USE OF A BIOGRAPHICAL DATA INVENTORY TO IDENTIFY BEHAVIORAL CORRELATES OF PRACTICING MEDICAL TECHNOLOGISTS: AN EXPLORATORY STUDY

Dissertation for the Degree of Ph. D.
MICHIGAN STATE UNIVERSITY
CHRISTIANA S. BLUME
1974

This is to certify that the

thesis entitled

Use of a Biographical Data Inventory to Identify Behavioral Correlates of Practicing Medical Technologists: An Exploratory Study

presented by

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has been accepted towards fulfillment
of the requirements for

Doctor of Philosophy degree in Higher Education and Administration

Major professor

Date May 6, 1974

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ABSTRACT

USE OF A BIOGRAPHICAL DATA INVENTORY TO IDENTIFY BEHAVIORAL CORRELATES OF PRACTICING MEDICAL TECHNOLOGISTS: AN EXPLORATORY STUDY

By

Christiana S. Blume

In recent years there has occurred a rapid proliferation of medical technology programs in academic institutions in the state of Michigan, accompanied by an increase in enrollments in established programs. This rapid growth in academic enrollments has not been matched by a proportionate increase in the clinical facilities necessary to provide internships which are required for certification by the certifying agencies for the profession. Concurrently, there is evidence to suggest that the employment market for new graduates has stabilized. Furthermore, the recent limitation of federal and state support monies has added to the complexity of the problem.

The overall problem is graphically illustrated by the present situation at Michigan State University where enrollments in the School of Medical Technology have increased approximately 150% since 1970. Limitations

of human and material resources to meet the needs of students are threatening dilution of the quality of the program. On this basis, administrators can justify limitations of enrollments in the program; the immediate concern is to find a predictive measure that will help to identify students with the potential for successful performance in medical technology. The measure would be helpful in selecting students for admission to the program and assist in guiding students with different capabilities into more appropriate curricula.

The literature is replete with studies which demonstrate the successful use of life history items to predict performance in many diverse areas. The purpose of the present study is to explore the effectiveness of biographical data and their correlation with successful performance in medical technology for students in the School of Medical Technology at Michigan State University. For purposes of this study, success in the clinical internship is used to approximate success in the profession.

A preliminary biographical data inventory was administered to 46 seniors in the School of Medical Technology in April, 1972. An Evaluation Form was developed which was used to rate the performance of the sample at the end of their clinical internship. Based on the rating scores, the sample was divided into two

criterion groups, an Upper (highest 27%) and Lower (lowest 27%). The biographical items were analyzed by means of an Index of Discrimination (D) to identify those items which differentiated most effectively between the Upper and Lower groups. Twenty-four items with a D of 2.5 or better were retained to form a new Biographical Data Inventory (BDI). Scoring weights of ±1, ±2, and ±3 were assigned to the item alternatives according to the magnitude of their power to differentiate between the two groups. The items were further analyzed by computing the range of differences in scoring weights for the item alternatives for the purpose of determining the optimal number of items to be used in the final Scoring Key. All 24 items correlated at .6773 with the criterion scores and were retained for the final BDI. The effectiveness of the instrument was tested on 35 successful medical technologists. Based on their scored responses to the BDI, no gross misclassifications were found.

The results of the study lead to the conclusions that the BDI may be a useful instrument in the advisement and selection of students for the School of Medical Technology at Michigan State University, in that it identifies behavioral correlates of successful performance in the clinical internship. It is recommended that further research be undertaken to refine and validate the BDI for use in other institutions.

USE OF A BIOGRAPHICAL DATA INVENTORY TO IDENTIFY BEHAVIORAL CORRELATES OF PRACTICING MEDICAL TECHNOLOGISTS: AN EXPLORATORY STUDY

By

Christiana S. Blume

A DISSERTATION

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

Department of Higher Education and Administration

1974

DEDICATION

This dissertation is dedicated, with love
and gratitude, to
My parents, who gave me life,
My husband, who inspired a dream,
My children, who threw down the gauntlet,
My friend, who gave me strength and comfort.

ACKNOWLEDGMENTS

It is not possible to adequately acknowledge all of those who have contributed to the completion of this dissertation. May I, therefore, name a few special persons who represent many others.

To my major advisor, Dr. Laurine E. Fitzgerald, I offer my most sincere thanks for her encouragement and support towards the attainment of two graduate degrees. The qualities of Dr. Fitzgerald's professional accomplishments are surpassed only by her fine qualities as a human being.

I gratefully acknowledge the assistance and guidance given to me by the other members of my doctoral dissertation committee: Drs. Mildred Erickson, Gwendolyn Norrell, and Paul L. Dressel and Mrs. Dorothy Ross.

Special thanks are due to Drs. Lois Calhoun and Linda Holmes for their unfailing support and gentle prodding, and to the faculty and staff of the School of Medical Technology without whose help and forebearance important deadlines could not have been met.

Finally, I wish to express my deep appreciation to Michigan State University for having given me the opportunity to earn the degree of which this dissertation is an integral part.

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CHAPTER I

INTRODUCTION

Today we decide. Tomorrow, and in all the tomorrows that follow, we live with the consequences of our decision. It is necessary, therefore, that the decision-making process be supported by as much relevant data as possible in order to assure the appropriateness of our decisions.

Educators in the field of medical technology, as in other fields, bear the dual responsibility of assisting students in making informed decisions regarding career choices and in selecting those students who are most likely to become competent practioners in their field. In addition to the current use of grade point average and interviews, there is a need for objective measurement instruments to aid in the discharge of these responsibilities.

The Purpose

The purpose of this study is two-fold: (a) to study the use of biographical data and their correlation

with successful on-the-job performance in the field of medical technology, and (b) to develop a biographical inventory form for use in advising and selecting students for the medical technology program at Michigan State University.

The Rationale for the Study

The need for additional predictive instruments can be justified for three reasons: (a) the high institutional cost of a medical technology program, (b) the cost to the student in terms of time and money, and (c) the increasing numbers of medical technologists being trained by academic institutions with the possible danger of over-saturating the market. The following description of the professional responsibilities, educational and certification requirements of a medical technologist illustrates the fact that the education of a certified medical technologist is an expensive procedure for both the educational institution and the individual student in terms of time and material resources expended.

Professional Responsibilities, Educational and Certification Requirements

A medical technologist plays a vital role as a member of the health care team responsible for the diagnostic and therapeutic care of episodic illness, as well as health maintenance. Working in a laboratory under the

supervision of a pathologist, medical technologists perform manual and precise instrumental procedures to quantify and qualify the cellular, bacterial and chemical constituents in the body as an aid in the identification and control of abnormalities. In order to efficiently perform these functions, a medical technologist requires a solid base of scientific theory and familiarity with diverse laboratory specialities, including chemistry, microbiology, bacteriology, urinalysis, and hematology.

A comprehensive four-year curriculum, such as that offered by Michigan State University's School of Medical Technology, is designed to provide the academic competencies required of medical technologists. The curriculum also introduces the students to the clinical proficiencies required in the performance of their professional duties.

In addition to the four years normally required to obtain a Bachelor of Science degree at Michigan State University, the medical technology student must complete a twelve-month internship in a hospital program approved by the American Medical Association (AMA) and pass a National Registry examination in order to be certified as a medical technologist by the Board of Registry of the American Society of Clinical Pathologists (ASCP).

Optional Tracks

The School of Medical Technology at Michigan State University offers four optional tracks to meet the differing needs and interests of its students. One track has an emphasis on chemistry and microbiology for students with a primary interest in research or the development of new laboratory techniques. A second track provides didactic and laboratory instruction in all of the clinical subjects encompassed in the functions of a clinical laboratory. Another track includes behavioral, basic and clinical science subjects to provide an acceptable educational background for students desirous of entering medical school or attaining supervisory positions in a laboratory. The fourth track emphasizes animal science and is intended for students interested in working in animal research, veterinary hospitals or gaining admission to the professional school of veterinary medicine. All of the tracks provide the students with the basic competencies required of all medical technologists and do not limit graduates to practicing only in their particular area of interest.

Costs

The program is expensive for the University because of the number and nature of the basic and clinical science courses included in the curriculum and their attendant cost of highly trained instructors, expensive

equipment, and the quantity of materials required for use in the laboratory sections.

The preparation for a career in medical technology represents a considerable investment on the part of the student, including time and money expended and income loss due to a delayed entry into the job market. In dollars and cents this could represent a conservative amount of $20,000: $10,000 as the cost of a Baccalaureate Degree, $2,000 expenses for the internship year and $8,000 lost income while interning.

These costs alone could justify the use of predictive instruments to aid in the preliminary choice of students for the program. However, there are more recent developments which lend urgency to the need for the development of more definitive predictive tools to supplement the present use of grade point average and interview techniques as methods of advising and selecting students for academic and hospital-based programs.

The Problem of Market Saturation

Among educators and administrators of medical technology programs, there is a growing concern that the production of medical technologists may soon outstrip the demand. A national survey conducted by the American Society of Clinical Pathologists in the Spring of 1972 produced results which lend credence to the concern that

opportunities for job placement for graduates in the field of medical technology may be decreasing (ASCP Newsletter #17, 1972).

The American Society of Clinical Pathologists sent questionnaires to all of the 779 approved hospital schools of medical technology in the nation and 551 responses were received. The objectives of this study were three-fold: (a) to determine if a lack of job opportunities did exist, (b) to ascertain the numbers of new graduates who were experiencing employment problems, and (c) to identify the geographical locations with a surplus of graduates. The results obtained indicated that 124 schools reported 377, from a total of 1,095 graduates, had not been successful in finding employment as medical technologists at the time of their graduation from the schools' programs. This contrasts with the situation as late as 1969 and 1970 when graduates could select from several employment offerings at the time of graduation. Eight of the 36 hospitals in Michigan which responded indicated a total of 25 graduates had difficulty in securing employment (ASCP Newsletter #17, 1972).

Two surveys conducted by the Institute of Biology and Medicine and the School of Medical Technology at Michigan State University in 1972 included two areas: (a) internships available in Michigan and nearby cities

in neighboring states, and (b) college enrollments in academic medical technology programs (Brooks & Blume, 1973).

The focus of the first Michigan State University study was to determine the number of internships currently available in Michigan and nearby areas for graduates of medical technology academic programs, the number of medical technology graduates for the past five years, and the projected numbers of medical technology graduates for the next five years. Included in the survey sample were the 75 hospital schools in Michigan; Cleveland, Ohio; Milwaukee, Wisconsin; and Chicago, Illinois that are approved by the American Medical Association. Sixty-four of the 75 hospitals responded for an 85% return.

The number of internships for the years 1967-1971 reported was 2,634 while the projected number of internships available for the next five years remained at the same number, 2,634. Thus, to 1977, no expansion in internship opportunities is anticipated in the areas surveyed. By contrast, survey figures indicate enrollment in academic programs is steadily increasing. This situation poses a serious problem for students presently enrolled and those who aspire to a career in medical technology in the future since a hospital internship is a requirement for certification.

Limited enrollments in such areas as engineering, education, and social work are a contributory factor to the increased numbers of students who are entering health related professions. In addition, national publicity given to the need for health professionals, and chronicled in such sources as the 1972-73 Occupational Outlook Handbook, have motivated many hitherto uninterested students to seek careers in medical technology. The federal government has responded to the perceived need by granting funds to educational institutions for the development of new programs and expansion of existing facilities through National Institute of Health, Allied Health Grants.

Illustrative of this burgeoning enrollment is the current expansion at Michigan State University. From 1967 to 1970, enrollments increased slightly from 223 to 247; but the next two years saw an increase to 490 in the 1972 Fall term enrollment and a further increase to 630 for Fall term, 1973 (Figure 1). The Senior Class of 1973 had 105 students as compared to 66 graduates in June, 1972, while the anticipated number of students to be graduated in June, 1974, is 170.

