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THE BIOGRAPHICAL INVENTORY (BIB)
IN ACADEMIC ADVISEMENT: EXPLORATORY USE IN THE
SCHOOL OF MEDICAL TECHNOLOGY AT MICHIGAN STATE UNIVERSITY

By
Linda Lou Holmes

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ABSTRACT

THE BIOGRAPHICAL INVENTORY (BIB) IN ACADEMIC ADVISEMENT: EXPLORATORY USE IN THE SCHOOL OF MEDICAL TECHNOLOGY AT MICHIGAN STATE UNIVERSITY

By

Linda Lou Holmes

Enrollment in the School of Medical Technology at Michigan State University has jumped from 259 in September 1970 to 611 in September 1974. This two and a half fold increase has occurred at a time when internship and job placement opportunities for graduates are limited. In addition, fiscal support for the university program has not kept pace with the enrollment increase and the quality of the educational program is possibly being compromised. To educate large numbers of students with limited entrant needs by the profession while diluting an effective curriculum does not fall within sound educational theory. Therefore, administrators of the School of Medical Technology are directing their efforts to defining and identifying those students who have the motivation, personal characteristics and aptitude to successfully complete the academic training.

The biographical correlates of talent and achievement include an area of research which has been growing rapidly within educational organizations. The biographical approach has been successful in identifying a wide variety of talents, including academic achievement.

The goal of this study was to develop a valid biographical inventory for predicting academic performance for students in the School of Medical Technology at Michigan State University.

An 84 item biographical inventory was administered to 124 students applying for admission to the upper division (3rd. year) of the School of Medical Technology for fall term 1972. The inventory was a composite instrument of multiple choice items in which the student described himself and his background. The rationale in using this instrument was that past behavior, experiences and self descriptions can be useful indicators of future performance.

Academic success, for the purpose of this study, was defined as accumulated grade point average at the conclusion of the sophomore year of study. The students were assigned to three criteria groups based on their academic success: upper (the highest 27%); lower (the lowest 27%); and middle (the remaining 46% of the students). The upper and lower criteria groups were used to compute an index of discrimination for each item alternative. A hold out group of 45 students was established for cross validation purposes. Forty one biographical items were found to discriminate between the criteria groups.

A new biographical key was generated from the 41 discriminating items with + double weight assigned to those items discriminating at .40 level or better and + single weight assigned to those items discriminating from .30 to .39. The differentiating items were then cross validated on the hold out group. A Pearson Product

Moment correlation of .51 was computed between inventory scores and sophomore grade point averages. This correlation was significantly high to establish the effectiveness of the biographical inventory in predicting academic success for the medical technology program at Michigan State University. In a practical sense, the scores from the biographical inventory can provide a basis for making rational decisions in the selection and advisement of students who have expressed an interest in the medical technology program at Michigan State University.

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I. INTRODUCTION

1.1 Purpose.

The purpose of this study was to explore the use of a Biographical Data Inventory (BIB) in academic advisement for medical technology students at Michigan State University.

1.2 Need.

1.21 Educational Training and Certification.

In order to appreciate the importance of determining potential academic success for students in the medical technology program, one needs to understand the educational requirements and responsibilities of the profession and become acquainted with the curriculum and objectives of the School of Medical Technology at Michigan State University.

A medical technologist is a member of the paramedical team working under the direct supervision of a pathologist. Using precise instruments, the technologist performs procedures which determine the presence and quantity of chemical, bacterial and cellular constituents in the body to help identify and control disease. The medical technologist must be well trained in scientific theory and familiar with many laboratory specialities, including chemistry, bacteriology, urinalysis, microbiology, hematology, etc.

The medical technology curriculum at Michigan State University is designed to prepare students in the numerous areas of laboratory medicine. Basic and applied science courses are included which provide

the student with the skills required in the performance of laboratory procedures. In addition, students gain a foundation in scientific theory which will enable them to adapt to rapid advances in technology and medicine.

The medical technology program at Michigan State has four optional tracts which permit a student to select a program most consistent with his career goals (Appendix A), and upon completion of four years of academic study the student is awarded the Bachelor of Science degree. To become eligible for certification by the Board of Registry of the American Society of Clinical Pathologists, the student must serve an additional year of internship in an American Medical Association approved hospital school of medical technology. Success in this year of clinical education and experience qualifies the student to take the National Registry Examination required for registration by the American Medical Association.

According to recent reports (ASCP Newsletter 17, 1972; Brooks and Blume, 1973), the supply of medical technologists is slightly in excess of job and internship placement opportunities. Current enrollment trends in the School of Medical Technology at M.S.U. support the view that this situation will continue to become more critical if efforts are not made to limit the number of students entering the profession.

1.22 Historical Developments in Medical Technology Education.

The increasing surplus of medical technology graduates may be best understood by reviewing historical developments in medical technology education. During the 1950's a critical national shortage of medical technologists existed. Student enrollment in university programs of medical technology was declining whereas employment opportunities in hospital laboratories had increased. Enrollment figures at Michigan State University support this phenomena; enrollment in the School of Medical Technology dropped from 28 graduates in 1945 to 16 graduates in 1953 (Brooks and Blume, 1973). During this period extensive recruitment efforts were made by the professional organizations associated with clinical laboratory personnel. Supported by a relative improvement in medical technologists' salary levels, these efforts produced a near equalization of medical technology graduates and employment opportunities which continued throughout the 1960's.

By 1970, the pendulum had swung to the opposite extreme as the supply of medical technology graduates began to exceed available internship placements and job opportunities. This imbalance was aggravated in part by the post World War II "baby boom". By the late 60's and early 70's, these children were completing degree programs on college campuses. Increased university enrollment and restrictions by many university departments and colleges prompted many students to search for new majors and careers which offered a promise of job placement and security upon graduation. Recruitment efforts continued for laboratory personnel despite the fact that a

critical balance existed between graduates and laboratory positions.

The problem was compounded by overly optimistic employment predictions as evidenced in the 1972-73 Occupational Outlook Handbook which reported "employment opportunities for medical technologists to be excellent throughout the 1970's". Governmental agencies were persuaded to grant financial support to academic institutions who increased their enrollment in their programs of medical technology. Students quickly responded to these optimistic reports by transferring to a profession which offered seemingly unlimited job opportunities, while universities faced with dwindling Federal financial support for educational programs, undertook an all out effort to increase student enrollment in medical technology programs.

These events are vividly illustrated in the School of Medical Technology at Michigan State University. Spurred by support by a National Institute of Health, Allied Health Grant enrollment in the School of Medical Technology rose from 247 in 1970-71 to 611 in 1973-74 (Figure 1). This increase in also reflected in the growth in size of the senior class. The 1972 graduating class had 66 students, the 1973 class has 105 and it is predicted that the 1974 class will graduate 150 students.

Increased student enrollment with minimal additional University fiscal support has strained the School's faculty, equipment and supply resources. Class sizes have doubled necessitating additional laboratory sections with the accompanying increase in supporting faculty, supply and equipment resources; advisement responsibilities have grown; and administrative duties and functions have increased

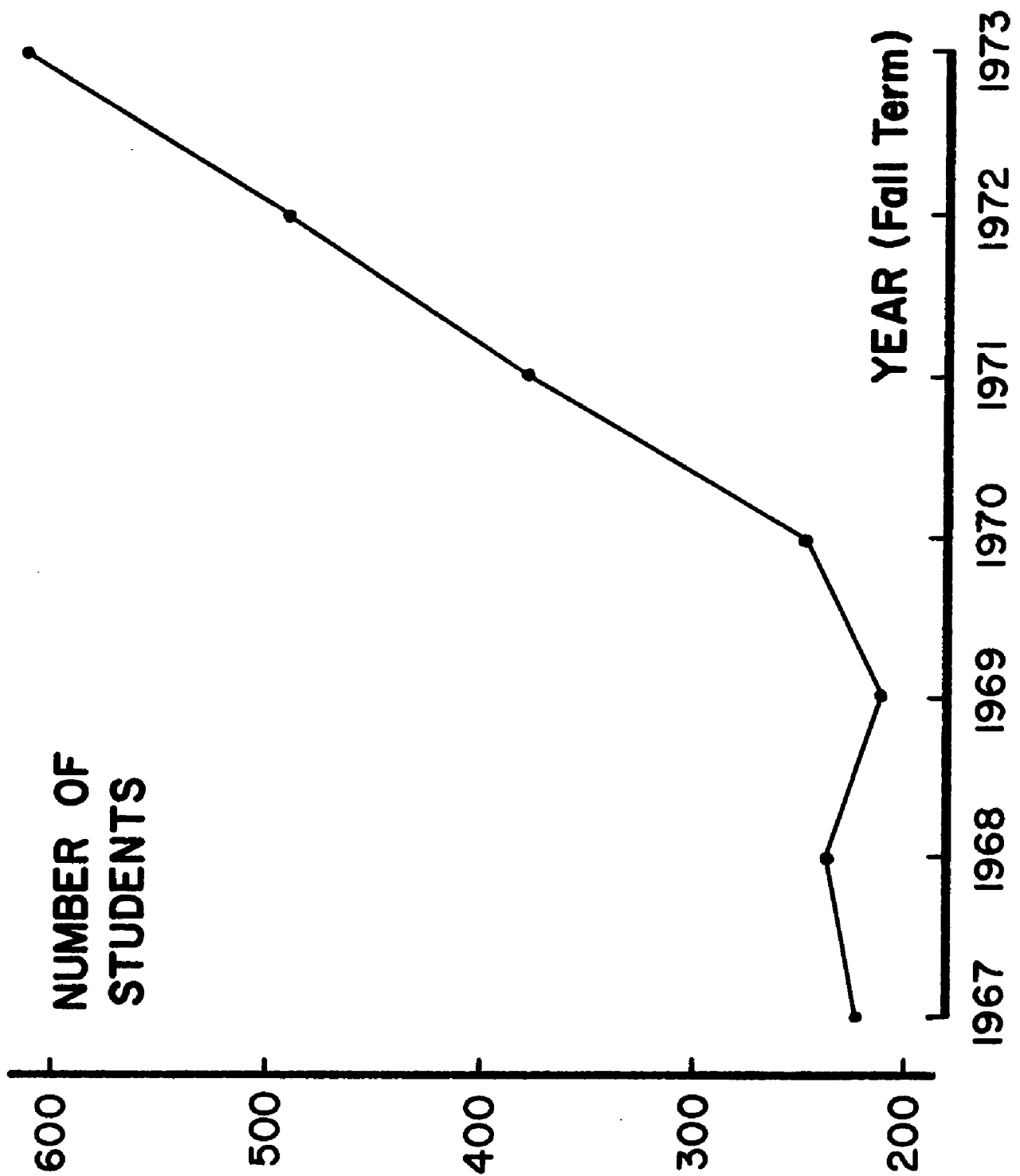


FIGURE 1. Enrollment Trends for the School of Medical Technology

accordingly. Faculty reactions and hospital personnel comments to administrators of the School of Medical Technology suggest that the lack of adequate funding and increased numbers of students has begun to effect the quality of the medical technology program at Michigan State University. Possible dilution of an effective curriculum is beginning to occur as some overtaxed courses are being eliminated from the curriculum, others with oversubscribed laboratory sections are not able to give the students the faculty attention they require. Still other courses are restricting the number of medical technology students which may enroll. Education of large numbers of students by compromising the quality of the instructional program is not within the scope of sound educational theory, irrespective of the implications of limited placement opportunities for graduates.

1.23 Medical Technology Internship and Employment Opportunities.

Concern with the overproduction of medical technology graduates has resulted in national and local surveys designed to assess the current status and future prognosis of the problem. During the spring of 1972 the American Society of Clinical Pathologists (ASCP) sampled all approved hospital schools of medical technology. The Society wished to ascertain whether job shortages did indeed exist, to identify geographical areas with a surplus of graduates and to report the number of technologists experiencing employment difficulties. Of the 124 schools responding, 8.4 percent of their graduates experienced difficulty in securing a job. Eight of 36 responding hospital schools in Michigan reported that 25 of their graduates had

difficulty with job placement (ASCP Newsletter 17, 1972).

Subsequent to the ASCP study, the School of Medical Technology at Michigan State University supported by the Institute of Biology and Medicine initiated two surveys. The first attempted to quantify the availability of internship opportunities in Michigan and the immediate geographical area and the second was designed to report the current and anticipated student enrollment in institutions of higher education in Michigan. These studies were deemed necessary because of the results reported by the American Society of Clinical Pathologists (ASCP Newsletter 17, 1972) together with the fact that the 1972 graduating class was the first in the history of Michigan State University's medical technology program in which some academically qualified graduates were not accepted into hospital internship programs. Since the clinical training is a necessary adjunct to certification, unavailability of such positions places a serious restraint on these students.

In the first survey, 75 questionnaires (Appendix B) were sent to approved hospital schools of medical technology in Michigan, Cleveland, Ohio, Milwaukee, Wisconsin, and Chicago, Illinois. Sixty four (85 percent) hospitals responded. The schools reported a total of 2,634 graduates over the past five years. The majority of these hospital schools anticipated that the number of students they will be able to accept during the next five years would remain constant, with a few hospitals reporting that they would have to reduce the size of their classes due to the lack of adequate funding for such educational programs. A stabilization in the number of

internship positions is expected although most hospitals reported a steadily increasing number of student applications.

