

ENTERING CHARACTERISTICS AS PREDICTORS OF  
SUCCESS OR FAILURE OF MLT-AD STUDENTS  
AT GRAYSON COUNTY COLLEGE

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A THESIS

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## CHAPTER I

### INTRODUCTION

High attrition rates have been a source of concern for instructors in Medical Laboratory Technology Associate Degree (MLT-AD) programs for several years. Open-door policies of community colleges seem to contribute to the problem. No selective criteria are used for screening prospective students. Curricula are designed so that all of the required courses may be completed within a two year period. The MLT-AD program at Grayson County College has experienced a high attrition rate since its beginning in 1972. The accreditation site survey report prepared by Middleton, Wallace and Hudspeth (1979) pointed out that "Various factors are cited as causes of the high attrition rate (greater than 70%), but a formal analysis study has not been made" (p. 4).

#### Statement of the Problem

This correlational study investigated the relationship between characteristics present at entry and the success or failure of students enrolled in the MLT-AD program at Grayson County College.

### Statement of Purpose

The purpose of this study was to determine the relationship between each of the following characteristics at entry and success or failure in the MLT-AD program:

1. High school grade point average (GPA)
2. Number of academic quarters each of high school biology, chemistry and algebra and the total number of academic quarters completed
3. American College Testing Program (ACT) subscores and the composite score
4. GPA for college courses completed before the semester in which the student enrolled in MLT course work
5. Composite GPA for anatomy and physiology, microbiology, chemistry and college algebra completed before the semester in which the student enrolled in MLT course work
6. Number of college hours completed before the semester in which the student enrolled in MLT course work
7. Previous work experience as a laboratory aid or assistant in a clinical laboratory
8. Age
9. Sex

10. Marital status
11. Race (self-declared)

### Hypotheses

The following null hypotheses were tested:

1. There is no significant difference between the high school GPA of successful students and failing students in the MLT-AD program
2. There is no significant difference between the number of academic quarters each of high school biology, chemistry and algebra and the total number of academic quarters completed by successful students and failing students in the MLT-AD program
3. There is no significant difference between the ACT subscores or composite scores of successful students and failing students in the MLT-AD program
4. There is no significant difference between GPA for college courses completed before the semester in which the student enrolled in MLT course work for successful students and failing students in the MLT-AD program
5. There is no significant difference between composite GPA for anatomy and physiology,

microbiology, chemistry and college algebra courses completed before the semester in which the student enrolled in MLT course work for successful and failing students in the MLT-AD program

6. There is no significant difference between the number of college hours completed before the semester in which the student enrolled in MLT course work for successful students and failing students in the MLT-AD program
7. There is no significant difference between previous work experience in a clinical laboratory of successful students and failing students in the MLT-AD program
8. There is no significant difference between age of successful students and failing students in the MLT-AD program
9. There is no significant difference between the sex of successful students and failing students in the MLT-AD program
10. There is no significant difference between marital status of successful students and failing students in the MLT-AD program

11. There is no significant difference between race (self-declared) of successful students and failing students in the MLT-AD program
12. There is no significant relationship between success and any combination of characteristics

#### Assumptions

For the purpose of this study the results apply only to the MLT-AD program at Grayson County College.

#### Definitions

For the purpose of this study, the definitions described below apply.

1. Characteristic--a distinguishing quality or trait of an individual
2. MLT-AD program--technical courses in laboratory technic taken in sequence as described in the Grayson County College MLT-AD curriculum
3. Success--completion of the two year MLT-AD program with a 2.0 GPA or better and passing the American Society of Clinical Pathologists Board of Registry (ASCP) certification examination upon the first attempt

4. Failure--withdrawal or failure to complete the MLT-AD program with a 2.0 GPA or failure to pass the ASCP certification examination upon the first attempt
5. Grade point average (GPA)--a numerical method of describing grades equated to courses attempted. For repeated courses the last grade is used for the calculation. (4.0 = A, 3.0 = B, 2.0 = C)
6. Work experience--at least three months employment experience actually performing clinical laboratory tests or enrollment as a Health Occupations Education student while in high school with experience in the clinical laboratory

#### Significance of the Study

Only a limited number of students can be admitted to most health related programs. If the student who is accepted into such a program drops out or fails, this represents a loss not only to society and to the individual, but also to the person who was denied access to the program (Morgan, 1976).

Rzonca (1976) pointed out that students are products of educational institutions. Expenditures are

usually related to the number of graduates or participants of a program. Local budgets are often based on the cost per student. Administrators are seeking educational services with low investment of resources. Low student/teacher ratios, limited clinical facilities and the high cost of equipment for teaching contribute to the high expense of health occupations programs. It was also noted that regardless of the cost of training workers for health fields, these programs must be provided.

Selection decisions affect not only the lives of those students accepted or rejected but also the program and the occupation itself. If students with varied backgrounds are accepted, the instructional methods may have to be modified. The quality of students selected may affect the program's reputation. Graduates of the program will make their own "mark" upon the profession as practitioners. If there is a large attrition rate, shortages of needed practitioners may be the result. (Ammons and Hartley, 1976). Middleton, Wallace and Hudspeth (1979) reported that, after interviewing medical directors and laboratory staff members of local medical institutions, the only real concern expressed about the graduates of the MLT-AD program at Grayson County College ". . . is the inadequacy of their number" (p. 6).

Grayson County College adheres to an open-door admission policy requiring only graduation from an accredited high school, passing the General Education Development (GED) examination or individual approval by the dean for persons over 21 years of age. Students may also transfer from another college (Grayson County College, 1980). The MLT-AD program has admitted any student eligible for admission to the college, including transfer students. Class size was usually limited to 24 students. The largest class consisting of 26 students was enrolled in 1974. Of all the students admitted between 1972 and 1978, only 46 have completed the program and have been certified as Medical Laboratory Technicians by ASCP. Two students required more than one attempt to pass the ASCP certification examination. The program was accredited by the Committee on Allied Health Education and Accreditation (CAHEA) in the fall of 1979. At that time, CAHEA recommended that enrollment in each class be limited to 12 students (Beckley, 1979).

## CHAPTER II

### REVIEW OF THE LITERATURE

Ahrendt (1975) described the open-door policy as a distinguishing factor of community colleges. The open-door policy, geographic location and generally low tuition have contributed to the rapid growth of community colleges. Kaster (1979) stated that the enrollment growth of the past decade symbolizes the success of the open-door policy of community colleges. This growth is also threatening the existence of such a policy. "As community colleges attempt to provide more services, taxpayers are beginning to be alarmed at what appears to be an unlimited expansion of cost" (p. 28). The erratic economy, inflation and demands for other public services have complicated the situation.

Acceptance of all students who meet basic criteria as long as space is available in the class is one admission policy used in health occupations programs. Retention problems are common with this method. Some allied health programs do not enroll students until they have successfully completed certain prerequisite courses. Academic aptitude, motivation and persistence determine which stu-

dents succeed and which fail (Ammons and Hartley, 1976).

Rzonca (1976) reported that proponents of the open-door policy support the position that all interested students have an opportunity. Previous poor academic performance does not hinder them in pursuing further education. Maturation of the student is emphasized. Critics of the open-door policy contend that counseling and sound education programs are necessary to successfully produce graduates.

Ammons and Hartley (1976) pointed out that the Civil Rights Act of 1964 (as ammended) prohibits discrimination on the basis of race, creed, sex or national origin. Discrimination on the basis of age is addressed by other federal laws. Discrimination in access to an educational program or service that receives federal funds is also forbidden. Programs receiving large sums of federal dollars are expected to examine admissions procedures to see that they do not consistently reject any one racial group or sex.