Results from a second survey conducted in Michigan by Michigan State University in October, 1972, indicated the phenomenon is not unique to this one institution (Brooks & Blume, 1973). Questionnaires were sent to the 26 colleges and universities listed by the American

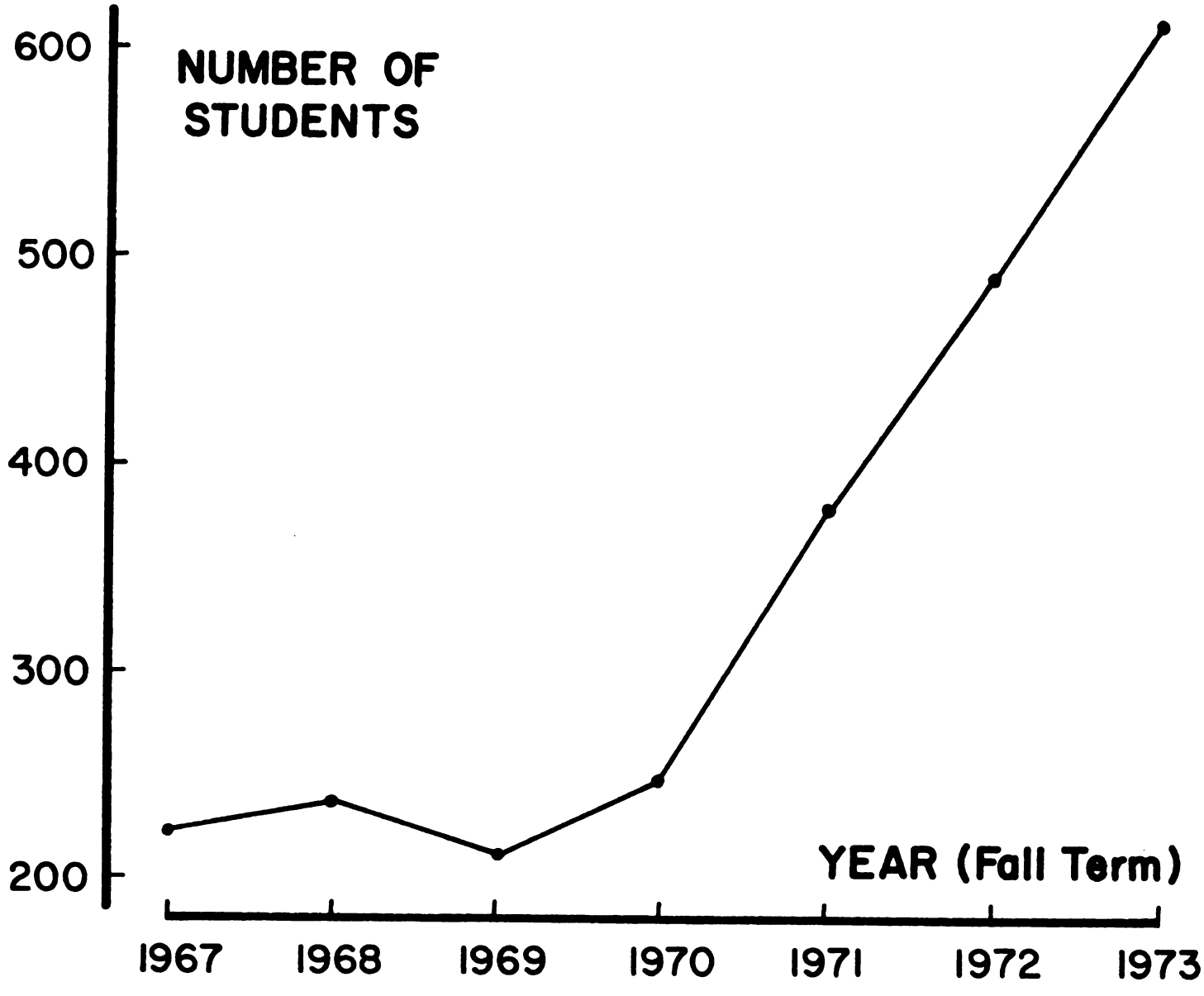

Fig. 1.--Enrollment in the School of Medical Technology 1967-1973.

Society for Medical Technology (ASMT) as offering medical technology programs in the state of Michigan. One hundred per cent response was received. Two of the institutions responding did not offer four-year Baccalaureate Degree programs and their responses were not included in the totals reported. The results of the survey showed an increase in the totals of students graduated from medical technology programs in Michigan. Twenty-four institutions reported a total of 928 graduates during the five years from 1967 to 1971 inclusive, or a yearly average of 186. Total graduates qualifying for internships in 1972 was 359. Projected internships needed for the next five-year period showed a further increase to a total of 2,286 or an average of 457 yearly. At the time of the survey, 2,314 students were enrolled in academic programs in medical technology. This dilemma is exemplified by the current situation at Michigan State University.

The need for additional faculty, space, equipment and supplies is increasing but the necessary financial support is not available. Personal interviews with the chairmen of science departments revealed that present human and physical resources are being taxed beyond their capacity to continue to provide the high quality instruction and advisement that are required in the science-oriented medical technology program. Some clinical experiences are being altered, others are not available

to all of the students, and individualized attention is no longer possible for many students in over-enrolled laboratory sections. In many cases, students have to sacrifice necessary summer employment in order to take required courses in which space was not available during the regular terms, or else delay their progress towards a degree for as much as one year. Thus, administrators are faced with the illogical process of offering a diluted program to greater numbers of students who are preparing to enter an apparently shrinking market. Sound educational policy dictates that an effective program should not be compromised merely to accommodate a greater number of students. On the contrary, it would seem more advisable to maintain the quality of the program and seek measures that could identify those students with the greatest potential for success in the practice of medical technology.

Changing Role of Medical Technologists

There is another aspect to the need for this study. In many hospitals the high volume, routine test procedures are now being efficiently performed by Medical Laboratory Technicians (MLT) holding an Associate in Arts degree and automated procedures have replaced many of the tests performed manually in the past. Medical Technologists perform the more complex tests and duties of a

problem-solving, decision-making nature. In addition, they are performing supervisory and teaching functions relative to the medical technicians in the laboratory. The future prescribed role of the medical technologist may require managerial and interpersonal relations skills at least equal to the scientific and dexterity skills traditionally required (ASMT Position Paper, 1973). New measures are needed which will aid in predicting success in this new role.

Current Predictors

While grade point average is commonly accepted as the best predictor of future academic success, several studies (Elberfeld & Love, 1970; Hoyt, 1966) indicate only a slight correlation between academic success and on-the-job performance.

Other methods of predicting performance success, such as personality inventories and interest tests are suspect (Mehrens & Lehman, 1969; Elberfeld & Love, 1970). Mehrens describes self-report personality inventories as being highly susceptible to faking. Elberfeld and Love, using the Kuder Preference Record, measured the interests of 61 medical technology students in ten areas of activity: outdoor, mechanical, computational, scientific, persuasive, artistic, literary, musical, social service, and clerical. The results showed little correlation between

degree of interest in an activity and attainment of success in the activity.

The increasingly competitive nature of the job market for medical technologists, added to the rapidly growing enrollment in academic programs and a stabilized number of clinical internships, indicates an urgent need for a predictive measure that will better differentiate between potentially successful and unsuccessful medical technologists. Such an instrument would be useful to advisors of entering freshmen or transfer students who have expressed an interest in medical technology. Those whose responses indicate little probability of success in the field could be guided into other, more appropriate career choices. Furthermore, hospital-based medical technology programs are high-cost programs since the usual ratio of instructor to student in the laboratory sections is 1:1, one medical technologist to one student. It seems imperative that available resources for clinical internships be expended upon those students most likely to succeed as practicing medical technologists.

Design of the Study

There are essentially four procedures incorporated in the design of this study: (a) administration of a preliminary biographical inventory blank to the senior class in the School of Medical Technology at Michigan

State University during Spring term, 1972, (b) evaluation of the performance of the sample during their internship year, (c) development of a final Biographical Data Inventory (BDI), and (d) validation of the BDI using successful medical technologists as the validation group. The descriptive statistic used to describe the relationship between successful performance and items on the questionnaire was Pearson's Product Moment correlation coefficient.

Definition of Terms

In order to facilitate understanding of the research, recurring terms are defined as follows:

Biographical Data Inventory (BDI).--A number of multiple-choice items which allow individuals to express themselves in demographic, attitudinal, and experiental terms.

Certification.--The process by which nongovernmental associations or agencies grant recognition to individuals who have met certain specific qualifications previously determined by the agency or association (McTernan & Hawkins, Jr., 1972).

Four Plus One Program.--Four years of academic study in medical technology culminating in a baccalaureate degree, plus one year of hospital training.

Foil.--One of the alternative responses to a multiple-choice item.

Interns.--Individuals enrolled in the twelve-month clinical program offered by hospital-based schools of medical technology.

Internship.--A specified period of time, usually twelve months, spent by a person in developing and perfecting proficiency in clinical laboratory procedures and integrating theoretical and practical knowledge.

Medical Laboratory Technician.--One who has earned an Associate in Arts degree in Medical Technology and who is certified by an accrediting agency.

Medical Technology.--Laboratory procedures which apply the basic principles of natural, physical, and biological sciences to aid in the diagnosis and treatment of disease and the maintenance of health.

Medical Technologist.--An individual who has earned a baccalaureate degree in Medical Technology or a related science and who is certified by an accrediting agency.

Three Plus One Program.--A medical technology program which includes three years of academic training, plus one year of hospital-based training.

Setting for the Study and Limitations

The study was conducted at Michigan State University in East Lansing, Michigan, beginning in the Spring of 1972. The small size of the sample available for the study may have a limiting affect on the generalizations which can be made from the results of the study. Generalizations may be appropriate only for students enrolled in a program which encompasses four years of academic studies followed by one year of clinical training. General statements may not be as applicable to students enrolled in other institutions which offer a different type of program.

Organization of the Dissertation

This study is reported in five sections. First, the introduction which includes a statement of the problem, the purpose and rationale for the study, a brief description of the study design, definitions of terms, and the setting for the study and its limitations. This is followed in sequence by a review of the related literature, the methodology of the study, and an analysis of the findings. The dissertation concludes with a discussion of the results, some conclusions, and the implications of the study.

CHAPTER II

REVIEW OF THE LITERATURE

Administrators and directors of expensive pre-professional and professional training programs are continually faced with the problem of advising and selecting students for admission to their programs. Ideally, only those should be chosen who have at least a minimum chance of success in the practice of the particular profession to which they aspire. As the numbers of applicants increase, it becomes more critical to find predictive measures of success which will minimize the risks taken by both the educational institution and the applicants.

Because of the comparatively brief history of medical technology as an emerging profession, little research has been done in the assessment of those qualities which characterize a successful practitioner in the field.

Aptitude and Interest Studies

The use of aptitude tests as predictors of success for medical technologists was first reported by Strassell (1956), followed by reports of studies by the

U.S. Department of Labor (1959), Williams (1963), and Williams, Konecny, and Champion (1967). The test battery used by Strassell included the ACE, one test from the Flanagan Aptitude Classification Battery for Biological Scientists and the Guilforn-Zimmerman Temperament Survey. Strassell concluded that aptitude tests are probably more valuable in schools not associated with universities because of selective admissions and that the study was only an indication of what might be done in testing potential students (Strassell, 1956).

Two years later, in 1958, the Colorado Society of Medical Technologists, assisted by the Colorado Department of Employment, developed an aptitude test battery specifically for medical technologists (U.S. Department of Labor, 1959). The entire General Aptitude Test Battery (GATB) was administered to a preliminary sample of 164 technologists and students with the final sample consisting of 56 technologists and 57 students. Based on highest means, lowest standard deviations, and significant correlations, the aptitudes identified as being peculiar to medical technology were: general intelligence, verbal aptitude, form perception, and clerical aptitude. Originally developed for use by the United States Employment Service in 1947, the GATB has been validated for 23 occupational aptitude patterns, including medical technology.

Williams (1963) compared supervisor ratings of student performance with their GATB test scores. Using a very small sample, Williams was unable to show a relationship between the variables.

Williams, et al. (1967) selected a sample of 37 medical technologists and 101 students and administered the GATB to the group. Their scores were correlated with the individual university grade point average (GPA) and scores on the National Registry Examination of the American Society of Clinical Pathologists. The authors concluded that the GPA predicted success on the Registry Examination more accurately than did any single aptitude score or any combination of aptitude scores.