The sample for the second survey (Appendix C) included all of the 26 colleges and universities in Michigan offering programs in medical technology. The purpose of the questionnaire was to collect data on current and future enrollment trends in university educational programs and the magnitude of the problem students were experiencing in acquiring internship positions. All directors of university medical technology programs reported increased student enrollment and many indicated that students were already experiencing difficulty in securing internships.

Three hundred and fifty nine students completed the academic requirements for an internship in 1972 and 239 of these were accepted to Michigan hospital schools of medical technology. Of the 120 students not placed in Michigan, 49 students elected either to forego this phase of their training or to satisfy this requirement in another state, whereas, the remaining 71 were unable to secure an internship in any state. The results of this study suggest that if current trends persist, by 1975 there will be 905 competitive students or somewhat over four qualified students for each internship position in Michigan (Brooks and Blume, 1973).

The American Society of Clinical Pathologists's survey and the two studies by the School of Medical Technology at Michigan State University verify that student enrollment in Michigan college medical technology programs is exceeding the capacity of existing, and projected, hospital internship positions. This imbalance occurred in

1972 and is expected to increase to four times hospital student capacity by 1975.

1.24 Manpower Utilization.

Efforts to cut hospital costs have affected the utilization of medical technologists in the hospital laboratory. Laboratory technicians (two year program graduates) are being recruited in increasing numbers and utilized in the laboratory to perform the more routine duties which have, in the past, been performed by the technologists. The laboratory technician commands a lower salary than the graduate technologist. Thus health care cost considerations are affecting the number of job opportunities for the technologist.

Advances in technology have relegated many laboratory procedures and analysis to computers and machines. Automated equipment now performs many tests more rapidly and efficiently than has previously been possible by manual methods, thus further reducing the number of technologists required to staff hospital laboratories.

Medical technologists have been and continue to be dominately female, although the profession is attracting more males as salaries increase and many departments of the more traditionally 'male' professions restrict entrants. Changing social and economic conditions are affecting the turnover rate of personnel in the laboratory. Traditionally the female medical technologist would work one or two years before quitting to remain in the home and raise a family. This created a rather constant turnover of personnel allowing for a larger demand for medical technologists. Changing mores have made it

increasingly acceptable and often economically necessary for women to work outside of the home during the child rearing years.

Increased attention to the psychological needs of the female and improved child care facilities are allowing many medical technologists to continue their professional careers for longer periods of time.

The increased use of laboratory technicians, automated equipment and the reduction in laboratory personnel turnover are all contributing to a reduction in the number of employment opportunities for medical technologists. Changes in manpower utilization coupled with the burgeoning numbers of trained technologists has created a complicated problem for administrators of medical technology training programs.

1.25 Predictive Studies of Success in Academic Training and Job Performance for Medical Technologists.

A search for predictive measures of success in the profession is a perennial concern of administrators of pre-professional and professional educational programs. The value of these predictive measures increases as the number of aspirants exceed the number of "successful" entrants needed to meet the requirements of the profession.

Few studies report the assessment of the particular abilities, interests, and personality qualities characteristic of successful medical technologists. Additional research in these areas is needed particularly during this period of excessive numbers of trainees.

The investigations of Williams (1963), Williams, et al. (1967), Strassell (1956) and the U.S. Department of Labor (1959) reported the

use of general aptitude tests as predictors of success for medical technologists. Strassell's early work in this area included the use of the ACE, Flanagan Aptitude Classification and the Guilford-Zimmerman Temperature Survey. She concluded that aptitude tests were of more value in schools not associated with universities, probably because of the selective admission factor (Strassell, 1956). More significantly, however, Strassell's work led to further experimentation with aptitude testing for medical technologists. In 1958, the Colorado Department of Employment, in cooperation with the Colorado Society of Medical Technologists, administered the General Aptitude Test Battery (GATB) to 164 students and technologists for the purpose of developing national norms. The GATB was originally developed by the U.S. Employment Service and had been validated for 23 occupational aptitude patterns, including the establishment of minimally acceptable scores for medical technologists. Aptitudes selected for use were general intelligence, verbal aptitude, form perception and clerical aptitude (U.S. Department of Labor, 1959).

Williams et al. (1967) administered the GATB to 37 working technologists and 101 students. Scores from the experimental battery and grade point averages were correlated with respective scores on the National Registry Examination of the American Society of Clinical Pathologists. Analysis of the data led these authors to conclude that no single aptitude or combination of aptitudes predicted the Registry Test Score as accurately as did university grade point average (Williams, et al., 1967).

Another study by Williams (1963) compared results on the GATB with supervisor ratings. Although the sample size was small, Williams was unable to establish a relationship between the supervisory rating and the score on the aptitude battery. The unreliability of aptitude testing in predicting success for medical technologists led investigators to explore other areas for predictive possibilities.

Lundgren (1968) investigated the use of past academic performance (high school rank, percentile rank on the Minnesota Scholastic Aptitude Test and scores on the ACT) and a measure of interest (scores on the Strong Vocational Interest Blank (SVIB)) as possible predictors of university grade point average. She concluded that no single performance variable, or combination of variables predicted grade point average with any degree of success. In a subsequent study, McClune and Rausch (1969) used Lundgren's sample and data to examine in detail the relationship between measured interest and performance in the medical technology curriculum. Revision of the SVIB to include new occupational scoring keys, including a scale for medical technologists, and interest patterns suggested but not studied by Lundgren, led them to further examine the original data in order to discover variables that might predict success for students in medical technology. Analysis of the data by McClune and Rausch (1969) showed that the SVIB could not be used as the sole criterion for admission to a medical technology training program. The SVIB appeared, however, to be measuring something which accounted for persistence in completing such a training program. McClune and Rausch suggested that

the Strong Vocational Interest Blank score is useful in individual counseling with students previously selected as having the minimal scholastic aptitude to complete the training. The authors further suggested that students with measured interest patterns inconsistent with medical technologists employed in the profession should be advised to reexamine their occupational choice to ascertain whether other educational goals might be more appropriate.

Elberfield and Love (1970) studied the records of 61 medical technology students at West Virginia University in an attempt to isolate characteristics which contributed to the success of medical technologists in clinical performance. Four criteria were selected for inclusion in the study: 1) grade point average from three years of college training, 2) scores on a battery of tests, including the Bell Adjustment Inventory, 3) the Kuder Preference Record, and 4) the Selective College Ability Test (SCAT). Scores on these variables were compared with three evaluations of clinical performance including classroom, practical and total performance records. College grade point average showed the highest relationship to all three areas of clinical performance. Scores on the SCAT were significantly correlated with classroom performance during clinical training. Low, but significant correlations with clinical performance and the Kuder Preference record in mechanics, computation and clerical categories were found and according to these authors, limited its use as a predictive instrument. Results on the Bell Adjustment Inventory suggested that this measure of social adjustment correlated significantly with classroom performance, and emotional adjustment was

significantly correlated with clinical performance.

The characteristics isolated by Elberfield and Love (1970) concurred with Lundgren's findings, namely, that the aptitude and interest patterns studied were of limited value for the selection or exclusion of students to training programs for medical technologists. However, according to Elberfield and Love (1970), the qualities they studied appeared to be somewhat related to success in the performance and training sphere of medical technologists and warrent use in individual counseling situations.

1.3 Justification for the Limitation of Medical Technology Students at Michigan State University.

The number of students currently enrolled in university programs of medical technology exceed the number of available internship training opportunities and employment possibilities. The academic and professional implications of this imbalance will become more critical in the immediate future.

Michigan State University's School of Medical Technology, in terms of student enrollment, is one of the largest in the nation and for many years has been a leader in medical technology education. The School has one of the most comprehensive educational training programs and for many years has been recognized for its innovation and flexibility with respect to the changing needs of the profession.

Recently, the School of Medical Technology at Michigan State University has been active in identifying and verifying the problem of surplus of graduates (Brooks and Blume, 1973). It follows

that the School has accepted the responsibility of exploring areas which might contribute to the elimination of the problem.

Many factors support the suggestion that the number of medical technology students at the university level should be limited and ideally include those students most likely to succeed in the program. Efforts are being directed toward defining and educating those students who have the motivation, personal characteristics and aptitude to become proficient and responsible medical technologists. Since identification of these students must occur early in their university career, the traditional use of grade point average is not feasible as college grade point average has not been established. Admission interviews place an additional burden on an already overtaxed staff with the predictive value of interviewing remaining questionable.

The School of Medical Technology at Michigan State University is concerned with early identification of those students most likely to succeed in the program. It is the purpose of the present investigation to develop and assess the use of a Biographical Inventory as a success predictor for students who show an interest in entering the School of Medical Technology at Michigan State University. If a noncognitive instrument, such as the Biographical Information Blank, could be developed and found to predict success in the medical technology program, this could be administered at the freshmen level and in combination with other aptitude and achievement data could be used as an advisement tool for students who have expressed a

preference for the medical technology program. Aspirants could be spared some of the disappointment, frustration and expense associated with an incorrect vocational choice and the University would be spared some of the expense of education abortive students in costly laboratory courses. In addition, faculty efforts and resources could be better utilized in the education of those students deemed most likely to successfully complete the medical technology curriculum.

II. REVIEW OF THE LITERATURE

Experimentation with biographical information as a predictive measure has a long and successful history but it is only recently that extensive systematic research has begun to accumulate. The term biographical information refers to a collection of multiple choice questions in which the individual describes himself and his background, with many of the questions being similar to those found on an application blank. The rationale in using such an approach is very simple - that past behavior can be used as an indicator of future behavior and performance (Ellison, et al., 1972). Industrial organizations, governmental units and educational institutions have utilized autobiographical data as an input for predictive, diagnostic and/or counseling purposes.

2.1 Industrial Studies.

Early exploration with the predictive potential of autobiographical information was conducted primarily by insurance companies. Their success generated further experimentation by the military during World War II, particularly as it related to the selection and placement of military personnel. Following the war, business was concerned with rebuilding the peace-time industrial organization. Personnel selection, training and placement were front rank problems in post-war planning (Bolanovich and Kirkpatrick, 1943) as myriads of servicemen returned to the labor force. Earlier success with

biographical inventories in selection studies, prompted many personnel research units to direct their attention to the use of this tool as a potential selective instrument. Much of the early work with biographical information was restricted to personnel selection. However, during the late 1950's and early 1960's, industrial personnel managers began to use other success criteria, such as performance and classification levels, creativity potential, and absenteeism and termination. Since work requirements varied, even within a common category of workers, a universal criterion of success was difficult to establish. Therefore, little coordination of effort existed among business organizations. Instead each industrial unit sought to develop its own biographical inventory based on its own established criterion of success. Measurement studies appearing in the literature report varying success in this endeavor.

The Life Insurance Sales Research Unit, in 1938, developed the Aptitude Index for Life Insurance Salesmen. This two part test booklet with a predictive scale was based on personal history items and personality characteristics. The original sample included 10,000 life insurance agents with the results cross validated on an additional 1600 salesmen. The authors found the test discriminated with a fairly high degree of accuracy between more successful and less successful men involved in the business of selling life insurance (Life Insurance Sales Research Bureau, 1938).

Kurtz (1941) expanded the Life Insurance Sales Research study to assess whether this same inventory could be used at the time

of hiring to predict success in selling life insurance. As in the report of the Life Insurance Sales Research Bureau (1938), the investigation by Kurtz showed the data to be more discriminatory when the sample was divided into two age groups; younger than 25 and 26 and older, with different scales set up accordingly. Kurtz administered the Aptitude Index to 304 recently hired insurance salesmen and coorelated their test results with total sales during the first year of employment. The Aptitude Index Test coorelated .40 with the criterion variable and Kurtz concluded that the personal history and personality inventory could predict life insurance selling ability with an acceptable degree of accuracy.

Assistant secretary of the AETna Life Insurance Company, Marion A. Bills (1941) experimented for many years with numerous possible predictive devices and found the tests most useful in the selection of insurance salesmen to be the Strong Vocational Interest Blank and a personal history inventory. Subjects for this research were men attending the casualty insurance schools for AETna Life Insurance Company. Bills' results were enhanced when the sample was separated into age groups and different scoring keys validated for each group. Bills (1941) was able to predict with a fair degree of accuracy whether or not a man would remain in life insurance sales and some degree of differentiation in production (total sales).

Elimination of unsuccessful insurance sales personnel was the objective of studies by Kornhauser and McMurry (1941) and Goldsmith (1922). Kornhauser and McMurry (1941) in their screening work with the Aptitude Index for Life Insurance Salesmen, reported a critical

cutting score which eliminated 31.8% of the men who later failed as insurance salesmen, 22.4% of the mediocre salesmen and 6.7% of the successful salesmen. Additional studies over a two year period reported a reduction in turnover of 23% and an increase in the production level per man of 6.5% when the Index for Life Insurance Salesmen was incorporated into the selection procedure. Goldsmith's (1922) work at the Guardian Life Insurance Company was designed to determine whether the items of a personal history inventory could be used to predict the success/failure of an insurance salesman. The critical score used in this study eliminated 54% of the failures and left 84% of the successful salesmen.

Utilizing the reports of earlier selective studies with insurance salesmen, James E. Kennedy (1958) hypothesized that consideration of the sales job would yield improvement in the validity of the predictive instrument. Kennedy's study evaluated the relative worth of developing a selective instrument for use with six subvarieties of car salesmen and retail car salesmen in general. A single test for general car salesmen correlated .31 (significant at .01 level) with the criteria of success whereas the validities of the subvarieties ranged from .37 to .07. He concluded that the more detailed subtests did not result in a significant improvement in validity when compared with the less involved development of a single key for all car salesmen, irregardless of the speciality.