The Southern Regional Education Board (1980) reported that in sciences and engineering there are too few enrollments and high attrition among minority groups. Colleges and universities are implementing a variety of programs aimed at increasing minority representation in

the sciences. "Black enrollment trends in higher education traditionally have indicated that the sciences are unpopular fields of study" (p. 2). Monroe (1975) reported that minority group students, for the most part, make up a small fraction of total college enrollment. He stated that less than 10 percent of the enrollment in community colleges in the South were black students. Thompson (1978) suggested that minority groups address issues such as "the decrease in the number of minority students attending health professions programs (whether the crux of the problem is one of admissions or getting individuals to apply is subject to some debate)" (p. 169). Hall, et al. (1979) recommended that:

Recruitment efforts to increase minority representation in allied health programs should be strengthened through provision of counseling and financial assistance. Training institutes for allied health faculty and administrators should include seminars dealing with the matter of minority student recruitment. (p. 8)

Malhiot and Ninan (1979) reported that:

The difficulties involved in recruiting and retaining minority students were explored in depth at a National Student Nurses' Association workshop in Los Angeles in April 1977. Called "The Three R's of Retention: Reasons, Responsibilities, Rights," the workshop identified four main problems. (1) Minority students entering nursing programs are often academically deficient and almost always beset with feelings of loneliness, isolation, frustration, and disillusionment when they enter the predominantly white environment. (2) Often, minority students are not aware of needing help until they

are so far into the semester that help is impossible. (3) Minority students may lack know-how about available support systems and may also fear these support systems because they are offered by whites. (4) Faculty, even when committed to helping minority students, are rarely proficient in handling such problems and may not recognize difficulties until too late to intervene. (p. 473)

Monroe (1975) indicated that the student body of the typical community college has a median age of 19 years. The ages ranged from 16 to over 30 for full-time day students. Harris and Grede (1977) reported that:

The proportion of older students in the college population, especially in the age range of twenty-five to thirty-four years, is increasing rapidly. . . . In fact, many community colleges and technical institutes report that the median age of their students is now twenty-six years or more. (pp. 29-30)

Ahrendt (1975) reported that:

A summarization of the literature indicates that there are certain common characteristics of community/junior college students. As a group they 1) come from families ranging from low to high on the socioeconomic scale; 2) comprise a cross section of the general population; 3) often are uncertain of their interests and career choices; 4) are more inclined toward vocational education, yet express the desire to transfer to a four-year school; 5) hold part-time jobs and in many instances have been unsuccessful with earlier experiences with traditional approaches to education; 6) represent a wide range of age groups (18-21 and 22 and over, with the median age of 25 years); 7) often need some form of remedial assistance; 8) represent the racial diversity present in the country; and 9) are marginal or high-risk students attracted by the open-door policy. (pp. 4-5)

Monroe (1975) also described community college students as a heterogeneous group. They come from diverse back-

grounds and many are poor as well as educationally handicapped. "However, among this group, both white and black, are undiscovered talented students who, if it were not for the community college, would find all college doors closed" (p. 186). Monroe (1975) made the following statements about ability.

Statistical medians or averages do not reflect the wide range of ability in a typical community-college population, a range which is greater than for students in four-year colleges. . . . College goals need to match student goals and abilities. As more and more students from the lower socioeconomic classes and the lower half of their high school classes enter the community-college, the colleges will be under more pressure to develop new curricula and teaching techniques. (pp. 188-190)

Harris and Grede (1977) suggested that

. . . the most critical issue posed by diversity is yet to be examined. It is the range of aspirations and academic ability presented by the "new" students, whose background and secondary school achievement would almost automatically have excluded them from higher education as recently as a decade ago. . . .

The issue here is not whether academically under-qualified students should be admitted to college--that step has already been taken. Egalitarianism and meritocracy are in a continual tug of war on many fronts, but in the arena of college admissions egalitarian ideas have won the day. Community colleges are committed to open access, to the second chance, and to the "late bloomer". . . . Having made the commitment, community colleges must do their utmost to render it meaningful. . . .

With dedication to the student and his needs, but with an equal commitment to the disciplinary demands of college study and the performance demands of careers, we can plan and operate college programs (each with its proper level of cognition and skill attainment) that will allow each student to learn as much as he

is capable of learning and perform as well as he is capable of performing. The chances of success for all will be enhanced, but success for everyone cannot be guaranteed. (pp. 36-38)

Ammons and Hartley (1976) felt that success could be defined progressively as persistence through each term of a program, graduation from the program and satisfactory scores on certification or licensure examinations. They warned that duplicates for successful practitioners could not be chosen from applicants of allied health programs because education results in change.

Monroe (1975) observed that:

Most colleges regard a heavy attrition, or drop-out rate, as a serious waste of educational resources and personal potential. Attrition rates in the community and senior colleges vary from 15 to 50 percent. At least half of the loss occurs in the freshman year. . . .

Dropout rates are defined as the percentage loss of students to the college for any reason during the normal period of time for graduation. In the community college, this rate is the loss of students over a period of two years. . . . If it is the goal of the college to remain a highly selective institution, a high dropout rate may be viewed as a sign of excellence and not to be deplored. However, if the college has as its goal the maximization of opportunities for higher education, a large dropout rate suggests that something is wrong with the program. In either case, dropouts are a waste of time and money unless there is evidence that they have received satisfaction of goals and needs. . . . Before any analysis of the reasons for college withdrawals can be made, a distinction needs to be made between those students who are voluntary withdrawals and those who are dismissed. Some of the voluntary withdrawals are not dropouts since they will transfer to another college and continue their education. (pp. 207-209)

Wilson and Levy (1978) reported that most studies of the attrition problem in nursing programs "have focused on academic ability, personality traits, demographic statistics . . . to predict student success or failure" (p. 437). Students were surveyed who had withdrawn from a baccalaureate nursing program at California State College. They found that each decision to withdraw was unique for the person involved. They recommended sound personal and career counseling before and during the program. A critical point to this recommendation was the counselor's ability to present the goals and content of the program clearly.

Schwirian and Gortner (1979) found that nursing schools, which were able to predict success, used some type of quantitative data. Two diploma schools studied used high school grades and ACT or Scholastic Aptitude Test (SAT) scores. Associate degree programs used high school grades as an initial screening device. Baccalaureate schools used high school records and college grades. Graduate Record Examination scores were used for those already possessing degrees in areas outside of nursing. Consistency of academic performance and evidence of improvement were important considerations in selecting students. Goal-clarifying preadmission counseling was re-

commended to reduce nonacademic attrition.

Moses (1976) found that GPA and ACT composite scores could be used as predictors of success in the first year of the associate degree nursing program at Grayson County College. Major reasons for dropping out of the nursing program were academic failure, lack of motivation and family responsibilities.

Morgan (1976) listed academic failure, imprecise career goals and marriage as the determinants which contributed most to attrition of females in both general and health related fields. Gragg and Stroud (1976) noted that a significant number of withdrawals could be attributed to financial difficulties, family problems or poor health.

French and Rezler (1976) reported a lower attrition rate, about 10 percent, in health professions programs in four-year schools than in general education programs. This lower rate was attributed partially to a large applicant pool. Academically weak students were screened out at an early stage.

Rzonca (1976) reported that students enrolled in four-year allied health programs usually have the following characteristics:

1. Rank in the upper quarter of their high school class

2. Have family members who are college graduates
3. Have well developed reading and mathematic skills
4. Have well developed conceptual and problem solving skills
5. Have completed basic skills and core requirements
6. Have experience to make a sound career choice
7. Are not employed as often as community college students

Ramist (1981) cautioned that:

A college cannot, and, for the benefit of its students, ought not try to hold on to every student who wishes to drop out or stop out. . . . Only by undertaking a higher social responsibility to help students enter the postsecondary course of study that would best meet their needs can the college help to reduce the personal, institutional, and social costs of an academic mismatch. (p. 1)

Ramist (1981) also maintained that students should receive accurate cost projections, student attrition rates, academic options and information about availability of jobs by career field before admission. He also stated that:

Interaction between faculty and students is one of the most important factors encouraging retention. It leads to academic and social integration in the college, and is related to higher grades, greater self-perceived intellectual growth, and higher self esteem. (p. 2)

Ahrendt (1975) reported that the attrition rate is

approximately 50 percent for students who enter college lacking the language and study skills necessary for success. Minority students also tend to be deficient in language skills. Remedial or developmental programs are available in many community colleges. Such programs are not usually integral parts of the total program.

Bamberg (1981) suggested that there will continue to be a need for increasing numbers of allied health professionals. He stated that:

As allied health education has changed from being predominantly apprentice oriented in service settings to being more academically oriented in institutions of higher education, there has come a rise in the level of cognitive performance expected of allied health students. . . . Increased provision of support services for disadvantaged students and increased exposure of students to minority allied health role models should serve to enhance the matriculation rate of such minority students into allied health programs. (pp. 259-260)

Roueché (1978) pointed out that most remedial courses are ineffective in meeting the learning needs of students who do not have the academic, study and personal skills to succeed. He said that 90 percent of students who enter community colleges have a deficiency in verbal skills. Students are often counseled into developmental courses while at the same time being enrolled in several college-level courses. "By the time the student has begun to improve his verbal skill, he already flunked his

regular courses because he couldn't handle the reading and writing assignments" (p. 29). "Students should not be allowed to enroll in any college course unless a determination has been made that the student possesses the prerequisites to succeed" (p. 30). It was found that

. . . entering students, to have a good chance of success, i.e., good persistence and high achievement, need to demonstrate the following criteria at entry: (a) reading skills at a 9th-10th grade level; (b) solid study skills; and (c) good motivation and belief that the student can succeed. (p. 30)

It was further suggested that assessment of the student's skills should begin at the time of entry and counseling procedures should assure that the student is enrolled in developmental programs if they are needed. Students who work 20 hours a week or more should be discouraged from enrolling in more than 12 hours of courses. Other circumstances, such as family responsibilities, also limit the chances of success for high-risk students enrolled full time. It was also noted that "few students finish programs in two years" (p. 31).

