Voluntary Dropout

Step	Variable	Increase		
		R^2	in R^2	Simple R
1	UCHSGPA	.12035	.12035	.34691
2	SEX	.13331	.01296	.15663
3	VSTAN	.15210	.01879	.27541
4	FRSHAGE	.16652	.01442	.03650
5	QSTAN	.17737	.01085	.15191
6	RESIDNCY	.18186	.00449	.07231
7	THRDCLAS	.18725	.00539	.09568
8	ORIENTN	.18903	.00178	-.03835
9	SECNDCLS	.19043	.00140	-.06357
10	FRSTCLAS	.19467	.00424	-.05832
11	PRIVATE	.19621	.00154	-.00334
12	RACIAL	.19676	.00055	-.06118
13	RELSIZE	.19683	.00007	-.03545

APPENDIX T. Complete Results of Stepwise Regression Analysis for
the Full Set of Characteristics on Academic/Voluntary Dropout*

Step	Variable	R ²	Increase in R ²	Simple R
1	LASTGPA	.45924	.45924	.67767
2	WTRGPA	.51947	.06023	.65877
3	QSTAN	.54173	.02226	.15191
4	SCHLPROB	.56449	.02276	-.52659
5	THRDCLAS	.57428	.00979	.09568
6	AUTGPA	.58298	.00870	.57828
7	SCHLWAIV	.59315	.01017	.14973
8	CUMCRED	.60076	.00761	.43972
9	VSTAN	.60574	.00498	.27541
10	TIMESTAT	.60848	.00274	.09721
11	SEX	.61121	.00273	.15663
12	RESIDNCY	.61390	.00269	.07231
13	GENSTDS	.61575	.00185	.01954
14	UCHSGPA	.61693	.00118	.34691
15	PRIVATE	.61798	.00105	-.00334
16	FRSHAGE	.61879	.00081	.03650
17	ORIENTN	.61933	.00054	-.03835
18	HONDISMS	.61985	.00052	-.05777
19	RELSIZE	.62021	.00036	-.03545
20	SECNDCLS	.62100	.00079	-.06537
21	RACIAL	.62128	.00028	-.06118
22	FRSTCLAS	.62152	.00024	-.05832

*ATHLWAIV was not included in the equation.

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