The usefulness of biographical inventories in early sales selection studies encouraged many of the large oil companies to

investigate the potential usefulness of biographical information for the prediction of performance levels. Because of the large financial and public relations investment a parent company makes in its dealers, the selection of service station managers is of paramount importance to the major oil companies. Robert Soar (1956) administered 39 personal history items to a sample of 29 American Oil Company dealers who had been rated on 15 aspects of performance. Fourteen of these items were found to discriminate between the more successful and less successful dealers and the cross validation supported the validity of the inventory. The American Oil Company, using the results of this investigation, has subsequently incorporated the validated biographical inventory into its selection procedure.

Carl H. Rush, Jr.'s (1953) study of salesmen at Burrough's Adding Machine Company was designed to assess the independent skills involved in successful salesmanship. Rush criticized earlier investigators for emphasizing the predictive measurement with little regard for understanding that which was being predicted. He theorized that sales success was a complex aggregate of variant skills and suggested that a more effective selective device could be developed if one would first assess the basic skills involved. The sample for his study included 100 of 352 Burrough's salesmen. Thirteen criteria variables, consisting of objective data (sales volume) and subjective data (supervisor's ratings), were collected for each subject and the variables intercorrelated. The resultant four factor matrix were labelled objective achievement, learning

aptitude, general reputation and sales technique and achievement. A battery of cognitive tests and personality and biographical data was collected for each man and correlated with the four extracted factors to establish their predictive value. It was found that the criteria of sales success was multidimensional rather than unitary. Rush (1953) concluded that the use of a global measure of sales success was unwarranted. He offered that a more effective selective device could be developed if researchers would undertake an analysis of the component elements of the job criteria rather than relying on one measure of success.

The value of the biographical inventory as a selective tool was established by the mid 1950's. The literature reports that personnel research units subsequently began to branch out into other areas in which the predictive potential of the biographical inventory might prove useful. Job classification, creativity skills, termination and absenteeism were the criteria variables for many of these studies.

Smith, et al. (1961) experimented with a group of petroleum research scientists at Standard Oil Company. This work was an early classification study and its success generated a number of additional studies. His investigation attempted to use a personal history questionnaire as a discriminator between supervisory and research oriented scientists. The sample consisted of 418 research scientists to whom 484 personal history items were administered. The items were correlated with three criteria measures: 1) supervisory ratings

on creativity, 2) supervisory ratings on overall performance, and 3) the number of patent disclosures each man had submitted during a five year period. Factor analysis of the items revealed 75 options which discriminated with one or more of the criteria variables at the .05 level or beyond. The discriminating key was then cross validated on an additional 100 randomly selected subjects. Validity coefficients of .613 with performance ratings, .521 with creativity ratings, and .517 with patent disclosures were established.

Albright and Glennon (1961) re-examined the data of Smith, et al. (1961). These two investigators correlated personal history items with the subjects' response to a single criterion variable. This variable was a statement relating to the subject's desire to advance within the company via a research bench work assignment or a supervisory/administrative position. Forty three items were found to differentiate employed petroleum research scientists desiring to advance in the supervisory/administrative hierarchy from those aspiring to remain in research assignments. These items were then administered to groups of scientists working at middle and higher echelons in administrative and technical positions. The biographical items were found to retain their discriminating power, though to a lesser extent due to smaller sample sizes. The results of Smith, et al. (1961) and Albright and Glennon (1961) investigations suggest that biographical inventories can be useful for personnel placement and management.

Morrison, et al. (1962) expanded on the Smith, et al. (1961) investigation using the petroleum research scientists for American

Oil Company as subjects. A matrix consisting of the 75 discriminating personal history items plus the three criteria variables (creativity rating, overall performance rating and the number of patent disclosures) was factored by a principal component analysis. Five factors emerged and were identified as favorable self perception, inquisitive and professional orientation, utilitarian drive, tolerance for ambiguity, and general adjustment. The factorial loading profiles were similar for the supervisory ratings, although they differed substantially from the patent disclosure variable.

William Buel (1965) used a biographical inventory to identify creativity potential among biological, medical, chemical and pharmaceutical research personnel at Searle and Company. One hundred and thirty two subjects were rated on "creativity", first by a trained group of raters and secondly, by their supervisors. An 118 item biographical history form was administered to each individual, inclusive of 59 items earlier validated by Albright and Glennon (1961). Fifty items were found to differentiate the more "creative" from the "less creative" personnel. Using the validated items from the inventory, Buel provided a descriptive image of the creative biological and physiological scientist which corresponded with an earlier description by Smith, et al. (1961).

A critical shortage of creative machine designers during World War II led Owens, et al. (1957) to search for measures which would assist in the identification of individuals possessing outstanding potentialities for creative work. The purpose of this study was to

develop and evaluate tests which would discriminate creative from non-creative machine designers. Nine measuring devices were administered to 295 engineers in 31 industrial firms and subsequently analyzed and cross validated against the criterion variable of creativity or non-creativity as rated by their immediate supervisor. Four tests survived the item analysis. These were the Power Source Apparatus Test, the Application of Mechanisms Test, the Personal Inventory, and the Personal History Form. The concurrent validity of this battery was such that it was able to correctly predict the classification of approximately 75% of the creative and non-creative machine designers included in the study.

A five year research program by the Life Insurance Agency (Ferguson, 1953) combined two predictive dimensions: termination and production level. Scores were collected on a variety of measures of interest, ability, aptitude, and background factors and analyzed to establish their predictive potential and interrelatedness to the criterion. Results of the study suggested that the survival/termination variable was best predicted by a measure of interest (Strong Vocational Interest Blank) whereas production earnings were highly correlated with scores on the personal history test. The personal history blank used for this study included the Combination Inventory (Life Insurance Sales Research Bureau, 1938), developed for earlier selection studies. For the purpose of this investigation, only the items were retained which dealt with economic maturity, that is, the extent to which the subject had progressed economically with

relation to others of his same age. The higher the score on economic maturity, the larger the proportion of agents who appeared above average in production sales.

Turnover and high absenteeism are very costly items for industrial organizations and attention has been directed towards ferreting out the characteristics of long term and attendant employees. Novack (1970) and Naylor and Vincent (1959) experimented with personal history items as a predictive measure for these variables.

Novack (1970) developed a weighted application blank for six classifications of employees at St. Luke's Hospital Center in New York City. Items were assigned positive or negative weights depending on how they differentiated between employees who were classified as long term (employed over a year) or short term (terminated before a year had lapsed). Composite scores for each group studied were established and a cutting score which gave a maximum differentiation was determined. The cutting score allowed for the inclusion of the largest number of long term employees while eliminating as many of the short term employees as possible. Novack concluded that personal history items could be used in the initial selection procedure as an aid in reducing employee turnover.

Prediction of absenteeism by personal history information was investigated by Naylor and Vincent (1959). The personal history items were validated on 220 clerical workers at a midwestern manufacturing company. Absenteeism, as the criterion, was distinguished as missing four or more days of work over a six month period.

Marital status, age and number of dependents were the personal history items included in Naylor and Vincent's experiment. Of these variables, only the number of dependents showed a significant relationship with absenteeism ($X^2 = 7.99$). Cross validation on a hold out group again revealed a significant relation of $X^2 = 6.40$. A multiple correlation for all three variables was computed. However, it did not significantly improve the predictability afforded by the variable - number of dependents. The authors suggested that personal history information did offer a valuable foundation for basing a selection program and potential absenteeism could be predicted with a reasonable degree of accuracy.

Industrial studies with biographical information as a predictive device have included a number of criteria measures: performance, creativity, absenteeism, and termination. Within the industrial setting, the validated biographical inventory has been consistent in predicting a success criterion with an acceptably high degree of accuracy, and in many instances, has been incorporated into the selection procedure for the industrial organization.

2.2 Governmental Agencies.

The Personnel Research Branch of the Adjutant Generals' Office was responsible for many research projects using biographical information during World War II. Most of these studies were validated using one of two criteria: 1) mental adjustment, and 2) a performance measure, the most common being leadership potential (Ellis and Conrad, 1948). The results of these studies were not made

available until the end of the war when military psychologists were allowed to release their empirical findings.

Donald Fiske (1947) reported on a study by the Navy Department, Division of Aviation, which was concerned with evaluating the usefulness of naval aviation cadet selection tests. One of the instruments included in this study was a biographical inventory developed by E. Lowell Kelly in 1940-41. The inventory was originally administered on an experimental basis to students doing poorly in flight training. The Biographical Inventory score, in combination with other information, was used to determine the advisability of continuing or dismissing a cadet. Near the end of the war, when numbers of applicants were far exceeding quotas, the Biographical Inventory was combined with a mechanical comprehensive test score to establish a Flight Aptitude Rating Index which was used in the selection of candidates. Although the Biographical Inventory was never used as the sole determinate for the selection of cadets, it was found to predict flight training school failures with a reasonable degree of accuracy.

The U.S. Military Academy conducted a research program from 1942-53 for the purpose of identifying Academy applicants who would become capable leaders (Haggerty, 1953). This project was initiated because some of the cadets, although performing satisfactorily academically, did not have the desired leadership qualities. Three instruments, which had been successful in identifying leadership ability in earlier studies, were included in this investigation: the West Point Self Description Blank, the West Point Biographical

Inventory and the West Point Personal Inventory. All tests had significant correlations with service ratings, while the Biographical and Personal Inventories had a cross validation multiple correlation coefficient of .40 with a second year aptitude-for-service rating for 400 randomly selected cadets of the 1951 class. The researchers suggested that with further refinement of the self descriptive instruments, the self reporting tests could make a valuable contribution to the cadet selection procedure.

A long term research program sponsored by the Adjutants Generals' Office attempted the classification of men for combat arms assignments (Willemin and Karcher, Jr., 1958). It was thought that if measurement techniques could be validated for determining combat assignments, than the overall combat performance would be expected to improve. The measurement instrument sought would identify those who could fight from those who would. Willemin and Karcher, Jr.'s (1958) study involved the testing of approximately 5000 enlisted combat arms personnel in a number of infantry combat settings. General aptitude, special abilities, personality characteristics and interest patterns were assessed to determine which discriminated most efficiently between good fighters and poor fighters as identified by ratings from non-commissioned officers.

The most successful instruments from the work of Willemin and Karcher (1958) proved to be a self descriptive inventory which correlated on an average of .39 with the criterion of combat effectiveness. This test was combined with an Arithmetic Reasoning and an Automotive Information Test to include new aptitude areas to

be used for the classification of personnel to combat arms assignments.

Successful results in earlier military studies with biographical inventories led the Army to undertake a study in 1951 concerned with the identification of leadership potential for Officer Candidate School applicants (Parrish, et al., 1958). The biographical inventory used for this project included a self descriptive instrument which had previously been used in predicting leadership potential in the ROTC. The questionnaire was administered to 2637 enrolled officer candidates in eight combat and technical schools. Included in the study was an evaluation of the desirability of item types, i.e. multiple choice, yes-no, and preference choices. Following an analysis of the questions, a new instrument was constructed including the most valid items from each type. The resultant inventory correlated .38 with the criterion of peer and tactical officer ratings for one sample. It was concluded that the new instrument was an improvement over previously tested self descriptive instruments and the new inventory was incorporated into the selection procedure for Army Officer Candidate School applicants.

Military applications of personal history inventories have yielded favorable results. The studies examined here are intended only to provide examples of the type of research which occurred during this period and are not intended to represent a comprehensive review of the research sponsored by the Adjutant Generals' Office in the area of biographical experimentation. The success of the inventories in the military situation support the hypothesis that

similar studies could prove equally useful in civilian situations.

The early biographical research by the Institute for Behavioral Research in Creativity was carried out in 1960 at the NASA Research Center. A 300 item questionnaire was developed containing questions relating to developmental history, family life, academic background and adult life and interests. The questionnaire was administered to 354 NASA scientists and engineers. Biserial correlations were computed for each item with three criteria measures: an overall rating, a creativity checklist and a creativity rating. The sample was split and a double cross validation study was carried out. The average cross validity coefficients were .55, .52, and .59 respectively. The authors concluded these cross validation correlations were remarkably high for such difficult criteria measures and recommended further experimentation with biographical information (Taylor, et al., 1966).

A biographical data inventory was developed and validated for use in the selection of State Police Troopers by the State of Michigan in 1972. Of primary concern was the usefulness of this instrument in predicting job performance. Mental ability tests had proven useful in predicting training school success but had not been valid in predicting job performance ratings. For his study, Salmon (1972) randomly selected 346 state troopers from Michigan, New York, and Pennsylvania. A criterion rating was obtained for each subject which included supervisory rankings on ten categories of performance. A biographical questionnaire containing 111 items was

administered to all participants; a hold out group of 49 men was established for cross validation purposes. According to Salmon (1972), the correlations obtained between Biographical Data Inventory score and job performance rating was sufficiently high, and he recommended the use of biographical information in the selection of state troopers.

2.3 Educational Studies.

The determination of biographical correlates of talent and achievement came into prominence in the late 1950's, and investigations centering on this correlation have continued to the present. Assessment of the predictive potential of biographical information has, in general, been restricted to academic achievement. However, a limited number of studies have included associated areas of achievement, i.e. creativity, extra curricular participation.