Dissatisfaction with the reliability of aptitude tests as predictors of successful performance by medical technologists led researchers to investigate other means of predicting success in the field of medical technology. In a study using past academic performance and an interest inventory, Lundgren (1968) conducted a study at the University of Minnesota to investigate the use of these variables as a means of predicting university grade point average for freshmen who had declared an interest in medical technology. Past academic performance was indicated by the use of high school rank, percentile rank on the Minnesota Scholastic Aptitude Test and American College Testing Program (ACT) scores. Interest

was measured by scores on four sections of the Strong Vocational Interest Blank (SVIB) including Laboratory Technician, Mathematics-Science Teacher, Nurse, and Physician. Analysis of the data, using correlation and regression techniques, led Lundgren to conclude that no single performance variable, or combination of the variables, was successful in predicting GPA.

Revisions and improvements in the SVIB enabled McCune and Rausch (1969) to examine all of the possible relationships between performance in the medical technology program and measured interests, based on the sample and data reported by Lundgren (1968). The results of their in-depth examination led McCune and Rausch to conclude that the SVIB should not be used as the sole evaluation criterion for admitting or rejecting applicants to the medical technology program; however, they concluded it does provide valuable additional information regarding the persistence of academically capable students in completing the program (McCune & Rausch, 1969, p. 650).

A study previously cited (Elberfeld & Love, 1970) used a sample consisting of 61 medical technology students at West Virginia University to describe individual characteristics which are related to success in the practice of medical technology. The researchers selected several psychological tests from a battery of tests given to the students at the start of the second semester of their

freshman year. The tests used were the Selective College Ability Test (SCAT), the Bell Adjustment Inventory, and ten sections of the Kuder Preference Record (form not reported). In addition, the student's cumulative grade point average for the first three years of college was included in the evaluative criteria. The scores were compared with grades earned in three aspects of their clinical year performance: academic performance, clinical performance, and the total grade point average for the clinical year. Analysis of the data showed a correlation coefficient of 0.82 (statistically significant at the .05 level) between college grade point average and the three ratings of the clinical year; however, the SCAT scores showed a slight relationship only with clinical academic performance. Results of the Kuder Preference Record were significant only in the relationships found between the interests in mechanical, clerical and computational activities correlated with specific aspects of clinical performance. Elberfeld and Love attached dubious predictive value to the significant relationships which resulted from a correlation of the Bell Adjustment Inventory emotional adjustment scale and total clinical year performance, or the correlation found between social adjustment and classroom performance. The researchers concluded that (a) interest inventories have little value in predicting actual performance in a specific activity,

(b) ratings of laboratory and classroom performance are more useful criteria when used separately rather than as a total score, (c) past academic performance predicts success better than the other indicators but should not be used as the sole indicator of successful performance, and (d) further refinements of the results, using techniques of correlation or factor analysis could increase the limited value of these findings as an aptitude criterion (Elberfeld & Love, 1970, p. 398). The investigators agree with the conclusions reached by Lundgren (1968) that aptitude and interest criteria are most valuable for use in the advisement of students and should not be used as an exclusive predictive instrument in admitting or rejecting applicants to a medical technology program.

Biographical Inventory Studies

A search of the literature reveals no studies using biographical inventory data as a predictor of success in the field of medical technology; however, life history items have been used successfully by industrial organizations, units of government, and educational institutions for the purposes of performance prediction, diagnosis and/or advising. The use of biographical data for prediction purposes is justified by Buel (1972) who states, "Social science shows that past behavior and experience predict future behavior, that past learning,

acquired habits, and previous accomplishments carry over into the future . . . [p. 337]."

Research in industry, government, and education, using biographical data is related only peripherally to the interests of this study. The studies in the literature review are included only to illustrate the use of biographical data as a predictive instrument in diverse fields of endeavor. The review is not all-inclusive of the extensive studies made in the use of biographical data.

Industry

Goldsmith (1922) studied the use of biographical data as a test for salesmanship. Following her lead, insurance companies pioneered in the investigation of the predictive potential of personal history items. Reports of success in this field led military units to explore the use of biographical data in selecting and placing military personnel during World War II.

The advent of peace following the second World War brought businessmen face to face with the problem of converting and rebuilding their organizations to serve peace-time needs. The selection, placement, and training of returning servicemen were problems of prime importance (Bolanovich & Kirkpatrick, 1943). Personnel research units, encouraged by the past success of biographical inventories in selection procedures, concentrated on the use of this instrument for selection of personnel.

Gradually, the use of biographical data began to spread to other areas of personnel work. By the end of the 1950's and beginning of the 1960's, personnel managers were using performance and classification levels, potential for creativity, absenteeism and termination, as criteria for investigation. Coordination of efforts among business organizations was minimal since a general criteria of success was difficult to establish due to the uniqueness of each business and its varying work requirements. Each organization endeavored to develop its own biographical inventory items based on criteria of success adopted for their own needs. Published reports record a varying degree of success for their efforts.

In 1938, the Life Insurance Research Bureau developed the Aptitude Index for Life Insurance Salesmen. This test booklet, consisting of a prediction scale predicated upon biographical data and a test of personality characteristics, is presently being used by the majority of the large life insurance companies to select personnel. The sample used in the study consisted of 10,000 life insurance agents. Results were cross-validated using 1,600 additional salesmen. The researchers concluded that the test differentiated between men who were more successful and those who were less successful in selling life insurance (Life Insurance Sales Research Bureau, 1938).

Other studies using personal history items (Bills, 1941; Kornhauser & McMurray, 1941; Kurtz, 1941) concluded that biographical data could be used, with an acceptable degree of accuracy, to predict sales success in the life insurance business, as well as probable length of tenure in the field.

The oil industry has made extensive use of biographical information to predict performance levels of dealers, for classification of personnel, and identification of creativity potentials. Oil companies may expend a large amount of money and public relations effort in instituting their dealerships. For this reason, prediction of dealer performance potential is of vital importance. Soar (1956) conducted a study for the American Oil Company using a sample of 29 dealers who had previously been rated on 15 performance variables by their supervisors. The dealers responded to a personal history inventory consisting of 39 items which yielded a scoring key based on 14 items. Cross-validation of scores on the personal history items with the performance ratings resulted in a correlation of $\pm.47$ ($p < .05$) and supported the validity of 14 items as differentiating between more and less successful dealers (Soar, 1956, p. 284).

A classification study (Smith, Albright, Glennon, & Owens, 1961) used biographical data provided by a

population of 418 research scientists at Standard Oil Company in an attempt to predict research competence and creativity. Due to personnel attrition and incomplete responses, the actual sample used varied between 362 and 187. Supervisory ratings based on three criteria were employed: (a) creativity, (b) overall performance, and (c) number of patent disclosures submitted by the participant during a five-year period. A factor analysis of the 484 personal history items administered to the sample disclosed 75 options which discriminated at the .05 level or beyond with one or more of the criterion variables. Cross-validation of the items, using a random sample of 100 additional subjects, revealed validity coefficients of .521 with creativity ratings, .613 with overall performance ratings, and .517 with patent disclosures.

The data generated in the previously cited study (Smith et al., 1961) were used in two subsequent studies (Albright & Glennon, 1961; Morrison, Owens, Glennon & Albright, 1962). Ninety-three personal history items were found to differentiate between supervisory- and research-oriented scientists (Albright & Glennon, 1961). Morrison et al. (1962) used factor analysis to cluster 75 of the items, " . . . with a view to better comprehending the underlying personal characteristics represented [p. 281]." The investigators concluded that

better personnel policies can be formulated based upon knowledge of personal characteristics of employees.

Buel (1965) studied subjects who were engaged in a milieu closely related to that of medical technologists. Buel sought to identify creativity potential among biological, medical, chemical, and pharmaceutical personnel employed by a large pharmaceutical manufacturing and research organization. The 132 participants represented all levels of personnel, from technical support to directors of research. Two criteria of creativity were employed: evaluation by a team of professional raters, and evaluation by supervisors using a forced-choice supervisory evaluation of creativity. Each individual responded to 118 personal history items which included 59 items which had been validated in the study previously cited (Albright & Glennon, 1961). An analysis of the items against the rank criterion revealed 50 items which differentiated significantly between creative and less creative employees at the .05 level of significance. The profile of a creative scientist which emerged from the study was similar to that resulting from previous studies (Buel, 1960, 1962; Smith, et al., 1961). Salient characteristics which were identified include a positive self-image, parental permissiveness in decision-making, a need for personal independence, a wide range of interests, and positive reactions to challenge.

Owens, Schumacher, and Clark (1957) investigated creative potential in machine design, using supervisory ratings of creativity or the lack of it as the criterion of success. Nine tests were administered to 295 engineers employed by 31 industrial firms. Items included in the subtests of a revised test battery were selected based on an evaluation of responses using either the H test (Kruskal & Wallis, 1952) or contingency tables with a 20% level of confidence required for inclusion in the subtest. Subtests were selected for the final test battery by application of the critical ratio described by Brozek and Tiede (1952). Four tests were validated as successfully predicting the classification of creative and noncreative machine designers in 75% of the sample including the Power Source Apparatus Test (8 items), the Applications of Mechanisms Test (7 items), the Personal inventory (50 items), and the Personal History Form (8 items).

A high level of absenteeism and employee turnover contribute significantly to the operating costs of an industrial organization (Novack, 1970). For this reason, personnel researchers have attempted to identify characteristics of more stable employees. Naylor and Vincent (1959) in a study to predict absenteeism, used three items usually found on job application forms: Marital Status, Age, and Number of Dependents. The

total sample for the study consisted of 220 female clerical employees of a large midwestern manufacturing company. The sample was divided into halves to form a primary group and a hold-out group for cross-validation purposes. The relationship between the predictor items and absenteeism was determined by means of chi-square and a significant relationship was found between Number of Dependents and absenteeism ($X^2 = 7.99$, df = 1). Cross-validation of this item was significant at the .05 level ($X^2 = 6.40$, df = 1) (Naylor & Vincent, 1959, p. 83). Age showed no significant correlation with the criterion and Marital Status correlated only to some extent (r = .212). Naylor and Vincent concluded, "A logical selection of initial variables, followed by a statistical evaluation of these variables, can provide results which are useful in personnel evaluation and selection [p. 83]."

Novack (1970) conducted a study at St. Luke's Hospital Center, New York City, in which biographical data gleaned from employee application forms were statistically analyzed to determine characteristics of long-term employees. A random sample of 360 was selected from six categories of employees. The sample was divided into two groups (long-term and short-term) employees using three years or more of employment to indicate long-term and termination by the end of one

year to describe short-term employees. The responses to items on the application form were recorded by percentage for each group and weights were assigned according to the difference in percentages. The total score of an application blank was the sum of the individual weights. A cutting score for each employee category was determined at the point of greatest percentage difference. Novack concluded that a scored application form could be used to predict longevity of employment for job applicants and act as a useful adjunct to other selection procedures.

Government

The ranks of military personnel have provided a fertile field for researchers including those concerned with the use of biographical inventory data as a predictive measure. During World War II, impetus was added to the use of such data as a result of many research projects under the aegis of the Personnel Research Branch of the Adjutant General's Office. A comprehensive report of all of the research carried on during this period is not within the purview of this study; however, a sampling of the types of research performed may be appropriate.

During the years 1940-42, the Navy used a Biographical Inventory (BI) developed by Kelly under the auspices of the CAA-NRC Committee on the Selection and Training of Aircraft Pilots (Fiske, 1947). The test was

used in conjunction with Bennett's Mechanical Comprehension Test (MCT) to determine the probability of students completing flight training. At the end of 1942, the scores from the two tests were combined to form a new index, the Flight Aptitude Rating, which was used in selecting pilots. This rating form proved to be a better predictive instrument than either test alone.

Other reports describe the use of personal history items by the Military to identify leadership qualities (Haggerty, 1953), in the selection of candidates for Officers Candidate School (Parrish & Drucker, 1957; Parrish, Kleiger, & Loeffler, 1958), and for the classification of men for combat assignments (Willemin & Karcher, 1958). The conclusions of these researchers indicated that biographical inventory data are useful as a predictive measure, particularly when used in combination with other instruments such as tests of mental ability and aptitude. The extensive and successful experimental research in the use of biographical data conducted by the Adjutant General's Office encouraged further studies to assess the usefulness of personal history data in civilian applications.