Murtha and Grimm (1979) of Harford Community College in Bel Air, Maryland describe "a successful developmental program specifically designed for academically 'high risk' students entering a two-year community college career program in allied health" (p. 232). An intensive

instructional program was offered to students who were academically deficient. The program lasted for three weeks and was followed by an "ongoing support system of tutoring, counseling and career development activities" (p. 232). Three years later, 15 of the original 18 "high risk" students were progressing satisfactorily. "This contrasts with the 70 to 80% attrition rate typical of 'high risk' students from traditional academic programs" (p. 236).

Youse and Clark (1977) conducted a study at the University of Delaware to obtain an idea of their students' knowledge of different aspects of medical technology. They determined that college students pursuing the preprofessional and professional courses had inadequate career knowledge. Knowledge of medical technology was generally nonexistent in high school students. The majority of students selected before the end of the sophomore year would probably not be aware of the major responsibilities of the profession. It was their opinion that this lack of knowledge contributes to a high attrition rate. Gleich (1978) found that high school counselors and teachers had little influence on the choice of medical technology as a career for 282 students enrolled in the Introduction to Medical Technology course at the University

of Iowa. Only 14 percent of the students indicated that they had heard about medical technology from high school counselors and/or career days. The decision to major in medical technology, however, was most often made during the junior or senior year of high school or the freshman or sophomore year of college. Factors influencing the choice of medical technology as a career for these students were salary, prestige, hours worked, type of work, demand for medical technologists and the desire to help people. Experience working in a hospital was a significant influence in making a career choice of medical technology. Hall, et al. (1979) recommended that:

Allied health administrators should establish links with local secondary school systems to inform students about allied health careers and requirements of educational programs and to encourage participation in work experiences in health settings during high school years. (p. 8)

Henry (1981) pointed out that the number of applicants for medical technology schools no longer exceeds the number of enrolled students. Two possible reasons were given for the decline in student numbers. A general decline of this age group may account for fewer students and this condition is "projected to continue throughout the decade" (p. 270). Students may be attracted to "shorter and less demanding curricula of other professions

which present-day students, out of economic necessity, may perceive as leading to faster entry into the job market" (p. 270). Henry (1981), the president of the American Society of Clinical Pathologists, made the following statement concerning the need for qualified laboratory workers. "We are only as good as the people with whom we surround ourselves, and our patients deserve the best we can offer" (p. 271).

Rifken, et al. (1981) pointed out that:

In recent years, a variety of public and professional concerns have occasioned increased demands for accountability in student admissions to allied health programs. In medical laboratory sciences education, these concerns are further complicated by factors such as high program costs, the need to maintain a viable employment market, and the fact that some programs continue to have many more qualified applicants than can be admitted. (p. 489)

Zufall (1974) reviewed research related to the selection of students into medical technology programs. It was found that:

Most Medical Technology educators presently do select students on the basis of GPA, personality, letters of reference, and college affiliations. However, most educators and coordinators are concerned about turning down a good potential medical technologist and would feel more comfortable in selection if there were a battery of proven selective tests to assist them. Until then, the GPA can be relied on as the most effective predictor of success. (p. 57)

Rifken, et al. (1981) reported that:

There has been minimal investigation into standardization of admissions processes for medical laboratory sciences or the broader field of the allied health professions. Criteria that predict student success are not agreed upon, particularly as regards non-academic applicant characteristics, although these are generally felt to be of significance in predicting both student success and subsequent professional success. (p. 489)

Rifken, et al. (1981) evaluated an admissions procedure used for the Department of Medical Laboratory Sciences at the University of Illinois at the Medical Center. They found that academic factors such as "pre-professional GPA or portions of it (e.g., science GPA or non-science GPA)" predict academic success (p. 490). Non-academic predictors such as knowledge of medical technology, career goals, problem solving skills, manual dexterity, balance of interests, relationships with others and overall impression given in the interview process predict clinical success. "Both types of variables are necessary for a total description of a student's capabilities as a practicing technologist" (p. 495).

Garza, Adams and Skinner (1976) surveyed 77 accredited programs of medical technology. Findings indicated the use of GPA, separate evaluation of science grades and the use of an admission committee, references and transcripts in selecting students. They found that in the

programs surveyed, an average of 82 students applied for each 15 available positions.

Crocker (1978) described a method for determining the validity of interview data. It was found that:

When interview data are used in making the selection decision, it is the responsibility of the interviewers to collect their data with as much effort and precision as are devoted to obtaining test scores and academic records for the applicants whose professional futures may hang in the balance. (p. 442)

Data from 112 medical technology graduates were studied at the School of Allied Health Sciences at The University of Texas Medical Branch in Galveston by Lanier and Lambert (1981).

The purpose of the present study was to examine the relative efficiency of several achievement and aptitude selection criteria in predicting academic performance in a university-based medical technology program. Three academic performance measures were examined. These measures were professional GPA, certification examination performance, and performance on a program comprehensive examination. This resulted in three research questions: 1) What is the relative contribution of the achievement and aptitude measures in predicting professional grade point average? 2) What is the relative contribution of the achievement and aptitude measures in predicting certification examination performance? 3) What is the relative contribution of the achievement and aptitude measures in predicting comprehensive examination performance? (pp. 315-316)

Entering achievement and aptitude selection criteria were overall GPA, science GPA, Otis Quick-Scoring Mental Ability Test (Lefever, 1959), Nelson-Denny Reading Test

(Forsyth, 1978) divided into subscores of vocabulary, comprehensive, combination (vocabulary and comprehensive) and reading rate. They found that the most efficient single predictor for professional GPA was the science GPA. The most efficient combined predictors for professional GPA were the science GPA and the Nelson-Denny combination subscore. The most efficient single predictor for certification examination performance was the Otis Mental Ability Test score. This test score and the science GPA were the most efficient combined predictors. These two scores were also the most efficient combined predictors for the program prepared comprehensive examination performance while the science GPA was the most efficient single predictor. They concluded that "academic performance can be predicted by including an achievement measure and an aptitude measure in an admission battery" (pp. 318-319).

Schimpfhauser and Broski (1976) conducted a study at the Ohio State University School of Allied Medical Professions to examine relative strengths and predictive relationships between the five ACT subscores, preprofessional GPA and the subscores of the Allied Health Professions Admission Test and first year academic success in allied health curricula.

The Allied Health Professions Admissions Test

(AHPAT) was developed by the Psychological Corporation for the Ohio State University School of Allied Medical Professions and administered for the first time in September 1973.

The experimental AHPAT measured applicants' abilities in five major areas. These were: verbal ability, quantitative ability, chemistry, biology, and reading comprehension. Efforts are being made by the Psychological Corporation to develop norms for several health areas including: Circulation Technology, Medical Communications, Medical Dietetics, Medical Illustration, Medical Records Administration, Medical Technology, Occupational Therapy, Physical Therapy, Radiologic Technology and Respiratory Therapy. (Schimpfhauser and Broski, 1976, p. 37)

Schimpfhauser and Broski (1976) studied four student subgroups. These were (1) total allied health admissions for all programs, (2) occupational therapy admissions alone, (3) physical therapy admissions alone and (4) other smaller divisions combined. Students were further divided into subgroups based on the availability of ACT test scores. The investigators used this design due to the significant number of entrants who did not have ACT scores available. They felt that:

In general, more strength might be given to those prediction equations which include ACT scores as potential predictors, for at least three reasons: (1) the test has a substantial track record as an indicator of performance potential; (2) it can be used as a comparative measure when included with other predictors; and (3) usually, the more measures included in equation derivation, the more precise the prediction results. (p. 37)

The following observations were made:

1. Selection procedures that are efficient and hold up under replication are difficult to achieve. . . .
2. It would seem that academic predictions should be approached from a "division specific" standpoint. . . .
3. The multiple correlations . . . outweigh single predictors in terms of strength and practicality.
4. Preprofessional grades generally serve as the strongest predictor variable with respect to the criterion, first year Allied Health grades . . . traditionally, the best indicator of future success is past success. . . .
5. . . . both preprofessional grades and ACT scores when available generally contribute more to predicting the criterion than do AHPAT scores. . . .
6. The AHPAT subtest that appears as a significant predictor most frequently is biology. . . .
7. When ACT scores are not available, AHPAT scores replace them as significant predictors. . . .
8. While a higher degree of confidence would normally be placed in those prediction equations in which ACT scores were considered . . . equations without ACT scores also performed favorably.
9. Perhaps the most critical aspect to consider in the analysis of these results is that the AHPAT is still in its developmental stage. (pp. 44-45)

Leiken and Cunningham (1980) of the State University of New York developed "multiple regression models to analyze the usefulness of AHPAT as a predictor of success in allied health programs" (p. 132). They concluded that:

It is evident that AHPAT is significantly correlated with allied health grade point average and that it improves predictions of GPA when used in an equation along with prior GPA and type of school. . . .