Robert Cobb Meyers (1952) examined the use of biographical information as a success predictor at an eastern women's liberal arts college. The purpose of his work was to determine whether biographical information obtained from the 1951 and 1952 freshmen classes would significantly add to the prognostic ability of College Board Aptitude tests and records of high school achievement in predicting college grade point average. An achievement index was established on 355 students by regressing freshmen year grade point average on combined College Board verbal and mathematical aptitude scores. Seven biographical history items were found to be significantly related to this achievement measure.

A scoring key was developed for the seven items giving double weight to the items significant at the .01 level as opposed to those significant at the .05 level (Meyers, 1952). The multiple correlation coefficient consisting of college board aptitude test scores and high school grade point average was increased from .62 to .65 with the addition of the biographical information score to the predictive battery. Cross validation of the biographical items was carried out on the freshmen class of 1952. In the cross validation group, the correlation between the predictive battery and grade point average rose from .63 to .65 by the addition of the biographical score. This slight rise in the multiple correlation was significantly ($P < 0.01$) different from zero. Meyers (1952) concluded that the inclusion of biographical information could add to the prognostic ability of the application process.

Students at Forham College constituted the sample for a study by Anastasi, et al., 1960, to determine the validity of a biographical inventory in predicting college success. The criterion of college success, though inclusive of the usual grade point average, emphasized "non-intellectual" factors. The students were rated on personality characteristics, adviser evaluations of college adjustment, ROTC assessments of leadership and general adjustment, participation in an honors program, disciplinary records, reported emotional disorders, and academic records. Students were assigned to three criteria groups (positive, average, and negative) based on a global evaluation of all the criteria measures by three independent judges. The

positive group represented the type of student the college sought to develop, the average group were making satisfactory adjustment to college but did not exhibit any outstanding characteristics. The negative group had shown evidence of emotional maladjustment or antisocial behavior and were judged to be unsatisfactory students.

Anastasi and her coworkers (1960) administered a 303 item biographical inventory to the freshmen class of 1958. Items included objective reports of present status and previous history, preference and reactions to past activities, anticipations of vocational and educational objectives and projective items pertaining to college and post college expectations. All items which discriminated ($P < 0.20$) between any two of the criteria groups were retained in the scoring key. Eighty differentiating items resulted from the item analysis. The scoring key was then cross validated on the class of 1959 and yielded validity coefficients of .548 for positive-negative, .346 for positive-average, and .256 for average-negative criteria group comparisons. These relationships were consistently higher than correlations obtained when other traditional measures were evaluated with the criteria groups. Analysis of other achievement, personality, and interest tests indicated the biographical inventory differentiated more effectively than the other predictors. The Anastasi study demonstrated the feasibility of success predictions for educational institutions.

The increase in the amount of leisure time has led many educators to believe that one purpose of education is to prepare students to profitably use their leisure hours. Frank L. Schmidt, et al. (1971)

studied and compared the characteristics of students who regularly did or did not attend cultural activities. These researchers felt that if the characteristics of non-attenders could be identified, appeals and publicity for cultural events could be altered so as to attract the non-attenders. Thus, the established predictive value of the biographical inventory in industrial, military and educational settings, attracted the investigators to examine the use of biographical information to direct the promotion of cultural events.

A sample of 315 undergraduate students from a midwestern university was randomly selected from the subscription list of the university theatre and the student directory, and assigned to two groups accordingly. Each group was further divided into halves for cross validation purposes. A Biographical Data Inventory containing 136 items was developed and mailed to all subjects of which 246 forms were returned and useable. The criterion measure was included in the inventory foils and involved a list of 13 student activities to which the respondent indicated whether he had attended or participated. Criteria scores were established and ranged from one to five depending on the number of events checked. Forty one items were found to differentiate the attenders from the non-attenders. From these results, Schmidt, et al. (1971) developed a profile for attenders and non-attenders to be used when deciding on publicity for cultural events.

The reliance of medical school admissions officers on grade point average as a criterion for selection resulted in the appointment of a Canadian governmental commission. After careful study of selection procedures the Commission urged medical schools to expand

the traditional evaluation of academic records for admission decisions in order to provide a broader basis for the evaluation of applicants.

Collishaw and Grainger (1972) responded to this directive by designing a research project concerned with assessing the biographical characteristics of medical school applicants and medical school populations. Data was collected by a biographical inventory which became a required part of the application procedure for the Association of Canadian Medical Colleges. The criterion of acceptable and unacceptable was provided by an evaluation by the admission officers at the various medical schools.

The sample for Collishaw and Grainger's study included the base population of 5,207,800 (the population of Canadians between the ages of 15 and 19 in 1969), 3,537 applicants for admission to Canadian medical schools, and 1,867 acceptable candidates. Information on the base population was extracted from the Vital Statistics Preliminary Annual Report, 1969, a publication of the Canadian Dominion Bureau of Statistics.

Results of the Collishaw and Grainger (1972) study confirmed the homogeneity of applicant pools and thus medical school populations. Applicants differed significantly from the general population with respect to certain biographical characteristics: social status, academic achievement, age, sex, marital status and residence. The researchers stated that "if medical schools hope to respond to the call to select students from a wider cross section of society, they

must do so by attracting a more diverse group of applicants to medical schools".

Annie Ward's (1959) study at the University of Tennessee was an attempt to develop a non-cognitive test for use in the prediction of academic success at that University. The preliminary inventory included items which had shown promise in earlier biographical studies. The items were designed to fit four categories: 1) motivation, 2) personality variables, 3) home, family, and school background, and 4) work-study habits. The initial sample was the freshmen class entering the University of Tennessee in 1957. The criterion of academic success was the first quarter grade point average. The lowest 27% of the students who failed to obtain the predicted grade point average were defined as non-achievers while the 27% who had achieved the highest above the predicted grade point average were labelled as achievers. Responses to 689 alternatives in the inventory were compared for the achievers and the non-achievers with 58 items differentiating the two groups at the .05 level of confidence. These items were cross validated on the 125 students entering the University during the winter quarter of 1958. A point biserial correlation of .75 was computed between inventory scores and grade point averages. An analysis of the discriminating items of the two groups showed that most were related to an expression of academic interest. Ward (1959) concluded that a complete reevaluation of society's child rearing and educational practices is needed to affect a change in academic interest attitude.

An approach to non-intellectual assessment of medical school applicants in this country was presented to the Conference of Personality Measurement in Medical Education by Lee Shulman and Arthur Elstein (1971). These authors were not concerned with the methods of predicting medical school academic performance. Rather, their concern was with predicting performance beyond medical school; clinical competence after graduation, entry into high priority medical fields which are currently undersupplied, and patient rapport. The authors concluded that current intellectual measures are not assessing these important and desirable characteristics. They suggested that other methods of character assessment, such as personality, interest, and biographical data might prove useful in improving the student selection process. Shulman and Elstein (1971) described various means of defining and evaluating criteria variables, urging that well designed research studies in this area be initiated.

The Institute for Behavioral Research in Creativity (1968) has experimented extensively with the use of biographical information for prediction purposes. The long range goal of the Foundation has been to develop a biographical instrument which would aid in the identification of different kinds of talents deemed important for a variety of kinds of performances in academic and work settings. Early work by the Institute included creativity studies with NASA scientists and researchers (Taylor, et al., 1966). Success in this investigation generated further studies with other industrial groups. In order to establish the validity of using biographical information

to predict academic performance, a special form of the biographical inventory was constructed using items from earlier research studies but including also items designed to relate specifically to academic performance.

The restructured biographical inventory was administered to the freshmen class at Ohio University in November of 1966. Item analysis of the Biographical Inventory with first semester grade point averages resulted in cross validities of .60 for females and .58 for males in predicting academic performance. The magnitude of the relationship of the biographical inventory score to academic performance supported the hypothesis that a biographical inventory can predict various criteria in a variety of settings (Elison, et al., 1970).

Encouraged with these results, the Institute for Behavioral Research in Creativity adapted and administered the biographical inventory to a stratified random sample of 13,250 9th and 12th grade students enrolled in the North Carolina public school system. A correlation of .61 was obtained for the Biographical Inventory key with grade point average. The evaluation of the data was expanded in this study to include other variables, such as sex, race, creativity, extra curricular activities and IQ score. According to the researchers (Elison, et al., 1970), the BIB was found to be independent of age, sex and race and was a better predictor of academic performance than the other intelligence and achievement tests included in the study. The results suggest that the Biographical Inventory, in conjunction with other available

information, may contribute to more effective vocational guidance and counseling. The Biographical Inventory demonstrated that it can contribute substantially to the prediction of academic performance criterion for college admissions selection.

The biographical correlates of achievement include an area of research that has been growing rapidly. Measures of non-intellectual performance have been used to identify a wide variety of talents, including successful performance among students, scientist, salesmen, and army personnel.

Our national commitment to testing is exemplified by the growth and scope of testing programs in the United States. Goslin (1963) has estimated that there are more ability tests being given annually than there are people in the United States. In 1961 commercial test publishers sold \$11,000,000 worth of test booklets and answer sheets (Goslin, 1963). The majority of these tests are in the intellectual or achievement sphere, although an increasing use of non-intellectual measures of performance is becoming evident. This has occurred because of the proven effectiveness of these indices and their inherent absence of racial bias, a volital problem during this period of educational history.

In view of the success of biographical data inventories and the validated need for enrollment limitations for the School of Medical Technology at Michigan State University, the present study was designed to evaluate the effectiveness of a biographical inventory for prediction of academic success in the medical technology

curriculum at Michigan State University. In a practical sense, the scores from the Biographical Inventory could provide a basis for making rational decisions about the selection and advisement of students who have expressed an interest in a career as a medical technologist.

III. MATERIALS AND METHODS

3.1 Sample.

The sample consisted of 124 students applying for admission for fall term 1972 to the upper division of the School of Medical Technology, College of Human Medicine at Michigan State University. These students had accumulated a minimum of 80 credits and had completed the requirements of the first two years of the medical technology program.

3.2 Criterion.

The accumulated grade point average at the conclusion of spring term 1972 served as the measure of academic success.

3.3 Instrument.

Social science has shown that past behavior, experience, and accomplishments and acquired habits predict future behavior (Buel, 1972). Applied and theoretical psychologists, as well as social scientists, have been concerned with the development and investigation of an assortment of psychometric devices designed to facilitate the understanding of present behavior and the prediction of subsequent behavior (Siegel, 1956). One such instrument, the Biographical Information Blank (BIB) has been successful as a predictive, diagnostic and/or counseling tool (Owens, 1966).

The Biographical Information Blank is a self report test composed of multiple choice items which permit the respondent to describe

himself in terms of demographical, experiential and attitudinal variables which have been demonstrated to relate to success in a variety of social, educational and occupational pursuits. The demonstrated validity and reliability of the BIB has led many administrators to utilize this instrument when confronted with specific predictive problems. The advantages offered by this psychometric technique can be summarized as follows:

1. A biographical inventory essentially represents an extension and revision of the existing and accepted application blank. The respondent can be expected to be familiar with the format and therefore, he is generally not threatened by the information requested. Additionally, the question alternatives assist the interviewee in responding in the most self-descriptive terms and the multiple choice format aids information recall.
2. The BIB is another form of the traditional selection interview with the advantage that questions are presented in exactly the same way and the value judgments made on the responses are standardized.
3. The applicant knows historical information is verifiable. Therefore, such knowledge discourages misrepresentation of facts. Studies by Mosel and Cozan (1952) and Keating, et al. (1950) reported r 's ranging from 0.90 to 0.99 between information provided by the applicant and that obtained from previous employers.

4. Faking or falsification of biographical information may not be expected to be a significant problem as it can be in other personality tests. There is little chance that the respondent knows the historical attributes associated with the "success" criterion; that is, the "right" or "acceptable" answer is not as obvious as with other questionnaire forms. Klein and Owens (1965) investigated the faking of a scored life history blank as a function of the criterion objectivity. They asserted that biographical inventories are least susceptible to faking if based on objective criterion rather than on a subjective evaluation, i.e. a rating.
5. The biographical inventory is a good exploratory device. Discriminating items may suggest other means for assessment in subsequent selection studies. For example, an item differentiating "successful" from "unsuccessful" medical technologists might deal with an expressed interest in science. This might suggest further experimentation with vocational interest tests.
6. The empirical derivation of both items and scoring keys assumes that only questions relevant to the predicted success criterion will be asked and that answers will be evaluated only in terms of their relationship to "success". Therefore, there can be no justifiable complaints of willful discrimination

against minority groups. Ellison, et al. (1970) found a correlation of .02 between the Biographical Inventory Academic Performance score and the variable of race. These results indicate a lack of racial discrimination as contrasted to other conventional approaches attempting the identification of talent.

7. The biographical inventory is easy and inexpensive to administer. The multiple choice questionnaire may be completed in approximately an hour and the answer sheets can be scored on most college computer testing programs.

The Biographical Data Inventory (Appendix D) for this study consisted of 84 items selected from A Catalog of Life History Items (Glennon, et al. 1966). All items had been previously validated in studies by the Institute for Behavioral Research in Creativity, an organization which has extensively used biographical information in a number of predictive studies. Although most items were taken verbatim from the Catalog, in a few instances the question and alternatives were altered to relate specifically to the college situation.

3.4 Procedure.

An 84 item Biographical Data Inventory was administered to 124 sophomore students at Michigan State University who were applying for admission to the upper division of the School of Medical Technology for fall term 1972. The questionnaire was a part of a battery of tests given during a general testing session. The students were

advised that participation in the experiment was voluntary and the results would have no effect on their admission to the medical technology program. The students were informed that the purpose of the questionnaire was to collect information which would be analyzed and incorporated into the selection procedure for future classes.