In 1960, the Institute for Behavioral Research in Creativity of the Richardson Foundation began research using biographical information from scientists and engineers at the NASA Research Center (Taylor, Ellison, &

Tucker, 1966). A questionnaire was developed composed of 300 items relating to adult life and interests, family life, developmental and academic background. The sample used for the study consisted of 354 engineers and scientists employed at the Center. A creativity rating, an overall rating, and a creativity checklist were used as criteria to compute biserial correlations with each item in the questionnaire. The sample was split and a double cross-validation study was performed which yielded average cross-validity coefficients of .59 for the creative rating, .55 for the overall rating, and .52 for the creativity checklist. Based on their conclusions that these coefficients were unusually high for the difficult criteria measures used in the study, Taylor et al. recommended additional experimental research in the use of biographical data.

Salmon (1972) developed a Biographical Data Inventory (BDI) to predict successful performance as a State Police Trooper. The sample of 346 subjects included randomly selected white State Police Troopers from three states: Michigan, New York, and Pennsylvania. Also included in the sample were all the black troopers from the same three states. The criterion measure used was the standard Michigan State Police Rating form which rates the individual on ten performance factors, using ratings of excellent, satisfactory, and unsatisfactory

with scoring values of 3, 2, and 1 respectively. The total score for each man was the sum of the scoring values. The BDI consisted of 111 items and was administered to the total sample; however, a separate scoring key was developed for the Troopers from each state. For purposes of cross-validation, a hold-out group (n=49) was randomly selected from the Michigan subjects included in the sample. Correlations obtained between the performance ratings and the BDI scores for the Michigan group were sufficiently high to warrant the use of biographical data in the selection of Michigan State Troopers (r=.35 at the .025 level) (Salmon, 1972, p. 5). Salmon recommended that locally developed scoring keys be used by each state.

Education

Traditionally, educational institutions have relied almost exclusively upon cognitive measures to predict academic success. Since the 1950's, a number of researchers have experimented with the use of biographical information from students to predict their academic achievement, creativity, and participation in cultural events.

Myers (1952) investigated the use of personal history items as an adjunct to scholastic aptitude tests and high school grade point average in predicting academic achievement in college. The sample used was composed of

355 students of the Class of 1951 who had completed their freshman year at a small liberal arts college for women in the East. An achievement index was developed by comparing the individual's scores on the mathematical and verbal sections of the College Board Scholastic Aptitude Test (SAT) and the freshman year grade point average. This achievement index was used to evaluate each item of biographical information as a predictor of academic success. Seven personal history items were found to be of significant value. A multiple correlation of the SAT scores, high school grade point average and freshman year grade point average yielded a correlation of .62. Weights were assigned to each of the biographical items used and a total biographical score computed for each student. A multiple correlation of the predictive measures, freshman grade point average and biographical score showed a correlation of .65. Results of a cross-validation study, using 346 students from the next year's class, and the same variables, yielded a similar multiple correlation of .65. Meyers concluded that the addition of biographical information provided a small but significant contribution to the predictive measures employed.

Research at the University of Tennessee (Ward, 1965) utilized biographical data as a noncognitive predictor of academic achievement. A preliminary inventory was developed consisting of 96 items with 689 alternatives

classified into four categories: (a) motivation, (b) home, school, and community background, (c) work-study habits, and (d) personal characteristics. The original sample was the entering freshman class of 1957 at the University of Tennessee and the grade point average (GPA) attained at the end of the first quarter was used as the criterion of academic success. Students were divided into eight groups according to their college and a predicted GPA was computed for each student by the use of regression equations for each group. Based on the difference between actual and predicted GPA, the 27% who achieved highest above predicted GPA were identified as achievers, while the 27% whose performance was farthest below prediction were identified as nonachievers. Chi-square for equal groups was used to compare the response of achievers and nonachievers for each item. An item was selected for the final inventory if it: (a) differentiated between achievers and nonachievers with a probability of .05 or less, (b) differentiated in the same direction for a sub-group of 79 students selected from designated achievers who failed, and (c) designated nonachievers who passed. Only 58 alternatives met the criteria for inclusion in the final inventory, the greatest number being in the work-study habits section of the initial inventory. One hundred twenty-five freshmen in the entering class of 1958 were used to cross-validate the

final inventory items. A comparison between GPA and inventory scores yielded a point-biserial correlation of .75. Based on an analysis of the discriminating items for both groups, Ward concluded the items differentiated because they were related to the degree of academic interest of the students. Motivation for learning is thus emphasized as an important factor in academic success (Ward, 1965, p. 14).

Anastasi, Meade, and Schneiders (1960) have demonstrated the feasibility of using biographical data to predict the success of a student in meeting specific nonintellectual goals of a particular institution. At Fordham University, top-level administrators identified four principal objectives of the institution: (a) intellectual development, (b) character formation, (c) promotion of personality growth, and (d) training for leadership. Three groups of 50 students each were selected for the initial sample from the class of 1958, and for the cross-validation sample from the class of 1959. The three groups were identified as Positive, Average, and Negative according to the degree to which the students had met the institutional objectives during their first three years in college.

The Fordham biographical inventory questionnaire (Anastasi, et al., 1960) consisted of 303 items categorized into four general groups of items: (a) objective

information about the student's present status and past history, (b) self-report items of the individual's reactions to past activities, (c) future plans and expectations, and (d) incomplete sentences of a projective nature. A phi-coefficient was computed between presence or absence of each item on the response and membership in a criterion group. All items which differentiated at the .20 or higher level of significance between two criterion groups were considered for inclusion in the initial scoring key. Cross-validation of the items, using similar criterion groups from the 1959 class, yielded validity coefficients of .548, .346, and .256 in comparing the Positive-Negative, Positive-Average, and Average-Negative groups respectively. All coefficients were significant at the .01 level. An analysis of other predictors including SAT scores, and aptitude, personality, and interest tests, indicated the biographical inventory differentiated more effectively than the other predictors. In the statement of conclusions, Anastasi emphasized the distinct quality of biographical data as a predictor of adjustment and achievements of college students apart from the traditional grade point average.

Concern for the quality and quantity of physicians in this country has prompted various studies relevant to the practice of medicine and procedures for admission to the profession. Studies of the competence

of practicing physicians (Clute, 1963; Peterson, Andrews, Spain, & Greenberg, 1956; Howell & Vincent, 1967) have shown very little or no correlation between a student's academic performance in medical school and competency in the actual practice of medicine. Based on these observations, Shulman and Elstein (1971) presented a different approach to the assessment of medical school applicants in a presentation made to the Conference of Personality Measurement in Medical Education. They recommended research in the use of noncognitive measures as predictors of performance in the practice of medicine. Present admissions criteria, including the Medical College Admission Test (MCAT) and grade point average, do not predict such important variables as long-range clinical competence, probable entry into under-supplied, high-priority medical specialities, effective doctor-patient relationships, and success in a medical career for under-represented minority groups. Shulman and Elstein suggested the use of personality and interest tests, and biographical data might improve the medical school admissions process. The authors emphasized the need for well-designed research efforts directed toward the definition and evaluation of criterion variables and described several research designs that might be used.

As a result of general dissatisfaction with present medical school admissions procedures, late in 1972,

the Division of Educational Measurement and Research of the Association of American Medical Colleges (AAMC) established the Medical College Admissions Assessment Program, under the direction of James Angel. Investigations to date have led Angel to recommend the use of a biographical inventory as part of the selection procedures for admission to medical school (Association of American Medical Colleges, 1973).

The search for nonintellectual measures as instruments for prediction and acceptance into medical school is not confined to the United States alone. A commission appointed by the Canadian government to inquire into health services urged medical school admissions officers to broaden their base for evaluation beyond sole consideration of academic achievements. As a result, Collishaw and Grainger (1972) investigated the use of biographical data as a selection instrument. To facilitate the collection of data, a short biographical questionnaire was distributed by the Association of Canadian Medical Colleges (ACMC). Each applicant was required to return a completed survey form with the application for admission to medical school. Based on academic qualifications, admissions officers at the medical schools marked each questionnaire as acceptable, marginal, or unacceptable and returned the forms to ACMC.

The total sample used by Collishaw and Grainger included all Canadians between the ages of 15 and 19 (5,207,800) as reported in the Vital Statistics Preliminary Annual Report, 1969, a publication of the Dominion Bureau of Statistics; 3,537 applicants for admission to medical schools in Canada, and 1,867 applicants evaluated as acceptable. A comparison of data from the different groups in the total sample showed that the medical school applicant group was homogeneous and quite different from the total population considered with respect to several biographical characteristics: age, sex, marital status, residence, social status, and academic achievement. The authors concluded that if a greater heterogeneity in the student body is desired, biographical data can be used to recruit applicants from under-represented backgrounds.

Further evidence of the versatility of biographical data as a predictor can be found in a study conducted at a large midwestern university (Schmidt, Owens, & Tiffin, 1971). The researchers used biographical information to develop a key for predicting attendance at campus cultural events. Half of the sample was randomly selected from the season subscription list of the University Theatre and half was selected at random from the student directory. Fifty per cent of each group was held out for the purposes of cross-validation. A list

of 13 student activities, including four cultural events, was used as the criterion and a criterion score was derived based on the number of events which the subject checked as having attended. A biographical inventory containing 136 items of an objective, factual, evaluative, or subjective nature, with 366 scorable foils, was mailed to the total sample and 246 usable responses were returned. A correlational analysis of the items produced 41 items which differentiated between students who attended cultural events and those who did not. Responses to these items were used by Schmidt et al. to develop a profile of attenders and nonattenders at cultural events which could be used in planning publicity strategies for cultural events.

Much of the success in establishing the biographical inventory as a valid predictive instrument can be attributed to the extensive experimentation conducted by the Institute for Behavioral Research in Creativity of the Richardson Foundation. The successful use of biographical information to predict creativity potential for NASA researchers and scientists (Taylor et al., 1966) led to further studies in the industrial sector. A concurrent interest of the Institute has been in the use of biographical data to predict academic performance. To this end, researchers at the Institute developed a special biographical inventory, using items which

related specifically to academic performance in addition to items used in prior research. To test the validity of this instrument, a study was conducted at Ohio University (Ellison, James, & Carron, 1970) using the freshman class as a sample. Cross-validation of biographical inventory items with first semester grade point average yielded validities of .58 for males and .60 for females in predicting academic performance. Based on these results, the researchers concluded that the use of a biographical inventory in an academic setting was a valid extension of the diversity of applications for this predictive instrument.

To further validate the findings of the previously cited study (Ellison, et al., 1970) the Institute for Behavioral Research in Creativity conducted a study using North Carolina high school students as subjects. A modified Biographical Inventory was administered to a stratified random sample of 13,250 students enrolled in the 9th and 12th grades. Grade point average was correlated with the inventory score and a correlation of .61 was obtained. Additional variables, including IQ score, sex, race, creativity, and extra-curricular activities were included in the evaluation of the data. Researchers of the Institute concluded that the Biographical Inventory was independent of sex, age, and race and more effectively predicted academic performance

than the achievement and intelligence tests included in the study. In addition to improving college admissions selection criteria, results of the study indicate the usefulness of a biographical inventory in advising and counseling students (Ellison, James, & Fox, 1970).

Holmes (1974) investigated the use of a biographical inventory to predict academic success for students in the medical technology program at Michigan State University. A Biographical Inventory Blank (BIB) was administered to 126 sophomore students who were applying for admission to the upper level of the School of Medical Technology at the beginning of Fall term, 1972. The accumulated grade point average for each student was used as the criterion of academic success and the sample divided into a High group (upper 27% on the criterion variable) and a Low group (lower 27% on the criterion variable). Using the responses of the High and Low groups, an Index of Discrimination was computed for each of the item foils. Forty-one items survived the analysis and were compiled to form a new BIB. Weights were assigned to the differentiating items and a total score computed for each subject. Pearson's Product Moment correlation coefficient was used to determine the relationship between the BIB scores and grade point averages and a correlation of .51 resulted. Holmes concluded the BIB is an effective measure for

predicting academic success in the medical technology program at Michigan State University and for use in advising and selecting students for the program.