Since neither ACT scores nor SAT scores . . . are uniformly available for applying students, AHPAT, can serve acceptably as such a uniform test for allied health students.

One must note, however, that at best the predictive value of any set of those explanatory variables is modest, and admissions committees need to take into consideration other factors such as interviews and recommendations in making evaluations of applicants. (p. 138)

A study was conducted by Johnson, Arbes and Thompson (1974) to ascertain the need for selections procedures, to determine what technics were being used, and to identify those basic professional occupational therapy programs that were conducting research. They determined that most of the programs surveyed limited their enrollment due to limited space, faculty and clinical resources. Students with the highest qualifications usually were accepted. Thirty-seven of 39 schools surveyed used one or more of the following methods for selecting students.

1. Interview
2. College grades
3. Aptitude or achievement test scores
4. Letters of recommendation
5. Application letter or essay
6. Personality or interest inventory
7. High school grades
8. Biographical questionnaire
9. Lottery

A variety of selection variables to be considered were listed by Johnson, Arbes and Thompson (1974).

1. Cognitive variables--GPA, aptitude and achievement test scores
2. Affective variables-- Personality and interest measures

### 3. Past experience--Relevant job experience and extra-curricular activities

Lucci and Brockway (1980) reported on a follow-up study conducted to evaluate a selection method for students of an occupational therapy curriculum. Data indicated no significant differences between groups in the upper and lower halves of the class with respect to grades in the program or on certification examination scores.

French and Rezler (1976) reported that in nursing, theory grades can be predicted by prenursing college GPA, high school GPA and the Otis Test of Mental Ability. They concluded that clinical performance cannot be predicted by the same tests. Following a study in Canada, Weinstein, Brown and Wahlstrom (1979) stated that ". . . all demographic variables were found conclusively lacking in significance for predictive purposes" (p. 40).

A study of admission criteria for the Intercollegiate Center, Spokane, Washington revealed that the GPA for all courses taken before admission and for prerequisite nursing courses ". . . correlate at the 0.001 level of significance with all of the measurements of academic performance" (Stronck, 1979, p. 605). It was also found that the GPA for the prerequisite courses was a better indicator than the cumulative GPA for all courses. Subscores

assigned to interviews had significantly negative correlation with academic performance. Letters of recommendation were of no help in predicting performance. This author observed that ". . . admissions policies are unfair if they assume that a grade of A from one college equals a grade of A from another college" (p. 607).

Rzonca (1976) recommended the use of tests measuring general intelligence and aptitude, such as those developed by the Educational Testing Service (ETS) and the ACT, for identification of strengths and weaknesses of individuals in areas of reading skills, comprehension and mathematical ability. These tests could be utilized to identify the need for developmental or enrichment programs, rather than to screen students out of health occupations programs. It was suggested that interviews be used to help determine if the applicant has knowledge of the specific health field and to provide the individual with an insight into the profession as well as the academic program.

Hills (1978) found that the quality of the ACT test is good and improving.

The tests yield five scores: English usage, mathematics usage, social studies reading, and natural sciences reading, and a composite score computed as the mean of the subscores. . . .  
The scores are not measures of single functions, such as reasoning or verbal comprehension. They are deliberately conglomerates. . . .  
. . . the score based on all four scores has an esti-

mated reliability of about .90. . . .  
 . . . there seems to be a lot of overlap among the four tests. Intercorrelations confirm this, being approximately .55 to .75, with the highest correlation typically between social studies reading and natural sciences reading. The heavy emphasis on reading produces a high correlation between tests of what otherwise would be quite different kinds of subject matter. The cross-validated multiple correlations of ACT scores with college grade averages can be represented by a value in the low .40s, ranging from .20 to .56. The typical correlation between ACT scores and college grades in the appropriate subject would be about .4. Adding ACT scores to high school grade averages increases the multiple correlation. (pp. 622-623)

Morgan (1976) stated:

In general, high school and undergraduate grade point averages predict fairly well the student's academic achievement, but virtually no measures have been effective in predicting clinical performance. (p. 81)

The author also stated, "A realistic desire to enter a field is probably the best selection criterion" (p. 83). "Realistic" was defined as academic ability as well as ability to perform in the clinical setting.

From a review of a wide spectrum of studies, Ammons and Hartley (1976) suggested that a certain level of academic skill is necessary for success in the didactic portion of any allied health associate degree program. It is not easy to predict the success rate of persons who score above the critical level. Those falling below that level usually fail to complete the program.

Rzonca (1976) stated that the allied health pro-

grams of most open-door community colleges are selective to some degree. Standardized test scores, grade point averages or interviews serve to identify deficiencies. Students with deficiencies are required to enroll in developmental programs or take general education courses of the curriculum. The author reported that attrition rates vary from 25 to 50 percent in most community college programs.

A cursory evaluation of entry-level student characteristics indicates that general intelligence and previous class standing have little to do with which students leave a program; i.e., when a range of students are admitted, a range of students drop out. (p. 17)

Amarillo College (1980) has a open-door policy for general admission but the Associate Degree Medical Laboratory Technology program has admission selection criteria. A student must qualify for admission to the college, make application to the MLT program and have a personal interview. High school records are evaluated. The ACT or SAT examination is not required. The student is admitted on the basis of academic performance and expressed interest in MLT.

Amarillo College and the Medical Laboratory Technology program believe that every student has the right to not fail but succeed in a chosen area. This is accomplished by counseling and closely working with the student. (p. 45)

This program usually has between 30-35 applicants. The

freshman class has 20 students. The attrition rate is approximately 40 percent. Major causes of attrition are financial, marriage, relocation and health problems. Only 1-3 percent of the attrition is due to failure or lack of interest in the MLT field.

The Medical Laboratory Technology program at Austin Community College has the following admissions procedure. The applicant takes the Psychological Services Bureau Health Occupations Aptitude Examination as a pre-entrance test. The applicant also completes an application to the program, a legal form and an opinion survey. Those who pass the pre-entrance examination are assigned an interview time and are asked to have transcripts sent. References are also required. As the information is collected for each applicant, scores are assigned. The applicants are ranked in order of their total scores and are accepted into the program accordingly. Students who have been accepted must have physical forms completed and returned to the school before the third day of class. (Sanders, 1981)

Rzonca (1976) stated that:

If allied health educators truly embrace the systems approach, their only justification for a selection procedure must be either a lack of program resources or the assumption that certain people will be unable to perform certain functions at the level of quality necessary to serve the needs of the public. (pp. 17-18)

Harris and Grede (1977) found that:

Most allied health careers (especially in nursing, and in the medical laboratory-technologies, the electronics-related medical technologies, and the dental fields) require extremely competent and well-prepared workers. The educational programs for these careers must be characterized by high standards of performance. Many such programs have a relatively rigorous science and mathematics content, and all require good reading skills and dedication to academic achievement. Colleges that have attempted to operate these programs on an open-door basis have experienced alarming attrition rates during the instructional program or untenably high failure rates on state licensing board examinations on completion of the program--usually both. (pp. 192-193)

They considered it an ill-advised policy to "admit students on a first-come-first-served basis up to the limits set by the resources for the program, regardless of the student's preparation or demonstrated interest" (p. 193). Such a policy fails to consider equity to society, both future patients and those who support the schools financially. Qualified students do not receive full benefit from classes which have ill-prepared students. They further observed that

. . . in view of the need for properly certified allied health workers, programs with built-in high attrition rates are not defensible, since they yield relatively few graduates. . . . if the program is "adjusted" to the students' abilities all the way through in order to eliminate attrition in the program, then the state or association that certifies examinations will later eliminate the candidate from career practice. . . . Open-door colleges, in other words, need not--and should not--operate all their programs as open-door curriculums. . . .

The safety, health, or even the life of a patient may depend on how effectively a health paraprofessional performs on the very first day of "regular" employment. (pp. 193-194)

Roueché (1978) felt that colleges should have a success-oriented philosophy and "do everything possible to keep students from enrolling in programs and courses where they have no chance for success" (p. 30).

Monroe (1975) concluded that:

Although excessive rates of failure or withdrawal are to be deplored and should be corrected in all possible ways, a realistic appraisal of what some students bring to a college in the way of interests and abilities warrants the conclusion that if they drop out of college prematurely, both the institution and the student may have profited. The problem is to distinguish between those students who ought to be saved at all costs and those students for whom college is not the right place to find personal improvement and happiness. (p. 215)

### Summary

A review of the available literature revealed the following information concerning community college students and health occupations students.