The questionnaire was reproduced in the form of reuseable mimeographed booklets and the responses were recorded on MSU standardized test answer blanks. The test was not timed. The time required to complete the inventory ranged from 20 minutes to 1 hour and 15 minutes, with most students finishing in 45 minutes.

3.5 Statistical Analysis.

3.51 Index of Discrimination.

An item analysis was made on the CDC 6500 computer for each of the biographical item alternatives with the criterion variable (grade point average). Approximately two thirds (79) of the total sample was randomly selected for the purpose of computing an index of discrimination for each item alternative. A hold out group ($N = 45$) was set aside for cross validation purposes.

To compute an index of discrimination for each item alternative, the upper and lower 27% of the sample (on the basis of the criterion variable grade point average) were selected. Each group consisted of 22 students. Truman Kelley (1939) has demonstrated that when extreme groups, each consisting of approximately 27% of the total

group, are used the ratio of the differences in responses of the groups to the standard error of their differences is maximum. Twenty seven percent from each group provides the best compromise in making the extreme groups as large as possible and as different as possible (Kelley, 1939).

A frequency table was than tabulated for each of the biographical items, consisting of the number of responses from the upper group (U) and responses of the lower group (L). The index of discrimination (D) was determined by subtracting the count of responses of the lower group from the count of responses of the upper group and dividing the difference by the maximum possible difference (the number of students in the upper (lower) group). The quotient, expressed as a decimal fraction, was the index of discrimination:

$$D = \frac{U - L}{n}$$

After the index of discrimination was computed for each item alternative, the items were screened for the selection of the most highly discriminating items for inclusion in the new biographical key. Experience with the index of discrimination has suggested that discrimination can be evaluated in the following terms (Ebel, 1965):

<u>Index of Discrimination (D)</u>	<u>Item Evaluation</u>
.40 and up	Very good item
.30 to .39	Reasonably good item
.20 to .29	Marginal item
Below .19	Poor item

Alternatives with a D of .40 and up were assigned a weight of + 2,

while foils with a D of .30 to .39 were weighted ± 1 . Item alternatives with a D of .0 to .29 were assigned 0 value since they did not contribute to the differentiation of the two criteria groups.

3.52 Cross Validation.

In constructing a new biographical scoring key for the analysis of biographical data to predict the criterion, the emphasis is placed on obtaining a high cross validity coefficient for the key in predicting that criterion on an independent sample. This is a function of four parameters (Elison, et al. 1970): 1) the number of items, 2) the magnitude of the index of discrimination (D) of the individual alternatives with the criterion variable, 3) the expected stability of the item alternative's discrimination, and 4) item heterogeneity. In building the revised biographical key to predict the criterion, cut off levels for biographical item scoring and retention for the scoring key required a D of .30 or better. This level allowed that a sufficient number of items would be retained, the items selected would be reliable and because the number of items selected would be large, some item heterogeneity would also be obtained.

Following the generation of the new biographical key, the responses of the hold out group (N = 45) were evaluated in order to estimate the predictive effectiveness of the revised biographical inventory on an independent sample. A separate group was used for cross validation analysis because the use of the same group for the development of the scoring key and the application of weights to

item alternatives produces results which are spuriously high. Therefore, to obtain an accurate estimation of the effectiveness of the revised biographical inventory to predict grade point average, a hold out group was used for cross validation. A Pearson Product Moment correlation was computed between score on the revised biographical inventory and the criterion variable, grade point average. (Games and Klare, 1967)

$$P_{xy} = \frac{\sum xy}{\sum x^2 \cdot \sum y^2} \quad (\text{Games and Klare, 1967})$$

It was assumed that these two variables were reasonably continuous.

IV. RESULTS

It was the purpose of this study to evaluate the effectiveness of a biographical inventory to predict academic success for medical technology students. An 84 item biographical data inventory was administered to 124 students applying for admission to the upper division of the School of Medical Technology for fall term, 1972. An item analysis was made to determine which alternatives were answered differently by students who had achieved a high grade point average from those with a low grade point average. To accomplish this, the responses of 79 students (randomly selected from the total sample) were used for the purpose of generating an index of discrimination (D) and a weighted score for each item alternative. D was computed from a frequency table (Table 1) based on a tabulation of the responses of the upper group (highest 27% on the criterion variable) and the lower group (lowest 27% on the criterion variable). The index of discrimination (Table 2) expressed as a decimal fraction, was used for assigning the scoring weights. An alternative with a D value of .30 to .39 was assigned a weight of + 1, whereas, alternatives with D of .40 or higher were assigned a + 2 value. Alternatives with a D of 0 to .29 were assigned 0 weight since they did not contribute to the differentiation of the criteria groups (Table 3). Forty one items contained at least one weighted alternative and these items were retained for

Table 1. Frequency Table for Upper and Lower Criteria Groups

Item No.	Item Alternatives					
	1	2	3	4	5	6
1	21/22	1/ 0	0/ 0	0/ 0	0/ 0	0/ 0
2	20/22	0/ 0	1/ 0	0/ 0	0/ 0	1/ 0
3	21/22	1/ 0	0/ 0	0/ 0	0/ 0	0/ 0
4	12/12	7/ 9	2/ 1	1/ 0	0/ 0	0/ 0
5	15/18	6/ 4	0/ 0	1/ 0	0/ 0	0/ 0
6	2/ 3	4/ 2	4/ 7	11/ 9	1/ 1	0/ 0
7	0/ 0	9/ 7	7/12	6/ 3	0/ 0	0/ 0
8	13/ 7	0/ 0	5/10	4/ 5	0/ 0	0/ 0
9	10/ 8	9/13	2/ 1	1/ 0	0/ 0	0/ 0
10	5/ 3	8/ 8	6/ 8	3/ 2	0/ 1	0/ 0
11	1/ 2	19/15	0/ 0	2/ 5	0/ 0	0/ 0
12	3/ 1	14/16	5/ 5	0/ 0	0/ 0	0/ 0
13	3/ 3	15/14	4/ 3	0/ 1	0/ 0	0/ 1
14	1/ 0	12/11	8/10	1/ 0	0/ 0	0/ 1
15	3/ 0	8/ 6	11/14	0/ 0	0/ 1	0/ 1
16	5/ 4	7/ 6	8/10	1/ 0	0/ 0	1/ 2
17	10/ 8	9/13	1/ 0	2/ 0	0/ 0	0/ 1
18	2/ 3	16/17	2/ 1	2/ 1	0/ 0	0/ 0
19	7/10	0/ 0	15/12	0/ 0	0/ 0	0/ 0
20	13/13	9/ 9	0/ 0	0/ 0	0/ 0	0/ 0
21	9/ 7	12/15	1/ 0	0/ 0	0/ 0	0/ 0
22	5/ 5	17/17	0/ 0	0/ 0	0/ 0	0/ 0
23	5/ 6	0/ 1	10/ 1	7/13	0/ 1	0/ 0
24	17/19	5/ 2	0/ 0	0/ 0	0/ 0	0/ 1
25	4/ 7	4/ 1	10/ 9	3/ 5	0/ 0	1/ 0
26	0/ 0	13/20	9/ 1	0/ 0	0/ 0	0/ 1
27	13/17	8/ 4	1/ 0	0/ 0	0/ 0	0/ 1
28	10/17	8/ 2	1/ 2	3/ 0	0/ 0	0/ 1
29	21/19	0/ 1	0/ 0	0/ 1	1/ 0	0/ 1
30	2/ 5	3/ 4	5/ 6	10/ 6	1/ 0	1/ 1
31	0/ 1	1/ 1	19/16	2/ 4	0/ 0	0/ 0
32	11/14	10/ 7	1/ 1	0/ 0	0/ 0	0/ 0
33	11/11	4/ 5	6/ 6	0/ 0	0/ 0	1/ 0
34	13/16	2/ 1	5/ 5	1/ 0	1/ 0	0/ 0
35	8/10	8/10	5/ 1	1/ 1	0/ 0	0/ 0
36	0/ 0	11/18	9/ 4	2/ 0	0/ 0	0/ 0
37	4/ 5	14/14	4/ 3	0/ 0	0/ 0	0/ 0
38	3/ 2	12/15	7/ 5	0/ 0	0/ 0	0/ 0
39	4/12	1/ 0	7/ 3	10/ 7	0/ 0	0/ 0
40	1/ 3	5/ 7	11/ 9	5/ 2	0/ 0	0/ 1
41	0/ 0	12/12	1/ 2	9/ 7	0/ 0	0/ 1
42	0/ 0	4/ 0	8/ 4	9/18	0/ 0	1/ 0
43	13/10	4/11	5/ 1	0/ 0	0/ 0	0/ 0
44	1/ 2	13/17	5/ 3	3/ 0	0/ 0	0/ 0
45	8/ 8	12/10	2/ 3	0/ 1	0/ 0	0/ 0

Table 1 (cont'd.)

Item No.	Item Alternatives					
	1	2	3	4	5	6
46	12/15	8/ 7	2/ 0	0/ 0	0/ 0	0/ 0
47	4/11	10/ 7	7/ 3	1/ 0	0/ 0	0/ 1
48	4/12	14/ 8	4/ 1	0/ 0	0/ 0	0/ 1
49	4/ 7	4/ 2	13/ 9	1/ 4	0/ 0	0/ 0
50	5/ 2	4/ 2	3/10	10/ 7	0/ 0	0/ 1
51	11/12	6/ 7	0/ 0	5/ 3	0/ 0	0/ 0
52	15/10	1/ 0	5/ 9	1/ 2	0/ 0	0/ 1
53	1/ 0	3/ 3	1/ 0	16/19	1/ 0	0/ 0
54	9/11	7/ 5	2/ 5	4/ 0	0/ 0	0/ 1
55	4/ 1	10/13	8/ 8	0/ 0	0/ 0	0/ 0
56	6/ 6	13/13	2/ 2	1/ 0	0/ 0	0/ 1
57	0/ 0	7/ 5	11/12	4/ 4	0/ 0	0/ 1
58	3/ 4	19/16	0/ 0	0/ 1	0/ 0	0/ 1
59	6/11	3/ 3	2/ 2	7/ 3	1/ 1	3/ 2
60	12/13	4/ 1	5/ 6	1/ 1	0/ 0	0/ 1
61	1/ 1	17/14	4/ 5	0/ 1	0/ 0	0/ 1
62	2/ 2	14/18	3/ 1	3/ 0	0/ 0	0/ 1
63	9/ 9	11/11	2/ 2	0/ 0	0/ 0	0/ 0
64	0/ 1	0/ 2	9/ 4	13/14	0/ 0	0/ 1
65	8/ 9	2/ 5	5/ 2	7/ 5	0/ 0	0/ 1
66	4/ 3	7/ 5	0/ 0	11/14	0/ 0	0/ 0
67	7/ 2	15/17	0/ 1	0/ 2	0/ 0	0/ 0
68	6/ 2	9/ 9	4/ 7	3/ 4	0/ 0	0/ 0
69	6/ 5	3/ 4	12/12	1/ 1	0/ 0	0/ 0
70	8/ 8	6/ 8	1/ 1	7/ 4	0/ 1	0/ 0
71	9/ 3	10/12	3/ 6	0/ 0	0/ 0	0/ 1
72	0/ 0	11/ 9	7/ 6	4/ 6	0/ 0	0/ 1
73	3/ 1	10/ 3	9/18	0/ 0	0/ 0	0/ 0
74	4/ 2	5/ 5	12/12	0/ 2	0/ 0	1/ 1
75	3/ 4	5/ 9	12/ 6	2/ 3	0/ 0	0/ 0
76	12/12	6/ 2	2/ 2	2/ 6	0/ 0	0/ 0
77	3/ 0	15/11	4/10	0/ 0	0/ 0	0/ 1
78	4/ 2	10/ 9	8/10	0/ 0	0/ 0	0/ 1
79	7/15	0/ 0	14/ 6	1/ 1	0/ 0	0/ 0
80	0/ 1	5/ 2	9/ 5	3/ 7	4/ 5	1/ 2
81	3/ 4	10/ 2	3/ 5	3/ 7	3/ 4	0/ 0
82	1/ 4	12/ 6	4/ 5	4/ 4	1/ 3	0/ 0
83	1/ 1	5/ 2	5/ 4	4/ 9	7/ 6	0/ 0
84	9/ 9	3/ 6	6/ 5	3/ 0	1/ 2	0/ 0

Table 2. Indices of Discrimination

Item No.	Item Alternatives				
	1	2	3	4	5
1	.0233	.0000	.0000	.0000.	.0000
2	.0476	.0000	.0000	.0000	.0000
3	.0233	.0000	.0000	.0000	.0000
4	.0000	.1250	.0000	.0000	.0000
5	.0909	-.2000	.0000	.0000	.0000
6	.2000	-.3333	.2727	-.1000	.0000
7	.0000	-.1250	.2632	-.3333	.0000
8	-.3000	.0000	.3333	.1111	.0000
9	-.1111	.1818	.0000	.0000	.0000
10	-.2500	.0000	.1429	-.2000	.0000
11	.0000	-.1176	.0000	.4286	.0000
12	.0000	.0667	.0000	.0000	.0000
13	.0000	-.0345	-.1429	.0000	.0000
14	.0000	-.0435	.1111	.0000	.0000
15	.0000	-.1429	.1200	.0000	.0000
16	-.1111	-.0769	.1111	.0000	.0000
17	-.1111	.1818	.0000	.0000	.0000
18	.2000	.0303	.0000	.0000	.0000
19	.1765	.0000	-.1111	.0000	.0000
20	.0000	.0000	.0000	.0000	.0000
21	-.1250	.1111	.0000	.0000	.0000
22	.0000	.0000	.0000	.0000	.0000
23	.0909	.0000	-.8182	.3000	.0000
24	.0556	-.4286	.0000	.0000	.0000
25	.2727	-.6000	-.0526	-.2500	.0000
26	.0000	.2121	-.8000	.0000	.0000
27	.1333	-.3333	.0000	.0000	.0000
28	.2593	-.6000	.0000	.0000	.0000
29	-.0500	.0000	.0000	.0000	.0000
30	.4286	.1429	.0909	.2500	.0000
31	.0000	.0000	-.0857	.3333	.0000
32	.1200	-.1765	.0000	.0000	.0000
33	.0000	.1111	.0000	.0000	.0000
34	.1034	.0000	.0000	.0000	.0000
35	.1111	.1111	-.6667	.0000	.0000
36	.0000	.2414	-.3846	.0000	.0000
37	.1111	.0000	-.1429	.0000	.0000
38	-.2000	.1111	-.1667	.0000	.0000
39	.5000	.0000	-.4000	-.1765	.0000
40	.0000	.1667	-.1000	-.4286	.0000
41	.0000	.0000	.0000	-.1250	.0000
42	.0000	.0000	-.3333	.3333	.0000
43	-.1304	.4667	-.6667	.0000	.0000
44	.0000	.1333	-.2500	.0000	.0000
45	.0000	-.0909	.2000	.0000	.0000

Table 2 (cont'd.)