The rapid growth of testing services as a commercial enterprise is testimony to our national commitment to evaluation. According to Goslin (1963) commercial test publishers sold $11,000,000 of testing materials in 1961. The largest percentage of these materials test for ability and achievement; however, noncognitive measures of performance are accounting for an increasing percentage of the total. Biographical data have been validated for use by industry, the government and educational institutions as classification, selection, and predictive measures for such diversified groups as army personnel, scientists, students, and salesmen.

Encouraged by the successful use of biographical inventories and prompted by the rapid growth in enrollments in academic programs for medical technology, the present study was designed to investigate the use of a biographical inventory and its correlation with success in the practice of medical technology and thereby assist in the advisement and selection of students who aspire to a career in the profession.

CHAPTER III

DESIGN OF THE STUDY

Two types of research methods were utilized in this study: descriptive and analytical. The purpose of the study was to investigate the use of biographical information and its correlation with successful clinical performance for medical technology students at Michigan State University.

The following definition of descriptive research is offered by John W. Best (1959):

> Descriptive research describes and interprets what is. It is concerned with conditions or relationships that exist; practices that prevail; beliefs, or points of view, or attitudes that are being felt; or trends that are developing. The process of descriptive research goes beyond mere gathering . . . of data. It involves an element of interpretation of the meaning or significance of what is described [pp. 102-03].

According to Smith, Stanley, and Shores (1950) analytical research is:

> . . . content selection . . . of the things people do in order to discover the subject matter functioning in . . . various activities. . . . There are three forms of analyses, an activity analysis, . . . job analysis, . . . and use of the processes of analysis to determine the elements of knowledge or the skills having general utility [pp. 306-12].

This study was designed to describe specific characteristics which correlate with successful performance in the practice of medical technology. The procedures used were chosen with the objective of determining how student success in the clinical year relates to responses to the biographical inventory items. The validity of any criterion in correlating with future on-the-job success rests on its ability to differentiate between successful and unsuccessful students or good or poor workers. The scores on these criteria must then correlate with ratings of actual job performance. Since the hospital internship closely parallels the actual practice of medical technology, performance during the internship year was chosen for evaluation of performance. Justifications for this procedure may be found in the methodology used in testing for vocational aptitude in which observations are made of an individual's performance in a situation similar to that in which he or she will later function (Elberfeld & Love, 1970, p. 390).

Sample

The original sample for the study consisted of the entire senior class enrolled in the School of Medical Technology at Michigan State University during Spring term, 1972, and was composed of 57 students, 51 females and 6 males. A biographical information form was administered to all of the seniors. One male did not return

the questionnaire and the responses of 10 females were discarded since they did not intern following graduation. These deletions resulted in a total usable sample of 46 students, 41 females and 5 males.

Criterion

Performance ratings of the subjects during their internship year were used to determine the relationship between the criterion, success in medical technology, and responses to items on the biographical inventory.

The Instrument

The initial instrument used in the study was a Biographical Data Inventory form compiled from a pool of items developed for the Creativity Research Institute (Glennon, Albright, & Owens, 1966). In essence, a biographical inventory is an extended and revised version of the application form commonly used in selection procedures for many types of occupations. The self-report form presents a number of multiple choice items which allows the applicant to describe himself demographically, attitudinally, and experientially. Items deal with attitudes, value judgments, and feelings, as well as factual data. The biographical inventory has an advantage over the traditional interview in that each applicant responds to a standardized set of questions which are objectively scored. Its semblance to the common application form

makes it less threatening to the respondent than a psychological test. An inventory composed of life-history items is nondiscriminatory since the items and scoring keys are empirically derived for each specific usage and assure that only job-related questions are included and responses are evaluated in terms of their relationship to successful job performance.

Eighty-four multiple-choice items were selected by a panel composed of a medical technologist, an academic advisor, and the researcher. The panel discarded those items from the original pool which they considered irrelevant to the sample. The preliminary questionnaire, entitled Biographical Data Inventory, (BDI) was administered to the sample in April, 1972, at Michigan State University (Appendix A). The BDI was reproduced in the form of a reusable mimeographed booklet and answers to the questionnaire were recorded on a standard IBM answer sheet.

Students were informed that response to the form was entirely voluntary and the information requested was to be used only as research data and would have no implications for their future progress in the medical technology program. Students were asked to complete the questionnaire by marking their responses on the attached standard IBM sheet and to return both the questionnaire and the answer sheet to the researcher within two weeks.

The importance of responding to the items independently of other persons was stressed. Fifty-seven forms were distributed. One student failed to respond, for a total return of 56. Ten additional subjects were subsequently deleted from the sample since they did not complete an internship and no criterion scores were available, resulting in a final sample of 46.

Procedures

On August 3, 1973, a form letter was sent to the educational coordinator at each of the 37 hospitals in Michigan offering a medical technology program (Appendix B). The letter requested a copy of the final evaluation form used at the end of the clinical internship to rate the overall performance of students. Sixteen hospitals complied with the first request. On August 20, 1973, a follow-up letter was mailed to the hospitals who had not responded (Appendix C). Fourteen additional hospitals responded to the second request, for a total of 30 responses, or an 81% return.

A tally was made of each category evaluated by each hospital, yielding a total of 76 categories. From this tally, similar or related categories were combined to form one category, i.e. "attitude towards staff" and "attitude towards fellow workers" were combined to form the category, "interpersonal relations." Only those categories employed by 50% or more of the hospitals were

included in the preliminary criterion measure which resulted in the use of 18 categories relevant to personal and work habits as well as quality and quantity of production. Also included on the preliminary form was a five-point rating scale for each category, 5 indicating Excellent, and 1 indicating Unacceptable. The following definitions of each increment of the rating scale were shown on the form to assure uniformity of ratings:

5 - Consistently performs above required standards;

4 - Occasionally performs above required standards;

3 - Meets required standards of performance;

2 - Occasionally falls below required standards of performance;

1 - Frequently falls below required standards of performance.

In an additional effort to obtain uniformity of ratings, each category included a brief statement of the considerations to be used in rating the individual for each category.

On October 8, 1973, a copy of the preliminary form was sent to six Educational Coordinators in hospitals ranging in size from less than 100 beds to more than 500 beds with a letter (Appendix D) requesting their reactions to the relevancy, format and utility of the criterion measure (Appendix E). Their responses resulted in two minor changes in the wording and format of the form.

On October 29, 1973, an explanatory letter (Appendix F) and a final Evaluation Form (Appendix G) was sent to the Educational Coordinator at each of the hospitals where the subjects had interned. All of the forms were completed and returned. Table 1 shows the geographic distribution of subjects during their internship.

Table 1

Geographic Distribution of Internships

State	Hospitals	Interns from M.S.U.
Michigan	17	32
Alabama	1	1
California	4	5
Illinois	2	2
New York	1	1
North Carolina	1	2
Virginia	1	1
Massachusetts	2	2
	29	46

Index of Discrimination

A total Evaluation Score was derived for each subject by summing the ratings on the Evaluation Form. Based on the Evaluation Scores, the highest 27% of the sample was designated as the Upper group and the lowest 27% formed the Lower group for the purpose of computing an Index of Discrimination. Each group included 12 subjects. Ebel (1965) states:

> 27 per cent provides the best compromise between two desirable but inconsistent aims (1) to make the extreme groups as large as possible and (2) to make the extreme groups as different as possible [p. 349].

It has been demonstrated that when extreme groups are used, each group consisting of 27% of the sample, the ratio of difference in average abilities of the groups to the standard error of their difference, is maximum (Kelley, 1939).

The CDC 6500 computer was used to tabulate a frequency table for each of the biographical item responses, showing the number of responses from the Lower group (L) and the number of responses from the Upper group (U). The Index of Discrimination (D) for each alternative response was determined by subtracting the number of responses of the lower group from the number of responses of the upper group and then dividing this difference by the number of respondents in either group (n). The Index of Discrimination was the quotient, expressed as a decimal:

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

Selection of Items

Based on experience, Ebel (1965) suggests that the Indices of Discrimination can be evaluated as follows:

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

Only those items with at least one alternative with a D of .25 or above were selected for inclusion in the final BDI. Twenty-four items met the qualifying criterion and were compiled to form the final BDI (Appendix H).

Scoring Key

The Index of Discrimination (D) was used to develop a Scoring Key for the Biographical Data Inventory. Alternatives showing a D of .40 or more were assigned a weight of ±3; alternatives with a D of .30 to and including .39 were given a weight of ±2; alternatives which had a D of .25 to and including .29 were weighted ±1. Alternatives with a D of less than .25 were given 0 weight since they made no significant contribution to the differentiation between groups. A BDI score was derived for each subject in the Upper and Lower groups by applying the Scoring Key to only those items in the original biographical inventory which had been selected for use in the final BDI and summing the values of the weighted items. The relationship between the BDI score and the criterion score was computed using Pearson's Product Moment correlation coefficient.

Validation

The small number of subjects in the sample (n=46) made it inadvisable to select a hold-out group for validation purposes. Since the use of the same group in developing scoring key weights as well as the application of these weights can produce spuriously high results (Holmes, 1974), a group of successful medical technologists was used to test the effectiveness of the final Biographical Data Inventory in correlating with successful performance in medical technology. Successful medical technologists were defined as those who had risen to responsible positions in their field as Educational Coordinators, Chief Medical Technologists, or Section Chiefs.

On March 13, 1974, a letter was sent to 48 medical technologists in several occupational environments, including laboratories in large, medium, and small hospitals, and private laboratories (Appendix I). The letter explained the purpose of the study and requested a response to the enclosed BDI. Thirty-five BDI's were completed and returned, for a 73% response. The BDI Scoring Key was used to compute a total score for each response. If the BDI did not, in some way, measure a successful medical technologist, then we would expect to find random fluctuations of the scores of individuals

who have succeeded in the profession. The range of possible scores was from +34 to -35.

The procedures described in this chapter were developed to implement the exploration of the use of biographical data and their correlation with successful performance in medical technology. A detailed report of the results generated by the procedures is reported in the following chapter.

CHAPTER IV

ANALYSIS OF THE DATA

The purpose of this study was to evaluate the effectiveness of life history items and their correlation with successful performance in the practice of medical technology. For purposes of the study, the assumption was made that a clinical internship approximates the actual work situation in medical technology. Therefore, successful performance in an internship was the criterion for the study.

A multiple-choice questionnaire, consisting of 84 biographical data items with 361 possible responses, was administered to 57 students. These students comprised the entire senior class enrolled in the School of Medical Technology at Michigan State University during the Spring term, 1972. One questionnaire was not returned and 10 others could not be used, resulting in a total usable sample of 46.

Criterion Scores

A total score was derived for each subject based on supervisor's ratings of performance during the

internship and two groups were selected from the sample, an Upper group, (highest 27% on the criterion variable, n=12) and a Lower group (lowest 27% on the criterion variable, n=12). The total distribution of scores was negatively skewed with scores of the Upper group ranging from 89 to 84 inclusive and scores of the Lower group ranging from 68 to 44 inclusive. The mean score was 75 ($\bar{x}$ = 75) and the median score was 66.5 (M = 66.5). Twenty-six scores fell above the mean and 20 scores fell below.

Item Analysis

Table 2 shows the frequencies of responses to each alternative for all items, by group, computed on the CDC 6500 computer. From this data, an Index of Discrimination (D) was computed for each item (Table 3). The Index of Discrimination was used as the means for selecting items to be included in the final Biographical Data Inventory and for assigning weights to the items for the Scoring Key (Table 4). Twenty-four items with a D of 2.5 and higher were found to differentiate between the Upper and Lower groups.