1. Attrition rates are high in community colleges and health occupations programs which operate with an open-door policy
2. Most health occupations programs in open-door community colleges have some type of admission criteria

3. Students with weak academic skills have little chance of succeeding in the rigorous health occupations programs
4. Numerous studies to determine predictors of success have been carried out for various health occupations programs
5. There have been a minimal number of studies of attrition rates, student selection and prediction of success using MLT-AD students as subjects

## CHAPTER III

### METHODOLOGY

#### Setting

Grayson County College is a two year community college located in north central Texas midway between Sherman and Denison. The school offers a broad scope of both academic and vocational programs--one of which is the Medical Laboratory Technology Associate Degree (MLT-AD) program. Upon completion of the two year MLT-AD program, the student receives an Associate Degree in Applied Science. The graduate is then eligible to write the Medical Laboratory Technician certification examination for the Board of Registry of the American Society of Clinical Pathologists (ASCP).

#### Subjects

All students who enrolled in the MLT-AD program at Grayson County College between 1972 and 1978 were included in the study. The students were divided into two groups; those who completed the program with a GPA of 2.0 or above and passed the ASCP certification examination on the first attempt and those who did not complete the program or did not pass the ASCP certification examination on the first

attempt. Individual student's names were not used in the report. To assure anonymity, a letter and number code was used. Each year from 1972 to 1978 was assigned a letter; G, R, A, Y, S, O and N respectively. The student's alphabetical position on the official freshman fall class roll determined the number to be used in the code. For example, if a student, B. Aaron, was enrolled in 1975, the code was Y-01.

### Data Collection

Permission was obtained to collect data from records at Grayson County College in order to study entering characteristics of MLT-AD students. The permission form may be found in the appendix. Collection of data was begun after approval of the proposal by the thesis committee. Data were collected in the following manner for compatibility with computer programming. High school and college transcripts were examined to determine previous academic achievement. Demographic information was obtained from applications for admission to the college and from applications for admission to the MLT-AD program. MLT grades and scores from the ASCP certification examination were used to classify successful and failing students. The following entering characteristics were recorded.

1. The high school grade point average (GPA)
2. The number of academic quarters of high school biology, chemistry and algebra courses completed was recorded separately and combined. Three academic quarters were recorded for each two semesters or for one credit
3. The American College Testing Program (ACT) subscores and the ACT composite score
4. The GPA for college courses completed before the semester in which the student enrolled in MLT course work
5. The GPA for anatomy and physiology, microbiology, chemistry and college algebra completed before the semester in which the student enrolled in MLT course work was recorded separately and as a composite score
6. The number of college hours completed before the semester in which the student enrolled in MLT course work
7. Previous work experience was recorded as (0) no experience, (1) on-the-job-training or (2) Health Occupations Education class in high school
8. The age on August 25 of the year that the MLT

course work was begun was calculated and recorded

9. The sex of each student was recorded as (1) male or (2) female
10. Marital status was recorded as (1) married, (2) never married, (3) divorced or (4) widowed
11. Race (self-declared) was recorded as (1) white (Caucasian), (2) black (Negro), (3) American Indian, (4) Asian or (5) other

If information was not available for any characteristic, a value of minus nine (-9) was entered for that item.

#### Procedures for Analysis of Data

The following methods were used for analysis of the data collected for this study. Hypotheses 1, 2, 3, 4, 5, 6 and 8 were tested by using the t-test. Hypothesis 8 was also tested by correlating age with success using a point-biserial correlation analysis (Hopkins and Glass, 1978). Hypotheses 7, 9, 10 and 11 were tested by using cross tabulation of the characteristic with success or failure and by calculating the chi-square. Hypothesis 12 was tested by a multiple step-wise regression analysis to derive an equation for the prediction of success. The level of statistical significance for all analyses was 0.05. The t-value of the pooled variance estimate was used.

## CHAPTER IV

### FINDINGS

A computer assisted analysis of the data collected was conducted. The Statistical Package for the Social Sciences (SPSS) was used (Moore, 1978; Berenson and Levine, 1979; Hamburg, 1979). The findings are presented below.

#### General Entering Characteristics

A total of 137 students enrolled in the MLT-AD program at Grayson County College between 1972 and 1978 were included in the study. The mean class size was 19.57. The largest class of 26 students was admitted in 1974. The 1977 class was the smallest with 15 students.

The self-declared race of 131 of the students was white. There were only four black students enrolled during the period of time which the study covers. One student listed himself as Hispanic. There were 94 female students and 43 male students enrolled. The mean age was 23.54 years. Ages ranged from 17 to 50 with the mode (34 students) being 18 years. Marital status was reported as 52 married, 73 never married, 9 divorced and 2 widowed. A total of 19 students had previous work experience in a clinical laboratory. Twelve students had on-the-job-training and seven were enrolled in Health Occupations

Education (HOE) in high school.

One hundred twenty-five of the students were high school graduates. Nine students had completed the General Education Development (GED) examination. Two students were admitted to the college by individual approval of the dean. A total of 97 subjects had previous college credit before entering the MLT-AD program. Six subjects had earned associate degrees, 4 had baccalaureate degrees and 1 had a master's degree.

#### General Exiting Characteristics

The MLT-AD program was completed by 53 students. Sixty-one students withdrew from the program and 23 failed to meet MLT course requirements. The overall mean GPA for MLT courses was 2.47 with a standard deviation (S.D.) of 1.19. The mean for the successful students was 3.41 with a S.D. of 0.51. The failing group mean was 1.85 with a S.D. of 1.10.

The American Society of Clinical Pathologists (ASCP) certification examination was passed upon the first attempt by 44 graduates. This figure represents an 83 percent success rate for those who completed the MLT-AD program. The examination was failed upon the first attempt by seven graduates. Two subjects passed the examination upon a later attempt. Two graduates have never taken the

examination.

Students were divided into two groups for the purpose of testing the null hypotheses. Group I was made up of 93 students (67.9 percent). These students withdrew or failed to complete the MLT-AD program with a 2.0 GPA or failed to pass the ASCP certification examination upon the first attempt. Success as defined for this study was achieved by 44 students (32.1 percent). Successful students were designated as Group II.

Entering Characteristics Derived  
From High School Records

A t-test of the mean high school GPA (HSGPA) for each of the two groups showed a t-value of -4.54 with a two-tail probability of 0 using the pooled variance estimate. The mean HSGPA for Group I was 2.68. Group II had a mean HSGPA of 3.24. These means were significantly different.

The data available showed that 101 students had some biology, chemistry or algebra in high school. The means of the number of academic quarters of high school biology (HSBIO), high school chemistry (HSCHEM) and high school algebra (HSALG) and the total number of academic quarters of high school science (HSSCI) for each of the groups were compared by the t-test. Group I had a HSBIO mean of 2.77 and the HSBIO mean for Group II was 3.49.

The  $t$ -test for HSBIO showed a probability of 0.005 with a  $t$ -value of -2.76. The HSBIO means of the two groups were significantly different. The means for HSCHEM, HSALG and HSSCI also were significantly different for the two groups when all students were included. Group I had a HSCHEM mean of 1.00 and the mean for Group II was 2.11. The  $t$ -value was -3.82 with a probability of 0. The HSALG mean for Group I was 3.36 and 4.97 for Group II. The  $t$ -value for HSALG was -3.37 with a probability of 0. The  $t$ -value for the comparison of the HSSCI means was -5.02 with a probability of 0. The mean for Group I was 7.38 and the mean for Group II was 10.57. Refer to table 1 for a summary of entering characteristics derived from high school records.

TABLE 1

t-TEST COMPARISON OF ENTERING CHARACTERISTICS  
 DERIVED FROM HIGH SCHOOL RECORDS  
 (ALL STUDENTS)

Variable	Group	<u>n</u>	Mean	Standard Deviation	<u>t</u> -Value	2-Tail Probability	
HSGPA	I	64	2.68	0.60	-4.54	0	*
	II	33	3.24	0.55			
HSBIO	I	66	2.77	1.10	-2.76	0.005	*
	II	37	3.49	1.50			
HSCHEM	I	66	1.00	1.43	-3.82	0	*
	II	37	2.11	1.39			
HSALG	I	66	3.36	1.79	-3.37	0	*
	II	37	4.97	1.74			
HSSCI	I	66	7.38	3.47	-5.02	0	*
	II	37	10.57	3.33			

\*  $p \leq 0.05$ . NOTE: Acronym meanings are found on pages 43-44.

The t-test was also performed to compare the means in each group for only those students who had taken biology, chemistry or algebra in high school. These statistics showed that all students who took chemistry in high school had the same number of academic quarters. Both groups showed a mean of 3.00. The t-value was 0 with a probability of 1.00 or no significant difference. There were significant differences in the means of the other variables. See table 2 for these results.

TABLE 2

t-TEST COMPARISON OF ENTERING CHARACTERISTICS  
DERIVED FROM HIGH SCHOOL RECORDS  
(STUDENTS WITH SCIENCE CREDITS)

Variable	Group	<u>n</u>	Mean	Standard Deviation	<u>t</u> -Value	2-Tail Probability
HSBIO	I	59	3.10	0.55	-2.37	0.020 *
	II	36	3.58	1.40		
HSCHEM	I	22	3.00	0	0	1.000
	II	26	3.00	0		
HSALG	I	58	3.83	1.38	-4.95	0 *
	II	35	5.26	1.29		
HSSCI	I	64	7.36	2.71	-5.27	0 *
	II	37	10.57	3.33		

\*  $p \leq 0.05$ . NOTE: Acronym meanings are found on pages 43-44.