Item No.	Item Alternatives				
	1	2	3	4	5
46	.1111	-.0667	.0000	.0000	.0000
47	.4667	-.1765	-.4000	.0000	.0000
48	.5000	-.2727	-.6000	.0000	.0000
49	.2727	-.3333	-.1818	.6000	.0000
50	-.4286	-.3333	.5385	-.1765	.0000
51	.0435	.0769	.0000	-.2500	.0000
52	-.2000	.0000	.2857	.0000	.0000
53	.0000	.0000	.0000	.0857	.0000
54	.1000	-.1667	.4286	.0000	.0000
55	-.6000	.1304	.0000	.0000	.0000
56	.0000	.0000	.0000	.0000	.0000
57	.0000	-.1667	.0435	.0000	.0000
58	.1429	-.0857	.0000	.0000	.0000
59	.2941	.0000	.0000	-.4000	.0000
60	.0400	-.6000	.0909	.0000	.0000
61	.0000	-.0968	.1111	.0000	.0000
62	.0000	.1250	.0000	.0000	.0000
63	.0000	.0000	.0000	.0000	.0000
64	.0000	.0000	-.3846	.0370	.0000
65	.0588	.4286	-.4286	-.1667	.0000
66	-.1429	-.1667	.0000	.1200	.0000
67	-.5556	.0625	.0000	.0000	.0000
68	-.5000	.0000	.2727	.1429	.0000
69	-.0909	.1429	.0000	.0000	.0000
70	.0000	.1429	.0000	-.2727	.0000
71	-.5000	.0909	.3333	.0000	.0000
72	.0000	-.1000	-.0769	.2000	.0000
73	.0000	-.5385	.3333	.0000	.0000
74	-.3333	.0000	.0000	.0000	.0000
75	.1429	.2857	-.3333	.2000	.0000
76	.0000	-.5000	.0000	.5000	.0000
77	.0000	-.1538	.4286	.0000	.0000
78	-.3333	-.0526	.1111	.0000	.0000
79	.3636	.0000	-.4000	.0000	.0000
80	.0000	-.4286	-.2857	.4000	.1111
81	.1429	-.6667	.2500	.4000	.1429
82	.6000	-.3333	.1111	.0000	.0000
83	.0000	-.4286	-.1111	.3846	-.0769
84	.0000	.3333	-.0909	.0000	.0000

Table 3. Weights for Test Items

Item No.	Item Alternatives				
	1	2	3	4	5
1	0	0	0	0	0
2	0	0	0	0	0
3	0	0	0	0	0
4	0	0	0	0	0
5	0	0	0	0	0
6	0	-1	0	0	0
7	0	0	0	-1	0
8	0	0	1	0	0
9	0	0	0	0	0
10	0	0	0	0	0
11	0	0	0	2	0
12	0	0	0	0	0
13	0	0	0	0	0
14	0	0	0	0	0
15	0	0	0	0	0
16	0	0	0	0	0
17	0	0	0	0	0
18	0	0	0	0	0
19	0	0	0	0	0
20	0	0	0	0	0
21	0	0	0	0	0
22	0	0	0	0	0
23	0	0	-2	0	0
24	0	-2	0	0	0
25	0	-2	0	0	0
26	0	0	-2	0	0
27	0	-1	0	0	0
28	0	-2	0	0	0
29	0	0	0	0	0
30	2	0	0	0	0
31	0	0	0	1	0
32	0	0	0	0	0
33	0	0	0	0	0
34	0	0	0	0	0
35	0	0	-2	0	0
36	0	0	-1	0	0
37	0	0	0	0	0
38	0	0	0	0	0
39	2	0	-1	0	0
40	0	0	0	-2	0
41	0	0	0	0	0
42	0	0	-1	1	0
43	0	2	2	-2	0
44	0	0	0	0	0

Table 3 (cont'd.)

Item No.	Item Alternatives				
	1	2	3	4	5
45	0	0	0	0	0
46	0	0	0	0	0
47	2	0	-1	0	0
48	2	0	-2	0	0
49	0	-1	0	2	0
50	-2	-1	2	0	0
51	0	0	0	0	0
52	0	0	0	0	0
53	0	0	0	0	0
54	0	0	2	0	0
55	-2	0	0	0	0
56	0	0	0	0	0
57	0	0	0	0	0
58	0	0	0	0	0
59	0	0	0	0	0
60	0	-2	0	-1	0
61	0	0	0	0	0
62	0	0	0	0	0
63	0	0	0	0	0
64	0	0	-1	0	0
65	0	2	-2	0	0
66	0	0	0	0	0
67	-2	0	0	0	0
68	-2	0	0	0	0
69	0	0	0	0	0
70	0	0	0	0	0
71	-2	0	1	0	0
72	0	0	1	0	0
73	0	-2	1	0	0
74	-1	0	-1	0	0
75	0	0	-1	0	0
76	0	-2	2	0	0
77	0	0	0	0	0
78	-1	0	0	0	0
79	1	0	-1	0	0
80	0	-2	0	1	0
81	0	-2	0	1	0
82	2	-1	0	0	0
83	0	-2	0	1	0
84	0	1	0	0	0

the revised biographical scoring key.

The effectiveness of the revised biographical inventory key in predicting the grade point average of an independent sample of students was evaluated. The randomly selected hold out group of 45 students was used for this purpose. The responses of the hold out group on the discriminating items were analyzed and a total score for each student was compiled, based on the weighted item values. The students' biographical inventory scores were correlated with grade point averages and a Pearson Product Moment correlation of .5131 was computed (Table 4).

Table 4. Cross Validation

Student	Grade Point Average	Score
4	3.23	5
6	2.18	1
7	3.18	8
10	3.21	-4
11	1.90	4
13	1.97	3
14	2.61	-6
20	2.79	5
21	3.41	0
23	2.66	5
27	3.24	6
34	2.60	1
35	2.14	-2
36	3.24	3
38	1.88	-9
40	3.29	7
44	3.37	7
53	2.49	4
55	3.45	11
56	2.97	3
57	3.10	2
58	3.29	10
60	3.25	2
63	2.80	0
65	3.97	5
66	3.85	10
67	2.17	3
77	2.68	5
81	3.24	7
82	3.27	15
83	2.42	4
91	2.89	1
93	2.70	-13
94	3.13	8
97	2.61	2
100	2.27	-1
101	2.68	-2
107	2.29	5
109	3.25	15
110	2.24	-12
116	2.64	-10
119	2.86	5
120	1.86	-3
121	3.04	2
123	3.03	9

Correlation using G.P.A. with test score was .5131

V. SUMMARY

5.1 Discussion.

The School of Medical Technology at Michigan State University is faced with a burgeoning student enrollment at a time when employment and internship opportunities for its graduates are declining. This imbalance between the number of students being trained and the number of entrants needed by the profession has occurred for several reasons:

1. Increased student enrollment.

Restriction of the number of students accepted in some university programs has forced many students to search for other professions which offer a promise of employment upon graduation. Prior to the 1970's, the demand for medical technologists exceeded the supply of well trained laboratory personnel, in fact, recruitment efforts were still being made to encourage students to enter the profession. Only within the last few years, and after significant increases in the numbers of students committed to medical technology programs, has the surplus of trainees been discovered.

2. Decrease in internship and job positions.

(a) Efforts to reduce hospital operating costs have affected the utilization of medical technologists in the hospital laboratory. Hospital administrators are recruiting

an increased number of laboratory technicians (two year program graduates) to perform the more routine laboratory duties previously assigned to technologists. The laboratory technician commands a lower salary than the graduate technologist, thus, health care costs considerations are affecting the number of available laboratory positions for the medical technologist.

(b) Advances in technology have relegated many laboratory procedures and analysis to computers and machines. Automated equipment now performs many tests more rapidly and accurately than was formerly possible by the technologist. This has further reduced the number of technologists required to staff hospital laboratories.

(c) Changing social and economic conditions have affected the turnover rate of laboratory personnel. In a traditionally female dominated profession it is becoming increasingly socially acceptable and economically necessary for a medical technologist to remain in her position for a longer period of time, thus further reducing the number of positions available.

Increased student enrollment in the School of Medical Technology at Michigan State University has been accompanied by a minimal adjustment in fiscal support for the School. A federally supported National Institute of Health grant awarded to the School continuously since 1967 was terminated in 1972 due to the lack of funding for

such programs. This grant had previously supported personnel, equipment and supply requirements of the academic departments involved in the education of medical technology students.

University fiscal support has failed to keep pace with the increased costs of educating an increased student enrollment. Over the past years, class sizes have doubled necessitating additional laboratory sections with the accompanying increased need for supporting faculty, supply and equipment resources; advisement responsibilities have grown as have administrative duties and functions, all of which require additional financial support. The University general funds provided for medical technology education have not increased in proportion to the needs engendered by increased School enrollment.

Reduced financial support in the face of increased operating costs has possibly compromised the quality of the medical technology program at Michigan State. Dilution of an effective curriculum is occurring: courses are being eliminated from the requirements, others with oversubscribed laboratory sections are not able to offer students the faculty direction they require, while still others are limiting the number of medical technology students which may enroll. Education of large numbers of students by compromising the quality of the instructional program is not within the scope of sound educational theory, particularly when the placement opportunities for graduates are limited.

Administrators of the School of Medical Technology at Michigan State can justify limiting the number of students they accept into

the program but they are presently concerned with the means of defining and identifying those students who have the motivation, personal characteristics and aptitude to successfully complete the program. It is necessary to identify these students early in their university career, when the traditionally used college grade point average has not been established. Admission interviews would place an additional burden on an already overtaxed staff, while the interview is of questionable predictive value.

Numerous studies have reported that biographical data can be successfully used as a means of predicting academic achievement. The goal of this study was to develop a biographical inventory for predicting academic performance for students in the Medical Technology program at Michigan State University.

An 84 item Biographical Data Inventory was administered to 124 sophomore students at Michigan State University who were applying for admission to the upper division of the School of Medical Technology for fall term 1972. Each item was analyzed for its ability to identify the good students from the poorer students. Forty one items survived the analysis and had alternatives which discriminated at the .30 level or better. After the discriminating items had been identified, the students in a hold out group ($N = 45$) were scored on these responses for cross validation purposes. The revised biographical inventory score correlated .51 with sophomore grade point average.

The correlation obtained between the biographical data

inventory score and the criterion of grade point average was sufficiently high to warrant its inclusion in a procedure for making rational decisions in the advisement and selection of medical technology students. The validated Biographical Data Inventory could be administered at the freshmen level and in combination with other aptitude and achievement data, be used as an advisement tool for students who have expressed a preference for the medical technology program at Michigan State. Aspirants could be spared some of the disappointment, frustration and expense associated with an incorrect vocational choice and the University could be relieved of the expense of educating abortive students in costly laboratory courses. Faculty efforts and resources could be better utilized in enhancing the education of those students deemed most likely to successfully complete the medical technology program. Finally, by limiting enrollment to those students who are most likely to succeed in the program, academic trainee figures would more closely meet employment and internship opportunities.

5.2 Limitations and Implications for Further Research.

Increased student enrollment in the Medical Technology program at Michigan State University is a situation not unique to this Institution. Similar growth patterns at other educational institutions have been reported in local and national surveys (Brooks and Blume, 1973; ASCP Newsletter 17, 1973). These studies have also found that the number of employment opportunities and internship positions have stabilized and in some instances are

declining. Therefore, for the first time in the history of medical technology education, this imbalance weighs against the prospective employee. Excesses of student graduates occurred first in 1972 and it may be expected to become even more serious if efforts are not directed towards checking current enrollment trends.