Items 3, 15, and 22 were the most powerful differentiators between the Upper and Lower groups with a weight of ±3. On item 3, "which of the following do you like least?" 7 of the Upper group selected (C), reading and stamp collecting; 5 of the Lower group chose (B),

Table 2

Lower and Upper Group Response Frequencies

Items	Alternatives											
	A		B		C		D		E		F	
	L	/ U	L	/ U	L	/ U	L	/ U	L	/ U	L	/ U
1	8/	9	3/	3	0/	0	1/	0	0/	0	0/	0
2	8/	9	0/	0	4/	3	0/	0	0/	0	0/	0
3	10/	12	2/	0	0/	0	0/	0	0/	0	0/	0
4	6/	9	5/	1	0/	1	1/	1	0/	0	0/	0
5	8/	8	2/	2	1/	2	0/	0	1/	0	0/	0
6	3/	1	0/	1	4/	4	4/	6	1/	0	0/	0
7	1/	0	2/	3	5/	7	4/	2	0/	0	0/	0
8	1/	1	1/	3	5/	6	5/	2	0/	0	0/	0
9	6/	5	5/	4	1/	3	0/	0	0/	0	0/	0
10	1/	2	5/	3	4/	4	2/	2	0/	1	0/	0
11	1/	2	9/	10	1/	0	1/	0	0/	0	0/	0
12	4/	7	6/	4	0/	1	2/	0	0/	0	0/	0
13	5/	7	5/	5	2/	0	0/	0	0/	0	0/	0
14	1/	2	6/	4	5/	3	0/	3	0/	0	0/	0
15	1/	0	4/	5	7/	7	0/	0	0/	0	0/	0
16	3/	3	5/	1	3/	7	1/	1	0/	0	0/	0
17	6/	6	5/	6	0/	0	1/	0	0/	0	0/	0
18	2/	1	8/	8	2/	3	0/	0	0/	0	0/	0
19	3/	6	0/	0	9/	6	0/	0	0/	0	0/	0
20	7/	5	5/	7	0/	0	0/	0	0/	0	0/	0
21	2/	5	8/	7	2/	0	0/	0	0/	0	0/	0
22	3/	3	9/	9	0/	0	0/	0	0/	0	0/	0
23	1/	6	2/	0	2/	2	7/	4	0/	0	0/	0
24	12/	10	0/	1	0/	1	0/	0	0/	0	0/	0
25	2/	2	3/	5	5/	2	2/	3	0/	0	0/	0
26	0/	1	8/	7	4/	4	0/	0	0/	0	0/	0
27	10/	5	2/	7	0/	0	0/	0	0/	0	0/	0
28	7/	10	3/	2	1/	0	1/	0	0/	0	0/	0
29	6/	11	4/	1	0/	0	2/	0	0/	0	0/	0
30	2/	1	2/	0	4/	3	4/	8	0/	0	0/	0
31	1/	2	0/	1	11/	8	0/	1	0/	0	0/	0
32	7/	5	4/	6	1/	0	0/	1	0/	0	0/	0
33	5/	7	2/	0	5/	5	0/	0	0/	0	0/	0
34	10/	6	0/	0	2/	6	0/	0	0/	0	0/	0
35	7/	3	5/	9	0/	0	0/	0	0/	0	0/	0
36	2/	0	5/	7	5/	4	0/	1	0/	0	0/	0
37	3/	1	7/	8	2/	3	0/	0	0/	0	0/	0
38	1/	1	9/	9	2/	2	0/	0	0/	0	0/	0
39	8/	6	0/	0	0/	1	4/	5	0/	0	0/	0
40	1/	0	4/	3	2/	7	5/	2	0/	0	0/	0
41	0/	0	3/	2	0/	3	9/	7	0/	0	0/	0
42	2/	0	1/	2	3/	3	6/	7	0/	0	0/	0
43	7/	6	2/	4	2/	2	1/	0	0/	0	0/	0
44	1/	2	9/	8	2/	2	0/	0	0/	0	0/	0
45	4/	2	5/	5	3/	5	0/	0	0/	0	0/	0
46	6/	8	6/	4	0/	0	0/	0	0/	0	0/	0
47	3/	3	6/	7	3/	2	0/	0	0/	0	0/	0
48	4/	1	6/	8	2/	2	0/	1	0/	0	0/	0
49	4/	4	2/	4	5/	4	1/	0	0/	0	0/	0
50	4/	0	1/	2	6/	4	1/	6	0/	0	0/	0
51	2/	3	4/	3	0/	2	6/	4	0/	0	0/	0
52	7/	8	0/	0	3/	2	2/	2	0/	0	0/	0
53	1/	0	3/	1	2/	2	6/	9	0/	0	0/	0
54	6/	3	3/	2	1/	4	2/	3	0/	0	0/	0
55	0/	0	6/	5	6/	6	0/	0	0/	0	0/	0
56	5/	5	5/	5	1/	1	1/	1	0/	0	0/	0
57	1/	2	4/	4	6/	6	1/	0	0/	0	0/	0
58	5/	1	7/	11	0/	0	0/	0	0/	0	0/	0
59	5/	4	2/	1	3/	1	2/	5	0/	0	0/	0
60	9/	7	2/	2	1/	3	0/	0	0/	0	0/	0
61	1/	1	8/	8	3/	3	0/	0	0/	0	0/	0
62	1/	1	9/	10	2/	1	0/	0	0/	0	0/	0
63	6/	5	5/	6	1/	0	0/	1	0/	0	0/	0
64	1/	0	0/	0	1/	5	10/	7	0/	0	0/	0
65	4/	3	5/	2	1/	2	2/	5	0/	0	0/	0
66	0/	2	4/	5	0/	0	8/	5	0/	0	0/	0
67	3/	1	8/	10	0/	0	1/	1	0/	0	0/	0
68	3/	3	4/	3	3/	3	2/	3	0/	0	0/	0
69	0/	0	4/	5	5/	7	3/	0	0/	0	0/	0
70	4/	1	2/	5	1/	0	5/	6	0/	0	0/	0
71	2/	3	9/	4	1/	5	0/	0	0/	0	0/	0
72	1/	0	9/	4	2/	8	0/	0	0/	0	0/	0
73	3/	1	2/	4	7/	7	0/	0	0/	0	0/	0
74	3/	2	0/	1	6/	8	3/	1	0/	0	0/	0
75	1/	1	3/	5	5/	4	3/	2	0/	0	0/	0
76	7/	7	3/	2	0/	0	2/	3	0/	0	0/	0
77	1/	0	7/	6	3/	5	1/	1	0/	0	0/	0
78	5/	2	5/	7	2/	3	0/	0	0/	0	0/	0
79	10/	9	0/	0	2/	2	0/	1	0/	0	0/	0
80	1/	0	3/	3	3/	5	1/	0	4/	4	0/	0
81	2/	3	2/	1	5/	4	1/	2	2/	2	0/	0
82	1/	3	4/	3	4/	4	1/	2	2/	0	0/	0
83	0/	1	2/	1	4/	1	3/	1	3/	8	0/	0
84	5/	6	2/	1	2/	2	1/	0	2/	2	0/	1

Table 3

Indices of Discrimination

Items	Alternatives				
	A	B	C	D	E
1	.0588	0.0000	0.0000	0.0000	0.0000
2	.0588	0.0000	-.1429	0.0000	0.0000
3	.0909	0.0000	0.0000	0.0000	0.0000
4	.2000	-.6667	0.0000	0.0000	0.0000
5	0.0000	0.0000	0.0000	0.0000	0.0000
6	-.5000	0.0000	0.0000	.2000	0.0000
7	0.0000	.2000	.1667	-.333	0.0000
8	0.0000	.5000	.0909	-.4286	0.0000
9	-.0909	-.1111	.5000	0.0000	0.0000
10	0.0000	-.2500	0.0000	0.0000	0.0000
11	0.0000	.0526	0.0000	0.0000	0.0000
12	.2727	-.2000	0.0000	0.0000	0.0000
13	.1667	0.0000	0.0000	0.0000	0.0000
14	0.0000	-.2000	-.2500	0.0000	0.0000
15	0.0000	.1111	0.0000	0.0000	0.0000
16	0.0000	-.6667	.4000	0.0000	0.0000
17	0.0000	.0909	0.0000	0.0000	0.0000
18	0.0000	0.0000	.2000	0.0000	0.0000
19	.3333	0.0000	-.2000	0.0000	0.0000
20	-.1667	.1667	0.0000	0.0000	0.0000
21	.4286	-.0667	0.0000	0.0000	0.0000
22	0.0000	0.0000	0.0000	0.0000	0.0000
23	.7143	0.0000	0.0000	-.2727	0.0000
24	-.0909	0.0000	0.0000	0.0000	0.0000
25	0.0000	.2500	-.4286	.2000	0.0000
26	0.0000	-.0667	0.0000	0.0000	0.0000
27	-.3333	.5556	0.0000	0.0000	0.0000
28	.1765	-.2000	0.0000	0.0000	0.0000
29	.2941	-.6000	0.0000	0.0000	0.0000
30	0.0000	0.0000	-.1429	.3333	0.0000
31	0.0000	0.0000	-.1579	0.0000	0.0000
32	-.1667	.2000	0.0000	0.0000	0.0000
33	.1667	0.0000	0.0000	0.0000	0.0000
34	-.2500	0.0000	.5000	0.0000	0.0000
35	-.4000	.2857	0.0000	0.0000	0.0000
36	0.0000	.1667	-.1111	0.0000	0.0000
37	-.5000	.0667	.2000	0.0000	0.0000
38	0.0000	0.0000	0.0000	0.0000	0.0000
39	-.1429	0.0000	0.0000	.1111	0.0000
40	0.0000	-.1429	.5556	-.4286	0.0000
41	0.0000	-.2000	0.0000	-.1250	0.0000
42	0.0000	0.0000	0.0000	.0769	0.0000
43	-.0769	.3333	0.0000	0.0000	0.0000
44	0.0000	-.0588	0.0000	0.0000	0.0000
45	-.3333	0.0000	.2500	0.0000	0.0000
46	.1429	-.2000	0.0000	0.0000	0.0000
47	0.0000	.0769	-.2000	0.0000	0.0000
48	-.6000	.1429	0.0000	0.0000	0.0000
49	0.0000	.3333	-.1111	0.0000	0.0000
50	-1.0000	0.0000	-.2000	.7143	0.0000
51	.2000	-.1429	0.0000	-.2000	0.0000
52	.0667	0.0000	-.2000	0.0000	0.0000
53	0.0000	-.5000	0.0000	.2000	0.0000
54	-.3333	-.2000	.6000	.2000	0.0000
55	0.0000	0.0000	0.0000	0.0000	0.0000
56	0.0000	0.0000	0.0000	0.0000	0.0000
57	0.0000	0.0000	0.0000	0.0000	0.0000
58	-.6667	.2222	0.0000	0.0000	0.0000
59	-.1111	0.0000	-.5000	.4285	0.0000
60	-.1250	0.0000	.5000	0.0000	0.0000
61	0.0000	0.0000	0.0000	0.0000	0.0000
62	0.0000	.0526	0.0000	0.0000	0.0000
63	-.0909	.0909	0.0000	0.0000	0.0000
64	0.0000	0.0000	.6667	-.1765	0.0000
65	-.1429	-.4286	0.0000	.4286	0.0000
66	0.0000	.1111	0.0000	-.2308	0.0000
67	-.5000	.1111	0.0000	0.0000	0.0000
68	0.0000	-.1429	0.0000	.2000	0.0000
69	0.0000	.1111	.1667	0.0000	0.0000
70	-.6000	.4286	0.0000	.0909	0.0000
71	.2000	-.3846	.6667	0.0000	0.0000
72	0.0000	-.3845	.6000	0.0000	0.0000
73	-.5000	.3333	0.0000	0.0000	0.0000
74	-.2000	0.0000	.1429	-.5000	0.0000
75	0.0000	.2500	-.1111	-.2000	0.0000
76	0.0000	-.2000	0.0000	.2000	0.0000
77	0.0000	-.0769	.2500	0.0000	0.0000
78	-.4286	.1667	.2000	0.0000	0.0000
79	-.0526	0.0000	0.0000	0.0000	0.0000
80	0.0000	0.0000	.2500	0.0000	0.0000
81	.2000	0.0000	-.1111	0.0000	0.0000
82	.5000	-.1429	0.0000	0.0000	0.0000
83	0.0000	0.0000	-.6000	-.5000	.4545
84	.0909	0.0000	0.0000	0.0000	0.0000

Table 4

Scoring Key

Items Final BDI	Preliminary BDI	A	B	C	D	E
1	4	0	-2	0	0	0
2	8	0	+1	0	-1	0
3	16	0	-3	+3	0	0
4	19	+1	0	-1	0	0
5	21	+1	0	0	0	0
6	23	+2	0	0	0	0
7	25	0	+1	-1	0	0
8	27	-2	+2	0	0	0
9	29	+1	-1	0	0	0
10	30	0	0	0	+1	0
11	34	-1	0	+2	0	0
12	35	-2	+1	0	0	0
13	40	0	0	+2	-2	0
14	48	-1	0	0	0	0
15	50	-3	0	0	+3	0
16	54	-1	0	+1	0	0
17	58	-2	+1	0	0	0
18	59	0	0	-1	+1	0
19	65	0	-2	0	+2	0
20	70	-1	+1	0	0	0
21	71	0	-2	+2	0	0
22	72	0	-2	+3	0	0
23	78	-2	0	0	0	0
24	83	0	0	-2	-2	+2

Note: The + and - figures indicate the scoring weights assigned to alternatives for each item of the BDI.

fishing, camping, hunting. On item 15, "which one of the following do you look forward to most in your leisure time activities?" 6 in the Upper group marked (D), "a chance to be outdoors or active"; while 4 of the Lower group chose (A), "a chance to rest and relax." On item 22, "as a child, whom did you confide in most?" 8 of the Upper group selected (C), "a brother or sister" and 9 of the Lower group indicated (B), "mother."