### ACT Scores

ACT subscores were available for 84 students and the composite score was available for 85 students. Differences between the means of the four ACT subscores and the ACT composite scores of the two groups were compared using the t-test. Means for the ACT English subscore (ACTENG) were 16.10 for Group I and 18.16 for Group II. The t-value was -2.11 with a probability of 0.038. The ACT mathematics (ACTMATH) mean for Group I was 13.21. The mean for Group II was 17.31. The probability was 0.001 with a t-value of -3.35. The t-value for the comparison of the ACT social sciences subscore (ACTSOC) means was -2.69 with a probability of 0.009. The means were 15.42 for Group I and 19.09 for Group II. The mean for the ACT natural sciences subscore (ACTNAT) for Group I was 19.62 and the mean for Group II was 21.91. The t-value was -1.83 with a probability of 0.070. The ACT composite score (ACTCOM) mean for Group I was 16.17. The mean for Group II was 19.45. The probability was 0.001 and the t-value was -3.48. The ACTNAT subscore means were not significantly different. All of the other ACT subscores and the ACT composite score showed probabilities of less than 0.05. A summary of the t-test results are shown in table 3.

TABLE 3

t-TEST COMPARISON OF MEANS OF ACT SCORES

Variable	Group	<u>n</u>	Mean	Standard Deviation	<u>t</u> -Value	2-Tail Probability
ACTENG	I	52	16.10	4.20	-2.11	0.038 *
	II	32	18.16	4.59		
ACTMATH	I	52	13.21	5.79	-3.35	0.001 *
	II	32	17.31	4.84		
ACTSOC	I	52	15.42	6.62	-2.69	0.009 *
	II	32	19.09	5.06		
ACTNAT	I	52	19.62	5.58	-1.83	0.070
	II	32	21.91	5.52		
ACTCOM	I	52	16.17	4.45	-3.48	0.001 *
	II	33	19.45	3.87		

\*  $p \leq 0.05$ . NOTE: Acronym meanings are found on page 47.

Previous College Experience

The means of the total college GPA (TOTGPA), the GPA for anatomy and physiology (GPAAP), the GPA for microbiology (GPAMICR), the GPA for chemistry (GPACCHEM), the GPA for college algebra (GPACALG) and the composite GPA for these college science courses (TOTGPASC) for those students who had received college credit prior to beginning MLT

course work were compared for the two groups. The means of the previous college hours (PREVHRS) earned were also compared. The t-test was used to test the null hypotheses concerning these characteristics. The mean of the TOTGPA for Group I was 2.24 and 3.00 for Group II. The t-value was -4.37 with a probability of 0. Group I had a GPAAP mean of 2.36. The GPAAP mean for Group II was 3.09. The t-value was -3.06 with a probability of 0.005. The GPAMICR mean was 2.63 for Group I and 3.42 for Group II. The probability was 0.118 with a t-value of -1.68. The t-value for the GPACCHEM mean comparison was -2.73 with a probability of 0.010. Group I had a mean of 2.00 and Group II had a mean of 2.82. The t-value for GPACALG was -1.74 with a probability of 0.090. Group I had a mean of 2.76. The mean for Group II was 3.26. The TOTGPASC mean for Group I was 2.30. Group II TOTGPASC mean was 3.20. The t-value was -4.26 with a probability of 0. The t-value for PREVHRS was -1.76 with a probability of 0.082. Group I had a mean of 30.31 and the mean for Group II was 44.12. The means of Group I and Group II were not significantly different for GPAMICR, GPACALG or PREVHRS. The results of the t-tests are summarized in table 4.

TABLE 4

t-TEST COMPARISON OF PREVIOUS COLLEGE EXPERIENCE

Variable	Group	<u>n</u>	Mean	Standard Deviation	t- Value	2-Tail Probability
GPAAP	I	21	2.36	0.76	-3.06	0.005 *
	II	11	3.09	0.30		
GPAMICR	I	8	2.63	0.92	-1.68	0.118
	II	6	3.42	0.80		
GPACCHEM	I	21	2.00	0.94	-2.73	0.010 *
	II	14	2.82	0.77		
GPACALG	I	19	2.76	0.82	-1.74	0.090
	II	17	3.26	0.90		
TOTGPASC	I	35	2.30	0.88	-4.26	0 *
	II	23	3.20	0.61		
PREVHRS	I	64	30.31	23.31	-1.76	0.082
	II	33	44.12	43.96		
TOTGPA	I	62	2.24	0.89	-4.37	0 *
	II	33	3.00	0.61		

\*  $p \leq 0.05$ . NOTE: Acronym meanings are found on pages 48-49.

### Demographic Characteristics

The null hypotheses concerning previous work experience, sex, marital status and race were tested by using cross tabulation of each characteristic with success or failure and by calculating the chi-square.

#### Previous Work Experience

It was found that 82 students (90.1 percent) in Group I and 34 students (77.3 percent) in Group II had no previous work experience in a clinical laboratory. Six students in each group had on-the-job-training. Three students (3.3 percent) in Group I and 4 students (9.1 percent) in Group II had Health Occupations Education (HOE) classes in high school. The chi-square value was 4.14 with a significance of 0.126. See table 5 for results of the cross tabulation and chi-square analysis which indicated no significant difference between Group I and Group II with regard to previous work experience.

TABLE 5

CROSS TABULATION AND CHI-SQUARE ANALYSIS  
OF PREVIOUS WORK EXPERIENCE WITH  
SUCCESS OR FAILURE

Work Experience	Failure (Group I)	Success (Group II)	Total (Row)
No Experience			
Row	82 f 70.7%	34 f 29.3%	116 f 85.9%
Column	90.1%	77.3%	
Total	60.7%	25.2%	
On-the-Job- Training			
Row	6 f 50.0%	6 f 50.0%	12 f 8.9%
Column	6.6%	13.6%	
Total	4.4%	4.4%	
Health Occupations Education			
Row	3 f 42.9%	4 f 57.1%	7 f 5.2%
Column	3.3%	9.1%	
Total	2.2%	3.0%	
Total (Column)	91 f 67.4%	44 f 32.6%	135 f 100.0%

Chi-Square = 4.14

Significance = 0.126

KEY: f = Frequency

% = Percentage



### Sex

A cross tabulation and chi-square analysis of sex with success or failure showed no significant difference between the two groups. Male students accounted for 31 of the 93 failing students (33.3 percent). There were 12 male students (27.3 percent) of the successful students. There were 62 female students (66.7 percent) in Group I and 32 female students (72.7 percent) in Group II. The total enrollment was made up of 43 male (31.4 percent) and 94 female (68.6 percent) students. The corrected chi-square was 0.27 with a significance of 0.605. See table 7 for results of the cross tabulation and chi-square results.

TABLE 7

CROSS TABULATION AND CHI-SQUARE ANALYSIS  
OF SEX WITH SUCCESS OR FAILURE

Sex	Failure (Group I)	Success (Group II)	Total (Row)
Male			
Row	31 f 72.1%	12 f 27.9%	43 f 31.4%
Column	33.3%	27.3%	
Total	22.6%	8.8%	
Female			
Row	62 f 66.0%	32 f 34.0%	94 f 68.6%
Column	66.7%	72.7%	
Total	45.3%	23.4%	
Total (Column)	93 f 67.9%	44 f 32.1%	137 f 100.0%

Chi-Square = 0.27

Significance = 0.605

KEY: f = Frequency  
% = Percentage

### Marital Status

A comparison of the marital status of the two groups made using cross tabulation and chi-square analysis showed no significant difference. Married students made up 35.9 percent of the unsuccessful group and 43.2 percent of the successful group. Students classified as "never married" made up 55.4 percent of Group I and 50.0 percent of Group II. Divorced students composed 6.5 percent and 6.8 percent of Group I and Group II respectively. Only two students were widowed. These made up 2.2 percent of Group I. The chi-square value was 1.54 with a significance of 0.673. See table 8 for a summary of the results.

TABLE 8

CROSS TABULATION AND CHI-SQUARE ANALYSIS  
OF MARITAL STATUS WITH  
SUCCESS OR FAILURE

Marital Status	Failure (Group I)	Success (Group II)	Total (Row)
Married			
Row	33 f 63.5%	19 f 36.5%	52 f 38.2%
Column	35.9%	43.2%	
Total	24.3%	14.0%	
Never Married			
Row	51 f 69.9%	22 f 30.1%	73 f 53.7%
Column	55.4%	50.0%	
Total	37.5%	16.2%	
Divorced			
Row	6 f 66.7%	3 f 33.3%	9 f 6.6%
Column	6.5%	6.8%	
Total	4.4%	2.2%	
Widowed			
Row	2 f 100.0%	0 f 0 %	2 f 1.5%
Column	2.2%	0 %	
Total	1.5%	0 %	
Total (Column)	92 f 67.6%	44 f 32.4%	136 f 100.0%

Chi-Square = 1.54. Significance = 0.673.  
KEY: f = Frequency. % = Percentage.