National and institutional concern with this problem is mounting as administrators of academic programs begin searching for measures which will ferret out the particular abilities, interests and personality qualities characteristic of the most "successful" medical technology student. By judiciously limiting student enrollment in educational institutions and filling these programs with those students most likely to succeed, we may come closer to establishing a balance between the output of the educational institutions and the practical needs of the profession.

It was the purpose of this study to examine the predictive power of a biographical data inventory in identifying students who are most likely to succeed in the medical technology program at Michigan State University. The reported success of the BIB in predicting academic success suggests that other institutions might profit from the application of a similar inventory for the advisement and selection of their students. However, because of the small number of students included in this study, the differences among academic institutions in relation to program requirements, and the unique characteristics of students selecting a particular educational institution, the results of this study are limited

to Michigan State University's School of Medical Technology. It is suggested that other institutions undertake their own research programs before incorporating a biographical inventory into their selection and/or advisement procedure. It is hoped that the results reported here may serve as a guide in these efforts.

In addition to the academic training a student receives at the college or university level, a medical technologist must complete a year internship in a hospital School of Medical Technology in order to achieve the clinical skills and techniques required for certification by the American Society of Clinical Pathologists. Increased numbers of student applicants at this level of training has made it necessary for hospital administrators to examine new ways of assessing student talent and potential. The success of the Biographical Data Inventory at the academic level suggests that biographical information might lend power to the selection procedures for hospital training. A study is currently in progress at Michigan State University to investigate the use of biographical information as a possible predictor of clinical performance. Positive results from this research could add another dimension to the use of biographical information in the advisement and selection of medical technology students.

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APPENDICES

APPENDIX A

CURRICULUM FOR THE SCHOOL OF MEDICAL TECHNOLOGY

Optional Tracks

- I. The SCIENCE track is appropriate for students who are interested in a career in research or in developing more highly skilled laboratory techniques. It is also an excellent preparation for graduate work in Chemistry or Microbiology. It includes courses in Calculus, Organic and Physical Chemistry, and a concentration in Microbiology.
- II. The CLINICAL track leads to an overall competency in Medical Technology but has no particular emphasis. It would be most appropriate for students who are interested in the clinical aspects of Medical Technology. It includes courses in Inorganic Chemistry, Anatomy, Physiology and Physics. The Senior year of this track is devoted to clinically oriented courses in Pathology, Microbiology, Biochemistry, and Medical Mycology.
- III. The BEHAVIORAL SCIENCE track is designed to meet the objectives of students who would like to work with people in a supervisory capacity, such as manager of a laboratory. It also satisfies the course requirements for application to the Colleges of Human and Osteopathic Medicine at M.S.U.
- IV. The ANIMAL SCIENCE track is appropriate for students who enjoy working with animals. It offers training in those skills necessary for work in animal research, a large animal hospital or clinic, and at the same time, prepares a student for application to the College of Veterinary Medicine at M.S.U.

APPENDIX A (cont'd.)

SCIENCE TRACK

Freshmen

Am. Thgt. & Lang.	121	Am. Thgt. & Lang.	122	Am. Thgt. & Lang.	123
Gen'l. Chem.	130	Gen'l. Chem.	131	Soc. Sci.	212
Math. (Algebra)	108	Chem. Lab.	161	Math. (Cal. I)	112
Psychology	160	Math. (Alg. & Trig)	109	Computer Sci.	120
		Soc. Sci.	211		

Sophomore

Med. Tech. Sem.	201	Biol. Sci.	211	Biol. Sci.	212
Organic Chem.	241	Organic Chem.	242	Organic Chem.	245
Math. (Cal. II)	113	Physics Lec.	238	Anatomy (Gross)	316
Physics Lec.	237	Physics Lab.	258	Physics Lec.	239
Physics Lab.	257			Physics Lab.	259

Junior

Biochem.	401	Elective		Soc. Sci.	213
Zoology (Genetics)	441	Physiology	331	Humanities	233
Humanities	231	Humanities	232	Physiology	332
Chem. (Quant.)	162	Statistics	421	Elective	

Senior

Med. Tech. Sem.	401	Micro. (Immuno.)	427	Micro. (Immun. Chem)	827
Micro. (Gen'l.)	401	Biochem. Lab.	404	Micro. (Immun. Lab.)	828
Micro. Lab	402	Chem. (Qual.)	163	Chem. (instr.)	333
Chem. (Physical)	383	Elective		Pathology	407
Pathology	404				

APPENDIX A (cont'd.)

CLINICAL TRACK

Freshmen

Am. Thgt. & Lang.	121	Am. Thgt. & Lang.	122	Am. Thgt. & Lang.	123
Gen'l. Chem	130	Gen'l. Chem.	131	Soc. Sci.	211
Math. (Algebra)	108	Chem. Lab.	161	Computer Sci.	110
Psychology	160	Math. (Alg. & Trig.)	109	Statistics	201
		Elective			

Sophomore

Med. Tech. Sem.	201	Biol. Sci.	211	Biol. Sci.	212
Organic Chem.	241	Organic Chem.	242	Organic Chem.	245
Soc. Sci.	212	Physics Lec.	238	Physics Lec.	239
Physics Lec.	237	Physics Lab.	258	Physics Lab.	259
Physics Lab.	257	Elective		Anatomy (Gross)	316

Junior

Biochem.	401	Soc. Sci.	213	Chem. (Quant.)	162
Anatomy (Hist.)	420	Physiology	331	Physiology	332
Humanities	231	Humanities	232	Humanities	233
		Zoology (Genetics)	341	Micro. (Gen'l.)	301
				Micro. Lab	302

Senior

Med. Tech. Sem.	401	Micro. (Immuno.)	427	Micro. (Infect.)	429
Pathology	404	Pathology	407	Clinical Biochem.	363
Micro. (Parasit.)	436	Elective		Botany (Med. Mycol.)	406
Elective				Elective	

APPENDIX A (cont'd.)

BEHAVIORAL SCIENCE TRACK

Freshmen

Am. Thgt. & Lang.	121	Am. Thgt. & Lang.	122	Am. Thgt. & Lang.	123
Gen'l. Chem.	130	Gen'l. Chem.	131	Soc. Sci.	211
Math. (Algebra)	108	Chem. Lab.	161	Computer Sci.	110
Psychology	160	Math. (Alg. & Trig)	109	Statistics	201
		Elective			

Sophomore

Med. Tech. Sem.	201	Biol. Sci.	211	Biol. Sci.	212
Organic Chem.	241	Organic Chem.	242	Organic Chem.	245
Physics Lec.	237	Physics Lec.	238	Physics Lec.	239
Physics Lab.	257	Physics Lab.	258	Physics Lab.	259
Soc. Sci.	212	Elective		Anatomy (Gross)	316

Junior

Psych. (Personal.)	225	Sociology	241	Soc. Sci.	213
Biochemistry	401	Physiology	331	Physiology	332
Zoology (Genetics)	441	Humanities	232	Micro. (Gen'l.)	301
Humanities	231	Elective		Micro. Lab.	302
				Elective	

Senior

Med. Tech. Sem.	401	Chem. (Quant.)	162	Botany (Med. Mycol.)	406
Pathology	404	Pathology	407	Clinical Biochem.	363
Micro. (Parasit.)	436	Sociology	351	Micro. (Infect.)	429
Humanities	233	Elective		Elective	

APPENDIX A (cont'd.)

ANIMAL SCIENCE TRACK

Freshmen

Am. Thgt. & Lang.	121	Am. Thgt. & Lang.	122	Am. Thgt. & Lang.	123
Gen'l. Chem.	130	Gen'l. Chem.	131	Soc. Sci.	212
Math. (Algebra)	108	Chem. Lab.	161	Dairy Sci.	214
Animal Husbandry	111	Math. (Alg. & Trig)	109	Poultry Sci.	224
		Soc. Sci.	211		

Sophomore

Med. Tech. Sem.	201	Biol. Sci.	211	Biol. Sci.	212
Humanities	231	Humanities	232	Humanities	233
Organic Chem.	241	Organic Chem.	242	Zool. (Embryo.)	317
Physics Lec.	237	Physics Lec.	238	Zool. Lab.	318
Physics Lab.	257	Physics Lab.	258	Physics Lec.	239
Soc. Sci.	213			Physics Lab.	259

Junior

Zoology (Genetics)	441	Chem. (Quant.)	162	Pharmacology	350
Physiology	401	Physiology	402	Zool. (Vert. Beh.)	413
Anatomy (Hist.)	420	Computer Sci.	110	Statistics	201
		Zoo. (Invert. Beh.)	381		

Senior

Med. Tech. Sem.	401	Office Admin.	370	Bot. (Med. Mycol.)	406
Pathology	404	Micro. (Parasit.)	416	Clinical Biochem.	363
Biochem.	401	Micro. (Immuno.)	427	Micro. (Infect.)	429
Micro. (Gen'l.)	301	Elective			
Micro Lab.	302				
Lab. Animal Res.	824				

APPENDIX B

QUESTIONNAIRE FOR HOSPITAL SCHOOL PROGRAMS

Name of hospital school _____

1. With how many academic institutions is the hospital school affiliated?
2. With how many academic institutions do you have a formal, signed agreement?
3. With how many of these institutions does the pathologist or director hold an academic appointment?
4. Are there reciprocal visits between the university and hospital laboratory staffs?
5. How many times a year do these visits occur?
6. What is the maximum approved enrollment number in your program?
7. How many students completed the internship program in each of the following years?
 1. 1971
 2. 1970
 3. 1969
 4. 1968
 5. 1967
8. How many students are presently enrolled in the internship program?
9. What is the projected enrollment in the internship program for the next five year period?
10. What percentage of your students are from affiliated schools or colleges?
 1. 0-25%
 2. 25-50%
 3. 50-75%
 4. 75-100%

APPENDIX B (cont'd.)

11. What percentage of your students are in-state students?
 1. 0-25%
 2. 25-50%
 3. 50-75%
 4. 75-100%
12. How many of your graduates, in each of the following years, found employment as medical technologists within one month of graduation?
 1. 1971
 2. 1970
 3. 1969
 4. 1968
 5. 1967
13. How many of your 1972 graduates have commitments for or have secured employment as medical technologists?
14. What percentage of your graduates are initially employed in state?
 1. 0-25%
 2. 25-50%
 3. 50-75%
 4. 75-100%
15. What percentage of your graduates, for the last 5 year period, have initially been employed in:
 1. Small towns
 2. Cities
 3. Large metropolitan areas
16. What is the estimated monthly dollar value of support provided for interning students in your school?
17. How many Michigan State University graduates have you had as interns in your school since 1967?
18. Do you perceive a need for a standardized admission, selection, and notification procedure for medical technology internship applicants in Michigan?

APPENDIX C

QUESTIONNAIRE FOR ACADEMIC INSTITUTIONS

1. What was the total number of graduates from your Medical Technology program for the years 1967 through 1971?
2. In 1972, how many students completed the academic requirements which are prerequisites for hospital internship?
3. How many of the above students are presently enrolled in an internship program in Michigan?
4. How many qualified students from your program were unable to find an internship in Michigan in 1972?
5. How many students are presently enrolled in the following levels of your program:

Freshmen
Sophomore
Junior
Senior

Please check if the Senior year includes the internship.

6. For the years 1973 through 1977, what is the projected total number of students from your program who will be needing internships?
7. How many internship positions are reserved, by contract, for your students each year in the State of Michigan?

APPENDIX D

BIOGRAPHICAL DATA INVENTORY

1. What is your present marital status?
 - A. Single
 - B. Married
 - C. Widowed
 - D. Separated or divorced
2. How old were you when you were married?
 - A. Not married
 - B. Less than 18 years old
 - C. 18 to 25 years old
 - D. Over 25 years old
3. How many persons, not including yourself, are dependent upon you for all or most of their support?
 - A. None
 - B. 1
 - C. 2 or 3
 - D. 4 or more
4. Regarding moving from location to location, I
 - A. Would go willingly wherever my job takes me
 - B. Would move only if it were absolutely necessary
 - C. Would move only to _____ section of the country
(north, south, east, west)
 - D. Would not move.
5. In how many different cities, towns, or townships have you lived?
 - A. 1 to 3
 - B. 4 to 6
 - C. 7 to 9
 - D. 10 or more
6. The place in which you spent the most time during your life was a
 - A. Farm
 - B. Town of less than 2,000
 - C. Town of 2,000 or more but less than 20,000
 - D. City larger than 20,000
7. How many hours per week of physical exercise did you average during the past two or three months?
 - A. None
 - B. 1 to 3 hours
 - C. 4 to 8 hours
 - D. 9 or more hours

APPENDIX D (cont'd.)

8. What kind of recreation do you like most and engage in most often?
 - A. Participation in competitive sports
 - B. Being a sports even spectator
 - C. Social relaxation with others, such as, parties, dances, etc.
 - D. Reading, listening to records, or other things of this sort where you won't be interrupted
9. On an average, how many classes have you missed, per term, because of health reasons?
 - A. None
 - B. 1 or 2
 - C. 3 or 4
 - D. 5 or more
10. On an average, how many classes, per term, have you missed for reasons other than health?
 - A. None
 - B. 1 or 2
 - C. 3 or 4
 - D. 5 or more
11. At what age did you start drinking?
 - A. 15 or younger
 - B. 16 to 21
 - C. 21 or over
 - D. Never drank
12. How do you feel about a job that requires you to regularly work evenings?
 - A. Inconvenient
 - B. Somewhat inconvenient
 - C. Not inconvenient
 - D. Would prefer such a job
13. How would you feel about a job that requires you to regularly work Saturdays and Sundays?
 - A. Inconvenient
 - B. Somewhat inconvenient
 - C. Not inconvenient
 - D. Would prefer such a job
14. How often are you in low spirits?
 - A. Frequently
 - B. Occasionally
 - C. Rarely
 - D. Hardly ever

APPENDIX D (cont'd.)