Items with a weight of ±2 included 1, 6, 8, 11, 12, 13, 17, 19, 21, 23, and 24. On item 1, only 1 of the Upper group said they would move from location to location only if it were absolutely necessary (B), but 5 of the Lower group chose this response. On item 6, "lack of finances" (A) was indicated by 1 of the Lower group as having caused the most personal difficulty in the past six months, but 6 of the Upper group chose the same alternative. For item 8, "How enjoyable do you find it to talk to people you don't know?" 7 in the Upper group said they occasionally enjoyed it (B), while 10 of the Lower group selected alternative (A), "usually enjoyed it." In answer to item 11, "In the past, how have you reacted to competition?" 6 in the Upper group chose (C), "Have done all right but haven't liked it." However 10 of the Lower group indicated they had done their best in competitive situations (A). On item 12, 7 of the lower group thought they could be

in the top 5% as a supervisor (A), while 9 of the Upper group saw themselves as being in the upper 20, but not the top 5% (B). For item 13, 7 of the Upper group indicated they volunteered information or opinions in the classroom less often than average (C), while 5 of the Lower group said they volunteered information or opinions very seldom (D). On item 17, 11 of the Upper group thought the quality of their decisions was about the same as that of their associates (B) but 5 of the Lower group felt they made better decisions than their associates (A). On item 19, the preferred reading by 5 of the Upper group during ages 12 to 18 was (D), "magazines, mysteries, love stories"; while 5 of the Lower group reported reading more biographies and historical novels (B) during the same age period. Item 21 asked, "How were you usually punished as a child?" Five Upper group respondents said they were, "warned not to do it again, but seldom punished" (C). Nine of the Lower group reported being reprimanded verbally, or deprived of something (B). On item 23, 5 of the Lower group felt they were well liked by practically everyone (A), but only 2 of the Upper group chose the same alternative. For item 24, 8 of the Upper group chose alternative (E), "business," as the occupational category of their father. Four of the Lower group marked response (C), "skilled," while 3 of the Lower group marked alternative (D), "professional."

The remaining ten items, 2, 4, 5, 7, 9, 10, 14, 16, 18, and 20, differentiated to a lesser degree between the Upper and Lower groups and were given a weighting score of ±1. Item 2 asked about preferred recreational activities. Five of the Lower group indicated they preferred solitary pursuits such as reading or listening to records (D); while 3 of the Upper group chose spectator sports (B). For item 4, "What sort of occupation would your parents most like you to enter?" 6 of the Upper group chose alternative (A) "profession." Nine of the Lower group said their parent had no preference (C). On item 5, only 2 of the Lower group said they preferred to work on one thing at a time (A), but 5 of the Upper group selected the same alternative. On item 7, the classroom or school (B) had provided the setting for the most negative experience for 5 of the Upper group; while 5 of the Lower group indicated a social situation (C) had provided their most negative experience. For item 9, 11 of the Upper group regarded puzzles as interesting (A); while 4 of the lower group were frustrated by puzzles (B). Item 10 questions, "As a youngster, how did you 'let off steam' when you got angry?" Eight of the Upper group but only 4 of the Lower group selected alternative (D) "I didn't, I tried to hide my feelings." On item 14, 4 of the Lower group said they had liked school very much while growing up

(A); by contrast, only 1 of the Upper group chose alternative (A). For item 16, "being with family and friends" (C) gave the most satisfaction to 4 of the Upper group; while 6 of the Lower group found their greatest satisfaction in being told they had done a good job (A). On item 18, 5 of the Upper group indicated the pressure for accomplishment (D) had caused them the most difficulty while working; while 5 of the Lower group had experienced the most difficulty in a work situation because of, "lack of friendliness of fellow workers," (A). For item 20, 5 of the Upper group indicated they were the youngest sibling, while 4 of the Lower group said they were the oldest.

A general profile of the successful and less successful medical technology intern emerges from the item responses of the Upper and Lower groups. Characteristics of the Upper group include a preference for the company of others, mobility, curiosity, and a moderate self-concept. By contrast, item responses of the Lower group show a tendency towards a greater need for approval, higher self-concept, impatience, and a preference for solitary pursuits.

Item Selection

The total difference in scoring weights for each item was computed by summing the difference, plus and minus, from 0; i.e., an item which showed weights

of +2 and -2 had a difference of 4. Four correlations of BDI scores and Evaluation scores were computed, using items having differences of 1, 2, 3, and 4 or greater, to determine the optimal combination of items for the BDI in terms of number of items used and power to differentiate between the Upper and Lower groups. The descriptive statistic used was Pearson's Product Moment correlation coefficient. Scores computed for items with a difference of 1 or better correlated .6773 with the criterion. Subsequent analyses of scores with item differences of 2, 3, and 4 or greater yielded correlations of .6907, .6185, and .5521 respectively. Elimination of items with a difference of 1 would have improved the correlation by .0134 but would have resulted in the loss of 3 items from the BDI. Therefore, items with a difference of 1 were used for the validation of the BDI since this permitted use of all items with a D of 2.5 or better.

Validation

The final Biographical Data Inventory was sent to 48 practicing medical technologists who currently held a position of responsibility as a Section Chief, Chief Medical Technologist, or Educational Coordinator. A total of 35 medical technologists responded for a 73% return. The BDI Scoring Key was used to compute a total score for each response. Computation of the BDI scores of the respondents supported the expectation that no

successful medical technologist would have an unacceptable score, and only 3 scores could be considered marginal. The possible high score was +34 and the possible low score was -35, based on the Scoring Key. The mean score was 3.77 with a standard deviation of 6.42.

An analysis of the data obtained in the study indicates that the BDI effectively identifies the behavioral correlates of success in the practice of medical technology for the sample and for practicing medical technologists.

CHAPTER V

SUMMARY, IMPLICATIONS, AND RECOMMENDATIONS

Summary

The administrators of academic and hospital-based medical technology programs in the state of Michigan are faced with the problem of rapidly increasing enrollments in academic programs at a time when internship facilities remain stable and employment opportunities for medical technologists may be decreasing. A number of factors have contributed to the present situation.

Prior to 1970, the supply of well-trained medical technologists was far below the demand; extensive, and successful, recruiting efforts have encouraged increased numbers of students to enter the profession. Concurrently, market saturation in other vocations has led to limitation of enrollments in the related academic curricula and students have turned to health-related professions, including medical technology, which seem to offer better employment opportunities after graduation.

The problem is further compounded for academic institutions by the recent curtailment of federal support.

National Institute of Health grants, awarded to colleges and universities for the purpose of instituting new programs in medical technology, or for extending existing programs, are no longer being funded in many cases. At Michigan State University the quality of the Medical Technology program faces impairment because of the limited university general funds which are available to supplement the loss of federal monies.

Another aspect of the problem is the change in employment opportunities for graduates of medical technology programs. A new category of laboratory personnel, the Medical Laboratory Technician (MLT), has recently been certified by the American Society of Clinical Pathologists. These graduates of two-year academic programs are trained to efficiently perform many of the high-volume, routine laboratory procedures formerly done only by medical technologists. Because MLT's command a lower salary, cost-conscious hospital administrators are employing more of these workers, thus reducing the demand for medical technologists. Increased automation and computerization of diagnostic procedures in the laboratory are further decreasing the need for greater numbers of medical technologists. Finally, changing economic and social conditions are encouraging more women to remain in the employment market, thus reducing the turnover rate which

has been traditionally high for the female-dominated medical technology profession.

National and state surveys have focused attention on the imbalance between medical technology graduates on one hand and limited internship and employment opportunities on the other. Results of the nation-wide survey indicated that 8.4% of medical technology graduates were not employed at the conclusion of their internships (A.S.C.P. Newsletter #17, 1973). Two related surveys conducted in Michigan by the School of Medical Technology at Michigan State University showed that facilities for internships remain stable while enrollments in academic programs are increasing (Brooks & Blume, 1973). The problem is graphically illustrated by the situation in the School of Medical Technology at Michigan State University where enrollments more than doubled from 1970 to 1974. The quality of the program is being adversely affected by over-enrollment in many required courses. Sound educational policy suggests that an effective program should not be compromised to educate increasing numbers of students in the face of limited internship and employment opportunities.

Limitation of the numbers of students accepted into the program can be justified by the administrators of the School of Medical Technology but there is a need for a means of identifying those students most likely

to succeed in the practice of medical technology. Previous studies have shown that grade point average and interest tests have little relationship to actual job performance, and personal interviews are time consuming. There is need for a different measure to augment the traditional selection procedures.

Multiple studies have validated the use of biographical data to predict successful performance in such widely diverse areas as sales, supervision, scientific research, police work, and academic pursuits. The use of a biographical inventory form has several advantages to recommend its use; it is easy and inexpensive to administer, nonthreatening and specific to the occupation for which it is used.

The purpose of this study was to explore the use of a Biographical Data Inventory in the advisement and selection procedures for the School of Medical Technology at Michigan State University.

A questionnaire consisting of 84 previously validated items was administered to the 57 students enrolled in the senior class of the School of Medical Technology at Michigan State University during Spring term, 1972. Ten deletions resulted in a final sample of 46 students. Each item of the questionnaire was analyzed to determine its ability to differentiate between more and less successful students, using

successful performance during their internship as the criterion since it was assumed that the clinical internship approximates actual work performance. Supervisors rated the performance of students on a scored Evaluation Form developed by the researcher. The sum of the ratings formed the Evaluation Score. Twenty-four items differentiated between the Upper group of students (highest 27% on the criterion variable) and the Lower group (lowest 27% on the criterion variable) with an Index of Discrimination of 2.5 or more. These items were compiled to form the final Biographical Data Inventory (BDI) and a Scoring Key was developed. The BDI scores of the participants correlated .68 with their Evaluation Form scores. The effectiveness of the BDI in identifying behavioral correlates of success in medical technology was tested using a group of 35 successful medical technologists. Their scored responses indicated no gross misclassifications with the use of the BDI.

Conclusions

The correlations obtained between the BDI scores and the criterion scores of the students are of sufficient magnitude to justify utilization of a Biographical Data Inventory as an advisement instrument and as a factor in the selection procedures for admission to the upper level of the Medical Technology program at Michigan State University. Added to grade point average, BDI

scores can provide another dimension to the decision-making process in admitting students to a profession which not only demands an intellectual capacity to master difficult concepts and intricate procedures, but also requires the ability to perform accurately and efficiently under conditions that are sometimes demanding and always important to the welfare of others.

Implications

The effectiveness of the Biographical Data Inventory in identifying behavioral correlates of success for students in the School of Medical Technology suggests its potential utility in advising freshman students who express an interest in medical technology as a career. Those whose scores indicate little potential for success could be advised to investigate other career opportunities and perhaps be spared the expense and frustration which accompanies an incorrect vocational decision. From the standpoint of the university, selection of students most likely to succeed in the profession would help to insure that limited human, material, and financial resources would be expended upon those students who could benefit most from the program.

In addition, the information provided by the BDI could aid hospitals in their initial screening of applicants. Present procedures are almost entirely dependent upon use of a student's grade point average. Since

research has shown there is little correlation between GPA and actual performance on the job, BDI scores would provide additional data to be used in the preliminary internship admissions procedures. BDI information could be included with the data furnished to hospitals when graduates apply for internships, either in the form of a separate score or included in the letters of recommendation required by most hospitals. Since the data are objectively scored, it would tend to obviate any bias that might be expressed in a personal recommendation.