### Race

It was found that 95.7 percent of Group I and 97.7 percent of Group II listed themselves as white or Caucasian on the application forms. Only four students (4.3 percent) of Group I were listed as black or Negro. This number made up 2.9 percent of the total enrollment. There were no black students in Group II. One student in Group II was listed as Hispanic. The chi-square analysis had a significance of 0.1342 with a chi-square value of 4.01 indicating no significant difference between the two groups. See table 9 for a summary of the results.

TABLE 9

CROSS TABULATION AND CHI-SQUARE ANALYSIS  
OF RACE WITH SUCCESS OR FAILURE

Race		Failure (Group I)	Success (Group II)	Total (Row)
White		88 f	43 f	131 f
	Row	67.2%	32.8%	96.3%
	Column	95.7%	97.7%	
	Total	64.7%	31.6%	
Black		4 f	0 f	4 f
	Row	100.0%	0 %	2.9%
	Column	4.3%	0 %	
	Total	2.9%	0 %	
Other		0 f	1 f	1 f
	Row	0 %	100.0%	0.7%
	Column	0 %	2.3%	
	Total	0 %	0.7%	
Total (Column)		92 f 67.6%	44 f 32.4%	136 f 100.0%

Chi-Square = 4.01  
Significance = 0.1342  
KEY: f = Frequency  
% = Percentage

### Multiple Regression Analysis

A multiple step-wise regression analysis using entering characteristics as independent variables and success as the dependent variable was conducted. The total GPA for college science (TOTGPASC), the number of academic quarters of high school science (HSSCI), the student being married (MDUM1) and the high school GPA (HSGPA) were the only independent variables which exerted any influence on the dependent variable. None of the F-ratios computed in each step of the regression analysis exceeded the critical F for the degrees of freedom involved. The significance of these characteristics as predictors of success was not proven. See table 10 for a summary of the regression analysis results.

TABLE 10

SUMMARY OF RESULTS OF MULTIPLE  
STEP-WISE REGRESSION ANALYSIS

Independent Variable	Dependent Variable: Success			
	Multiple <u>R</u>	Simple <u>R</u>	<u>B</u>	<u>F</u> -Ratio
TOTGPASC	0.49430	0.49430	0.1644917D+00	0.126 (1.293)*
HSSCI	0.57246	0.46782	0.4486605D-01	0.111 (0.731)*
MDUM1	0.60980	0.07407	0.2119843D+00	0.073 (0.395)*
HSGPA	0.62736	0.42200	0.1279992D+00	0.036 (0.162)*
Constant			-0.9475413D+00	

\* F-ratio for the equation in which this variable was added.

NOTE: Acronym meanings are found on page 60.

### Summary

All entering characteristics derived from high school records were significantly different for the two groups. The successful students (Group II) had the higher mean for each characteristic.

The natural sciences ACT subscore means were not significantly different between Group I and Group II. The other three ACT subscores and the ACT composite score were significantly different. All means were higher for Group II.

The means of Group I and Group II were not significantly different for the GPA for microbiology, the GPA for college algebra or for the number of college hours completed before MLT course work was begun. There were significant differences in the means of the GPA for anatomy and physiology, the GPA for college chemistry, the composite GPA for college science courses and the total GPA for all college courses completed prior to starting MLT course work. Group II had the higher mean in each case.

There was no significant difference between the two groups for any of the demographic characteristics tested. Group I had the higher mean for age.

The total GPA for college science, the number of academic quarters of high school science, the high school

GPA and being married were the characteristics which showed the most influence on success. None of these characteristics had a level of significance which would establish them as predictors of success.

The typical successful MLT-AD student in this study could be characterized as being a 23 year old white female. She could have been single or married and had no previous work experience in a clinical laboratory. Her high school GPA was 3.24 and she had taken 3 academic quarters of biology, 3 academic quarters of chemistry and 6 academic quarters of algebra. Her ACT scores were as follows: English--18/33, mathematics--17/36, social sciences--19/34, natural sciences--22/35, composite score--19/35. She had earned some college credit before beginning MLT course work. She had completed college algebra and may or may not have taken anatomy and physiology, microbiology or chemistry. Her total GPA for all previous college work was 3.0 on a 4.0 scale. The total GPA for college science courses completed was 3.20. The final MLT GPA was 3.26.

## CHAPTER V

### SUMMARY, CONCLUSIONS, DISCUSSION AND RECOMMENDATIONS

Attrition rates are high in most MLT-AD programs existing in open-door community colleges. Even though there is a continued need for medical laboratory technicians, the cost of preparing these workers is high and class size is limited by resources and clinical space. Rigorous academic standards put success out of the reach of students with limited abilities. Educators feel a responsibility to those students who enter MLT-AD programs as well as to the public and the profession. These educators are seeking guidelines which will enable them to admit students who have the potential to graduate and become productive medical laboratory technicians.

There have been numerous studies of attrition rates, selection procedures and prediction of success for community college students. Similar studies have been carried out for baccalaureate degree health occupations programs. There also have been several such studies using students of associate degree nursing programs. Research has been limited with MLT-AD students as subjects.

### Summary of the Study

The present study was an attempt to determine the relationship between characteristics present at entry and the success or failure of students enrolled in the MLT-AD program at Grayson County College. The study included 137 students.

The subjects were divided into two groups. Group I included those students who withdrew or failed to complete the MLT-AD program with a 2.0 GPA or failed to pass the ASCP certification examination upon the first attempt. Those students who completed the program with a 2.0 GPA or better and passed the ASCP certification examination upon the first attempt were designated as Group II.

Entering characteristics were identified from high school transcripts, ACT scores, college transcripts, applications to the college and applications to the MLT-AD program. MLT grades and the score on the ASCP certification examination were used for determining each student's group.

A review of the available literature, found in chapter II, indicated several predictors of academic success. High school GPA, ACT scores and preprofessional college GPA (particularly the science GPA) were the predictors most often mentioned.

The methodology used in the present study is found in detail in chapter III. Data collected were analyzed by

using the t-test, point-biserial correlation analysis (Pearson product-moment correlation coefficient), cross tabulation, chi-square and multiple regression analyses.

The findings were put into tabular form, interpreted and presented. To determine if the null hypotheses could be accepted or rejected at the 0.05 level of confidence, the investigator used the critical values for the t-test, chi-square test, r and F-ratios found in Hopkins and Glass (1978).

#### Summary of the Findings

A t-test comparison of the means of the high school GPA for each group showed a significant difference. The successful group, Group II, had the higher mean. The means of the number of academic quarters of biology, chemistry and algebra and the means for the total number of academic quarters of high school science for the two groups were also significantly different when compared with the t-test. Group II had the higher mean in each situation.

Differences between the means of the four ACT subscores and the ACT composite scores of the two groups were compared using the t-test. The ACT natural sciences subscore means of the two groups showed no significant difference. The English, mathematics and social sciences subscore means and the composite score means did differ

significantly. The mean was higher for Group II in each case.

The means of the total college GPA, the GPA for anatomy and physiology, the GPA for microbiology, the GPA for chemistry, the GPA for college algebra and the composite GPA for these college science courses for those students who had received college credit prior to beginning MLT course work were compared for the two groups using the t-test. The means for previous college hours earned were also compared. The means of Group I and Group II were not significantly different for the GPA for microbiology, the GPA for college algebra or for previous college hours earned. The means of the total college GPA, the GPA for anatomy and physiology, the GPA for chemistry and the composite GPA for college science courses were significantly different for the two groups. Group II had the higher mean for each characteristic tested.

Previous work experience of the two groups was examined by cross tabulation and chi-square analysis. No significant difference in the two groups was indicated.

The mean ages of the two groups were compared by the t-test and were not significantly different. Group II had the lower mean in this case. Age was also correlated with success using a point-biserial correlation analysis.

Cross tabulation and chi-square analyses of sex, marital status and race with success or failure were performed. These tests showed no significant difference between the two groups for these characteristics.

A multiple step-wise regression analysis was conducted to test the influence of all of the entering characteristics on success. Total GPA for college science courses, the number of academic quarters of high school science, the high school GPA and being married were the independent variables which exerted the most influence on the dependent variable--success. These characteristics were not significant enough to use them as predictors of success.

### Test of the Hypotheses

Originally, 12 null hypotheses were postulated. Three of these (Hypotheses 2, 3, and 5) were divided into subgroups for testing. Computer assisted analysis using the Statistical Package for the Social Sciences (SPSS) was conducted on the collected data. Based on the findings of the study the following conclusions were reached concerning the disposition of the null hypotheses. Refer to table 11.