15. How comfortable are you in a social situation?
 - A. Always at ease in a social situation
 - B. Usually at ease in all social situations
 - C. Generally at ease, but occasionally feel uncomfortable
 - D. Only occasionally at ease in a social situation, and quite often feel uncomfortable
16. Which of the following do you like least?
 - A. Outdoor sports, football, baseball, soccer
 - B. Fishing, camping, hunting
 - C. Reading, stamp collecting
 - D. Making things
17. How do you tend to react to an unpleasant situation?
 - A. Generally try to react immediately and figure out the best solution
 - B. Most of the time put off a decision for a little while so you can think it over
 - C. Often want to sleep on it or put off a decision for quite a while
 - D. Don't worry about it, things will take care of themselves
18. How often do you read the newspaper?
 - A. Twice a day
 - B. Once a day
 - C. Weekly
 - D. Never
19. What sort of occupation would your parents most like you to enter?
 - A. Profession - doctor, lawyer, engineer, etc.
 - B. Same as your father
 - C. Have no preference
 - D. Business
20. Regarding responsibility in your job, would you
 - A. Like to have a good deal of responsibility
 - B. Like to have some responsibility but still have someone responsible over you
 - C. Prefer a minimum of responsibility
 - D. Rather not have any responsibility
21. Generally, in your work assignments would you prefer
 - A. To work on one thing at a time
 - B. To work on a couple of things at a time
 - C. To have many things "on the fire" simultaneously
22. Is the type of work which interests you most that which
 - A. Has much fine detail involved
 - B. Has some fine detail aspects
 - C. Very seldom requires fine detail work
 - D. Would never require you to bother with fine details

APPENDIX D (cont'd.)

23. Which one of the following has caused you the most difficulty in the past six months?
 - A. Lack of finances
 - B. Difficulty with friends
 - C. Difficulty with studies
 - D. Something else
24. Given the choice, would you prefer to
 - A. Persuade others
 - B. Order others
25. In which of the following settings did your most outstanding negative experience occur?
 - A. Family setting
 - B. Classroom or school
 - C. Social situation
 - D. Religious
26. When you take a vacation, which do you prefer?
 - A. Like to plan it down to the last detail
 - B. Like to make general plans, but let the details take care of themselves
 - C. Like to take spontaneous trips and recreation
 - D. Never take a vacation, or just work or loaf around home
27. How enjoyable do you find it to talk to people you don't know?
 - A. Usually enjoy it
 - B. Occasionally enjoy talking to people I don't know
 - C. Do not usually enjoy it
 - D. Never enjoy it
28. Which of the following do you find the most satisfying?
 - A. A good discussion
 - B. Reading
 - C. Thinking over a problem
 - D. None of these
29. How do you regard puzzles?
 - A. As interesting
 - B. As frustrating
 - C. As tiring
 - D. As time wasting
30. As a youngster, how did you "let off steam" when you got angry?
 - A. By fighting
 - B. By kicking, throwing something, or "cussing".
 - C. By talking it over with someone
 - D. I didn't. I tried to hide my feelings

APPENDIX D (cont'd.)

31. What do you feel has been your major accomplishment, outside of academic activities?
 - A. Family activities
 - B. Community activities
 - C. Development of yourself
 - D. Something else
32. Which of the following is most likely to make you feel most uncomfortable or unhappy?
 - A. Having a friend not speak to you
 - B. Making a mistake in your work
 - C. Being laughed at when some circumstance makes you look silly
 - D. Having to introduce yourself to someone you don't know
33. Which do you enjoy most?
 - A. A good "bull session"
 - B. Working or studying hard
 - C. Listening to music or reading for pleasure
34. In the past, how have you reacted to competition?
 - A. Have done my best in competitive situations
 - B. Have been unaffected by it
 - C. Have done all right, but haven't liked it
 - D. Unfavorable
35. How good do you think you are, or could be, as a supervisor?
 - A. In the top 5 percent
 - B. In the upper 20 but not the top 5 percent
 - C. In the upper half, but not top 25 percent
 - D. In the lower half
36. If you have thought about something and come to a conclusion, how hard is it for someone else to change your mind?
 - A. Not at all
 - B. Somewhat
 - C. Quite
 - D. Very
37. Viewing yourself as objectively as possible, would you describe yourself as:
 - A. Aggressive
 - B. Occasionally aggressive but typically not
 - C. Passive
38. Which one of the following do you think is closest to describing your personality?
 - A. Difficult to really get to know
 - B. Have some really close friends and a number of acquaintances
 - C. Friendly and easy going, have a lot of friends
 - D. Very jolly, the "life of the party" type

APPENDIX D (cont'd.)

39. How well do you do most things you have decided to do?
- A. You almost always succeed in the things you attempt and do them better than most people could
 - B. You often find you have bitten off more than you can chew and have to give up
 - C. You usually get the things done that you attempt
 - D. You find that you do most things as well as other people do
40. In class discussions, how frequently do you volunteer information or opinions?
- A. Very frequently
 - B. More often than average
 - C. Less often than average
 - D. Very seldom
41. Which of the following statements best expresses your feelings concerning the proctoring of examinations?
- A. Examinations should be closely proctored because few students are completely honest in all situations
 - B. Examinations should be closely proctored although most students are honest, a few need to be watched carefully
 - C. Close proctoring is not necessary, since cheating is not really much of a problem
 - D. The best way to handle this problem is by use of the honor system, in which students themselves are responsible to each other
42. What was your standing in your high school class?
- A. Below the average
 - B. Above average
 - C. In the upper 25 percent
 - D. In the upper 10 percent
43. How difficult was high school work for you?
- A. Quite easy
 - B. Fairly easy
 - C. Fairly hard
 - D. Quite hard
44. As a college student, were you
- A. More active and popular than most students
 - B. About as active and popular as most students
 - C. Not quite as active and popular as most students
 - D. Not very active and didn't have very many friends

APPENDIX D (cont'd.)

45. About how often did you change your mind about future vocational plans since the time you entered college?
 - A. Have not changed them
 - B. Only once
 - C. Two or three times
 - D. Too many times to remember
46. The teachers I got the most out of in school, usually treated me this way
 - A. Gave me very general instructions or directions and then left me alone to do the assignment
 - B. Were quite specific in their assignments and followed me up from time to time
 - C. Went into thorough detail and followed my work very closely
47. During your teens, how did you compare with others of your own sex in rate of progress through school?
 - A. Advanced much more rapidly than most
 - B. Advanced just a little faster than most
 - C. About the same as most
 - D. Progressed just a little slower than most
48. As you grew up, how did you feel about school?
 - A. Liked it very much
 - B. Liked it most of the time
 - C. Just accepted it as necessary
 - D. Was often a little unhappy with it
49. How does the responsibility for a difficult decision affect you?
 - A. It stimulates you
 - B. It disturbs you
 - C. It makes you cautious
 - D. Something else
50. Which one of the following do you look forward to most in your leisure time activities?
 - A. A chance to rest and relax
 - B. A chance to putter around
 - C. A chance to be with other people
 - D. A chance to get outdoors or be active
51. In which of the following groups of social organizations have you participated most frequently in recent years?
 - A. Athletic and recreation clubs
 - B. Social organizations
 - C. Civic and political organizations
 - D. None

APPENDIX D (cont'd.)

52. Which one of these characteristics bothers you most in people you meet?
- A. Bragging
 - B. Shyness
 - C. Lack of initiative
 - D. Being very competitive
53. When someone around you is disturbed about a personal problem which one of the following do you usually do?
- A. Leave him alone, avoid the subject
 - B. Offer advice and suggest a possible solution
 - C. Sympathize with him
 - D. Encourage him to talk it out with you
54. In the course of a week, which of the following gives you the greatest satisfaction?
- A. Being told you have done a good job
 - B. Helping people solve their problems
 - C. Being with your family and close friends
 - D. Having free time to use as you please
55. In order for you to perform your job most effectively, what kind of supervision do you believe you should receive?
- A. Your immediate supervisor should keep himself very familiar with the details of the materials you are responsible for
 - B. Your immediate supervisor should be concerned with all the important elements in your work but not follow details as a general rule
 - C. Your immediate supervisor should exercise only the most general kind of supervision
56. Would your choice of an ideal job be one which
- A. Allowed a great amount of interaction with other people
 - B. Would require working with a small group
 - C. Would allow you to work closely with one other person
 - D. Would allow you to work by yourself
57. How greatly disturbed are you if something is left unfinished?
- A. Slightly
 - B. Moderately
 - C. Considerably
 - D. Highly

APPENDIX D (cont'd.)

58. Comparing yourself to others you associate with how do your decisions seem to stack up on quality?
- A. In most instances, my decisions are better
 - B. About the same as decisions of others
 - C. In most instances my decisions are poorer
 - D. Rarely make decisions
59. Which one of the following has given you the most difficulty on any job you have held?
- A. Lack of friendliness of fellow workers
 - B. Not being as fast as other workers
 - C. The boss's criticism
 - D. The pressure for accomplishment
 - E. Have never worked
60. If you have a difficult decision to make what do you typically do?
- A. Make it just as soon as the evidence has been weighted
 - B. Sleep on it and decide in the morning
 - C. Think it over for two or three days
 - D. Ponder it carefully for a week or more
61. How creative do you feel you are?
- A. Highly creative
 - B. Somewhat more creative than most
 - C. Somewhat less creative than most
 - D. Not creative
62. With regard to taking risks, which best describes you
- A. Hardly ever take a risk
 - B. Sometimes take a risk
 - C. Generally take a risk
 - D. I'm a gambler at heart
63. Looking back on the days you spent in your family or childhood home, how happy were they?
- A. Very happy
 - B. Quite happy most of the time
 - C. A little on the unhappy side
 - D. Very unhappy
64. When you were growing up did your parents follow the rule that "children should be seen and not heard"?
- A. Quite often
 - B. Often
 - C. Occasionally
 - D. Almost never

APPENDIX D (cont'd.)

65. What type of reading, other than school work, did you tend to do most between the ages of 12 and 18?
 - A. Adventure stories
 - B. Biography or historical novels
 - C. Books about science
 - D. Magazines, mysteries, love stories, etc.
66. Who made the major decisions in your family?
 - A. Your mother
 - B. Your father
 - C. Some other person
 - D. Discussion and common agreement
67. Who influenced your conduct most when you were a child?
 - A. Your father
 - B. Your mother
 - C. A brother
 - D. A sister
68. How much part time work have you done?
 - A. Worked most of your hours out of school
 - B. Worked regularly out of school, but saved plenty of time for study and recreation
 - C. Worked only occasionally out of school
 - D. Almost never worked during out of school hours
69. With how many brothers or sisters did you grow up?
 - A. One or more brother(s), no sisters
 - B. One or more sister(s), no brothers
 - C. Both brother(s) and sister(s)
 - D. None
70. With regard to your brothers or sisters are you the
 - A. Oldest
 - B. Youngest
 - C. Have no brothers or sisters
 - D. Other
71. How were you usually punished as a child?
 - A. Punished physically
 - B. Reprimanded verbally, or deprived of something
 - C. Warned not to do it again, but seldom punished
 - D. Sent to bed
72. As a child, to whom did you confide in most?
 - A. Your father
 - B. Your mother
 - C. A brother or sister
 - D. Some other person

APPENDIX D (cont'd.)

73. Which one of your parents did the disciplining?
A. Father
B. Mother
C. Both
74. How old were you when you first spent an entire month away from your family?
A. Under 12
B. 12 to 15
C. 16 to 19
D. 19 or over
75. How much independence do you feel your parents allowed you while in high school?
A. Quite restrictive
B. About as much as the rest of your friends
C. Quite lenient
D. As much as you wanted
76. As you planned your career, what was your primary goal?
A. Personal satisfaction
B. Excitement and opportunity
C. Economic security
D. Something else
77. How often do you feel discouraged?
A. Frequently
B. Occasionally
C. Rarely
D. Hardly ever
78. How well do people like you in a social group?
A. I am well liked by practically everyone
B. I am quite well liked by practically everyone
C. I am fairly well liked by most people
D. I am not very well liked by most people
79. Using your own interpretation of what success means, do you feel you have been successful to this point in your life?
A. Yes
B. No
C. Partly
D. Not sure
80. Your parents' annual income is between:
A. 0 - \$4,999
B. \$5,000 - 9,999
C. \$10,000 - 14,999
D. \$15,000 - 19,999
E. \$20,000 and above

APPENDIX D (cont'd.)

81. Your father's highest level of education
 - A. Grade school graduate
 - B. High school graduate
 - C. Post high school education
 - D. Baccalaureate degree
 - E. Professional or graduate degree
82. Your mother's highest level of education
 - A. Grade school graduate
 - B. High school graduate
 - C. Post high school education
 - D. Baccalaureate degree
 - E. Professional or graduate degree
83. Your father's occupational category
 - A. Unskilled
 - B. Semi-skilled
 - C. Skilled
 - D. Professional
 - E. Business
84. Your mother's occupational category
 - A. Housewife
 - B. Professional
 - C. Office
 - D. Unskilled
 - E. Other