TABLE 11

## DISPOSITION OF THE NULL HYPOTHESES

Hypothesis		Accept	Reject
1	There is no significant difference between the high school GPA of successful students and failing students in the MLT-AD program		X
2	There is no significant difference between the number of academic quarters of high school biology, chemistry, algebra and the total number of academic quarters completed by successful students and failing students in the MLT-AD program		X
3a	There is no significant difference between the ACT subscores (English, mathematics and social sciences) or composite scores of successful students and failing students in the MLT-AD program		X
3b	There is no significant difference between the ACT natural sciences subscores of successful students and failing students in the MLT-AD program	X	
4	There is no significant difference between GPA for college courses completed before the semester in which the student enrolled in MLT course work for successful students and failing students in the MLT-AD program		X

TABLE 11--Continued

	Hypothesis	Accept	Reject
5a	There is no significant difference between composite GPA for anatomy and physiology, microbiology, chemistry and college algebra courses completed before the semester in which the student enrolled in MLT course work for successful students and failing students in the MLT-AD program		X
5b	There is no significant difference between GPA for anatomy and physiology and chemistry completed before the semester in which the student enrolled in MLT course work for successful students and failing students in the MLT-AD program		X
5c	There is no significant difference between GPA for microbiology and college algebra completed before the semester in which the student enrolled in MLT course work for successful students and failing students in the MLT-AD program	X	
6	There is no significant difference between the number of college hours completed before the semester in which the student enrolled in MLT course work for successful students and failing students in the MLT-AD program	X	
7	There is no significant difference between previous work experience in a clinical laboratory of successful students and failing students in the MLT-AD program	X	

TABLE 11--Continued

	Hypothesis	Accept	Reject
8	There is no significant difference between age of successful students and failing students in the MLT-AD program	X	
9	There is no significant difference between the sex of successful students and failing students in the MLT-AD program	X	
10	There is no significant difference between the marital status of successful students and failing students in the MLT-AD program	X	
11	There is no significant difference between race (self-declared) of successful students and failing students in the MLT-AD program	X	
12	There is no significant relationship between success and any combination of characteristics	X	

### Conclusions

The findings of this study lead to the following conclusions relative to predictors of success or failure in the MLT-AD program at Grayson County College.

1. None of the entering characteristics were significant enough to be used as predictors of success
2. The composite science GPA for courses of anatomy and physiology, microbiology, chemistry and college algebra completed prior to starting MLT course work may have an influence on academic success. Successful students who had taken any of the courses had a composite science GPA of 2.0 or better. The mean was 3.20
3. The combined number of academic quarters of high school biology, chemistry and algebra may have an influence on academic success. The majority of successful students had taken at least nine academic quarters of high school science. The mean was 10.57
4. The high school GPA may have an influence on academic success. Most of the successful students, all except one of those whose GPAs

were known, had high school GPAs of 2.0 or better. The mean was 3.24

5. Being married may have an influence on academic success. The percentage (43.2) of successful students who were married was higher than the percentage (35.9) of unsuccessful students who were married
6. Students who have a total GPA of 2.0 or less for previous college work may consider taking developmental courses and related science courses before entering the MLT-AD program. Such courses may enhance the chance of success

### Discussion

There are several findings and observations relative to this study which warrant discussion. The most important of these is that complete data were available for only two students. The multiple regression analysis was conducted including all subjects with complete data on paired variables with the result that the correlations computed were not based on an equal number of cases. This may limit the reliability of the information obtained from the analysis. Even though they did not prove to be significant enough to predict success, the composite college science GPA, the combined number of academic quarters of

high school science (including algebra) and the high school GPA would be the most appropriate screening criteria for admission into the MLT-AD program. This information is available for most applicants and could be easily utilized. The study revealed that these aspects had more influence than any other characteristics on the academic success of the students. If the study were repeated using a larger number of subjects having complete data, the results may prove to be significant.

Examination of the raw data revealed that 10 subjects in the unsuccessful group who had taken some of the science courses in college had a composite science GPA below 2.0. No student in the successful group had a composite science GPA below 2.0.

It was found that the mean of the combined number of academic quarters of high school science for the successful group was 10.57. Nine or more academic quarters of biology, chemistry and algebra had been completed by 70.45 percent of this group. Eighty-two percent of the subjects in this group had completed at least 3 academic quarters of algebra and 59 percent had completed 3 academic quarters of chemistry. Five students in the unsuccessful group and one student in the successful group had high school GPAs below 2.0. The mean for Group I was 2.68 as

compared to 3.24 for Group II.

The study revealed that there was no entering high school or college mean GPA of less than 2.0. It was found, however, that 18 students in Group I had GPAs of less than 2.0 for all college work completed prior to beginning MLT course work. In addition to these, nine students in this group had GPAs of 2.0. Only one student in Group II had a college GPA of 2.0 and there was no college GPA of less than 2.0 in this group. An examination of the GPA for all previous college work might be an indicator for potential "high-risk" students who would have little chance for success.

The information gained from this study could be used for counseling in order to help prevent or cut down on the attrition rate. A student, found to be deficient in any area, could be advised to take developmental courses and some of the required science courses before starting MLT course work. This would result in a longer period of time being required to finish the program but would give the student a greater chance for success.

Marriage was one characteristic which the multiple regression analysis revealed might have some influence on success. This might be attributed to a more mature attitude toward study, a more stable social life and better defined career goals.

Any conclusions concerning black students which may have been reached as a result of this study might not be valid--no black student has ever finished the program. The small number (four) of black students enrolled in the program reflects a pattern described in the literature review in chapter II. Researchers reported that both science and health occupations were unpopular areas of study among minorities.

One observation which seems to conflict with the idea that knowledge of the field contributes to success was the result of the cross tabulation for previous work experience in a clinical laboratory (table 5). The 19 students who had worked in clinical laboratories were divided almost equally between the two groups--9 students in Group I and 10 students in Group II.

Another interesting finding was the number of college hours completed by the students before the MLT course work was begun. There were no prerequisite courses for entry into the MLT-AD program between 1972 and 1978, however, 97 of the students enrolled during this period had completed some college courses and several held degrees. Thirty-three (75.0 percent) of the successful students had previous college experience. Sixty-four (68.8 percent) of the failing students had some college credit (table 4).

Another observation which should be noted is that the definition used for "failing" students should be limited to this study only. Some of the students who dropped out of the MLT-AD program or failed did not withdraw from college. Some of these students completed associate degrees at Grayson County College or at another community college. Others transferred to four-year colleges or universities and completed baccalaureate degrees. One student who withdrew is now a dentist. Some of the "failing" students held degrees before entering the MLT-AD program.

#### Recommendations for Further Studies

On the basis of the conclusions and observations presented in the discussion, it is recommended that the following studies be conducted.

1. A replicate study using a larger sample in order to include a greater number of subjects having complete data
2. A replicate study using students from MLT-AD classes since 1978
3. A study comparing characteristics of students who completed the program, those who withdrew from the program and those who failed

4. A study using other variables for the prediction of success, for example, the Allied Health Professions Admission Test (AHPAT)
5. A study to develop "admission criteria" for the MLT-AD program at Grayson County College
6. A study to find the reasons for withdrawal from the program
7. A study to determine how many of the failing students continued their education in some other field
8. A follow-up study to determine how many graduates continued their education to become medical technologists
9. A study of admission criteria and attrition rates of other MLT-AD programs in Texas

## APPENDIX

TEXAS WOMAN'S UNIVERSITY  
SCHOOL OF HEALTH CARE SERVICES  
DENTON, TEXAS 76204

AGENCY PERMISSION FOR CONDUCTING STUDY\*

THE Grayson County College

GRANTS TO Shirley Hagan  
a student enrolled in the School of Health Care Services  
leading to a Master's Degree in X Health Sciences Instruction  
Health Care Administration at the Texas Woman's University,  
the privilege of its facilities/data in order to study the  
following problem:

Entering Characteristics as Predictors of Success or  
Failure of MLT-AD Students at Grayson County College

The conditions mutually agreed upon are as follows:

1. The agency (may) (~~may not~~) be identified in the final report.
2. The names of consultative or administrative personnel in the agency (may) (~~may not~~) be identified in the final report.
3. The agency (wants) (~~does not want~~) a conference with the student when the report is completed.
4. The agency is (willing) (~~unwilling~~) to allow the completed report to be circulated through interlibrary loan.
5. Other \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Date: February 19, 1981

Shirley Hagan  
Signature of Student

[Signature]  
Signature of Agency Personnel

[Signature]  
Signature of Faculty Advisor

\*Fill out and sign three copies to be distributed as follows:  
Original-Student; First copy - agency; Second copy - SCHOOL  
OF HEALTH CARE SERVICES.

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