Anastasi et al. (1960) have demonstrated the feasibility of using biographical information to predict success for an individual in meeting particular non-intellectual goals of an institution. In this respect, hospitals could develop their own Biographical Data Inventory to identify those applicants with characteristics most compatible with their own goals and philosophies.

Generalizations and Recommendations

Several factors tend to limit the generalizations that may be made from the results of this study: (a) the small size of the sample, (b) the inherent bias that may be present because of the pre-selection of students in choosing a particular institution, and (c) the variance in academic preparation in different institutions which

could affect the evaluation of clinical performance. However, the encouraging results obtained from this pilot study suggest that an adaptation of the instrument could be made for use in other Allied Health professions. For the present, it is recommended that other institutions use this study only as a guideline for their own research in developing a Biographical Data Inventory for their own use.

This study points to the need for further research in several areas. A follow-up study is planned to determine the success of the participants after a period of actual employment in the practice of medical technology to assess the predictive validity of the BDI. In addition, a cross-validation study will be conducted, using the Senior class of 1974 as a cross-validation group.

A longitudinal study is needed, based on a sample of entering freshmen, to validate the use of the BDI at different points of entry into the medical technology program. It may be that the college experience has some affect on the item responses.

While medical technologists will still be expected to know how to perform the many diagnostic tests used in a laboratory, they may not be required to exhibit the same degree of proficiency as in the past. More important may be those skills required in teaching

and management positions and in supervising other personnel. A current study is being conducted at Michigan State University to investigate the changes that may be required in the curriculum of medical technology programs to adequately prepare medical technologists for a new role in the laboratory. Further research is needed to develop a BDI which can predict success for the medical technologist of the future.

Two important conclusions can be drawn from this study: (a) there is an identifiable common core of expectations of successful clinical performance by medical technology interns in hospitals offering a medical technology program, and (b) there is strong evidence for believing that behavioral correlates have a potential for predicting future success in clinical settings by practicing medical technologists.

A BDI and Scoring Key was developed which resulted in no gross misclassifications in either student or medical technologists groups which indicates that a BDI can be developed and used as a high quality predictor of success in the field of medical technology. Further refinements of the present BDI may lead to such an instrument.

Other procedures that may be followed to improve the predictive quality of the present BDI include: (a) a more thorough empirical choice of weights for

differentiating foils may optimize the prediction, and (b) design an appropriate evaluation for nonsuccessful medical technologists and a more definitive evaluation for successful medical technologists. For practical use, a cut-off score must be determined to identify applicants who have more and less potential for success. This is especially important in view of the legalistic stance now being adopted by students. There is the possibility that denial of access to an educational program could result in court action by the applicant. Until the reliability and predictive validity of the BDI can be firmly established, the instrument should be used only as a contributing factor in the total assessment of an applicant's potential for success.

The decision-making process is an arduous task. It is hoped this study will be of assistance to those who seek new ways to improve the important decisions made in the advisement and selection of current and future medical technology students.

APPENDICES

APPENDIX A

BIOGRAPHICAL DATA INVENTORY
(Preliminary Form)

APPENDIX A

BIOGRAPHICAL DATA INVENTORY
(Preliminary Form)

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, town, 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.

8. What kind of recreation do you like most and engage in most often?
   A. Participation in competitive sports.
   B. Being a sports event 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.

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 in social situations.
    D. *Only* occasionally at ease in a social situation, and quite often feel uncomfortable.

16. Which of the following do you like <u>least</u>?
    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 you 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. You 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.

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. Persude 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 it.
   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.

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. - Accident, practical joke, etc, -
   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.

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, but you seldom do them as well as you want to.
   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.

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 distrubs 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 - bowling, golf, lawn tennis, chess, bridge, etc.
   B. Social organizations, college fraternity or sorority, dramatics, debating, bible class, etc.
   C. Civic and political organizations.
   D. None.

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.

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 weighed.
   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.

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.

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 16.
   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.

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 mothers' 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 fathers' occupational category:
   A. Unskilled.
   B. Semi-skilled
   C. Skilled.
   D. Professional.
   E. Bussiness.

84. Your mother's occupational category:
   A. Housewife.
   B. Professional.
   C. Office.
   D. Unskilled.
   E. Other.

APPENDIX B

REQUEST FOR CLINICAL PERFORMANCE

RATING FORMS

APPENDIX B

Request for clinical performance rating forms.

August 3, 1973

Dear

May I introduce myself and explain the purpose of this letter. My name is Christiana Blume and I am a Ph. D. candidate in Administration and Higher Education at Michigan State University. This correspondence is to enlist your aid in gathering material for my doctoral dissertation.

Those of us who are involved in the education of medical technologists are keenly aware of the increasing numbers of students seeking entry into the profession. This situation, coupled with budgetary limitations, indicates the need for an instrument that will help us predict those students most likely to succeed in the profession. The research for my dissertation is concerned with the development of such an instrument.

Would you be kind enough to send me a copy of the evaluation form used by your School in the final evaluation of the clinical performance of your students? I am sending this request to the Educational Coordinators of all of the hospital-based medical technology programs in Michigan. These forms will be used to develop a standard evaluation form to rate Michigan State University graduates who have interned in Michigan during the 1972-73 year.

Your cooperation in this research project will be very much appreciated.

Sincerely,

Christiana S. Blume
Michigan State University

APPENDIX C

SECOND REQUEST FOR CLINICAL PERFORMANCE RATING FORMS

APPENDIX C

Second request for clinical performance rating forms.

August 20, 1973

Dear

Enclosed is a copy of my letter of August 3, asking for your assistance in developing an evaluation form to be used in research for my doctoral dissertation.

I know the summer is a busy time for you because of vacations and a new class of students beginning their internships; however, I wonder if you would take just a moment to send me a copy of your student evaluation form. I have had a response from all the hospital programs in Michigan except eleven and I would like very much to include the information from your school in the evaluation form I am developing.

Your early response will be greatly appreciated.

Sincerely,

Christiana S. Blume
Michigan State University

APPENDIX D

REQUEST FOR REACTIONS TO DRAFT

COPY OF EVALUATION FORM

APPENDIX D

Request for reactions to Draft Copy of Evaluation Form.

October 8, 1973

Dear

Based on the individual evaluation forms currently used by Michigan hospital schools of medical technology to evaluate interns, I have developed the enclosed evaluation form to be used as part of the research for my doctoral dissertation. The purpose of the research is to study the use of biographical information as a predictor of on-the-job performance for medical technology students, using the internship as an approximation of actual working conditions.

Would you be kind enough to assist me by reacting to the relevancy, utility, and format of the form as an instrument to rate the overall performance of students at the conclusion of their internship.

I am aware of the many demands placed upon your time and apologize for this intrusion. However, with the increasing numbers of students seeking entry to medical technology programs, there is a need for information in addition to grade point average upon which to base advising and selection of students. It is hoped that the results of this research project will lead to the development of an instrument to generate this kind of data.

Time is of the essence and your early reply to this request will be very much appreciated. A self-addressed, stamped envelope is enclosed for your convenience.

Sincerely,

Christiana S. Blume
Michigan State University

APPENDIX E

DRAFT COPY

FINAL EVALUATION FORM

MEDICAL TECHNOLOGY INTERNS

DRAFT COPY

FINAL EVALUATION FORM
MEDICAL TECHNOLOGY INTERNS

INTERN'S NAME_____

HOSPITAL NAME_____

EDUCATIONAL COORDINATOR_____

Rating Scale
1 - Excellent
2 - Good
3 - Fair
4 - Poor
5 - Unacceptable

Please circle the appropriate number for all categories.

Quality of work - consider accuracy and neatness regardless of volume.	1	2	3	4	5
Quantity of work - consider productivity under normal conditions.	2	3	4	5	1
Responsibility - consider degree to which student exhibits accountability for work in laboratory.	3	4	5	1	2
Organizing ability - consider efficient use of time and materials.	4	5	1	2	3
Initiative - consider degree to which student is self directed.	5	1	2	3	4
Technical competency - consider manual dexterity and mastery of techniques.	1	2	3	4	5
Intelligence - consider ability to comprehend quickly.	2	3	4	5	6
Cooperation - ability and willingness to work with others.	3	4	5	1	2
Professional conduct - consider discretion.	4	5	1	2	3
Work habits - neatness, attention to detail, care of equipment.	5	1	2	3	4
Personal appearance - consider neatness, cleanliness of uniform, hair and shoes.	1	2	3	4	5

Punctuality - consider arrival at start of shift and return from coffee breaks, lunch and classes.	1	2	3	4	5
Application of knowledge - ability to correlate theoretical and practical knowledge.	2	3	4	5	1
Desire to learn - scientific curiousity.	3	4	5	1	2
Attendance.	4	5	1	2	3
Interpersonal skills - consider ability to get along with staff, fellow workers and patients.	5	1	2	3	4
Emotional maturity - ability to control emotions, work under pressure, accept criticism.	1	2	3	4	5
Would you employ this individual in your laboratory? 1. Would actively recruit. 2. Would employ if opening existed. 3. Would consider for future needs. 4. Would only employ if no other applicant was available 5. Would not employ under any circumstances.	1	2	3	4	5

APPENDIX F

REQUEST FOR EVALUATION OF INTERNS

APPENDIX F

Request for evaluation of interns.

October 29, 1973

Dear

May I introduce myself? My name is Christiana Blume and I am a doctoral candidate in Administration and Higher Education at Michigan State University.

The enclosed evaluation form was developed as a data-gathering instrument for use in fulfilling the research requirement for my degree. The purpose of the study is to investigate the use of biographical data to aid in predicting on-the-job performance for medical technology students at Michigan State University.

Will you please complete the questionnaire for the Michigan State graduates in your 1972-73 program as indicated on each form. Since my sample is small, it is of vital importance to the study that every evaluation from be completed and returned. May I depend on your help in completing this project? I am very cognizant of the many demands placed upon your time but I hope the results of this research may provide additional data for use in the arduous task of selecting future interns for your program.

Your return of the completed form by November 19, 1973, will be very much appreciated.

Sincerely,

Christiana S. Blume
Michigan State University

APPENDIX G

FINAL EVALUATION FORM

MEDICAL TECHNOLOGY INTERNS

APPENDIX H

BIOGRAPHICAL DATA INVENTORY

1. 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.

2. What kind of recreation do you like most and engage in most often?
   A. Participation in competitive sports.
   B. Being a sports event 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.

3. 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.

4. 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.

5. 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.

6. 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.

7. 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.

8. How enjoyable do you find it to talk to people you don't know?
   A. Usually enjoy it.
   B. Occasionally enjoy it.
   C. Do not usually enjoy it.
   D. Never enjoy it.

9. How do you regard puzzles?
   A. As interesting.
   B. As frustrating.
   C. As tiring.
   D. As time wasting.

10. 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.

11. 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.

12. 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.

13. 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.

14. 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.

15. 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.

16. 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.

17. 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.

18. 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.

19. 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.

20. With regard to your brothers or sisters are you the:
    A. Oldest.
    B. Youngest.
    C. Have no brothers or sisters
    D. Other.

21. 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.

22. 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.

23. 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.

24. Your fathers occupational category:
    A. Unskilled.
    B. Semi-skilled.
    C. Skilled.
    D. Professional.
    E. Business.

APPENDIX I

REQUEST TO MEDICAL TECHNOLOGISTS FOR RESPONSE TO BDI

APPENDIX I

REQUEST TO MEDICAL TECHNOLOGISTS FOR RESPONSE TO BDI

March 13, 1974

Dear

Enclosed is a Biographical Data Inventory form which I have developed as part of my doctoral research.

The purpose of the research study was to investigate the use of biographical data to predict successful performance in the practice of medical technology for students at Michigan State University.

There has been a rapid increase in the numbers of students enrolling in academic programs in medical technology as opposed to the limited numbers of spaces available in hospital-based internship facilities. These circumstances suggest the need for the development of measures, in addition to the use of grade point average, that may be used in advising students and in selection of those most likely to succeed in the profession. The enclosed form represents an effort to develop such a measure.

Your present position of responsibility indicates you are a successful medical technologist and I am asking that you respond to the enclosed form in order that I may validate the instrument.

Please mark your answers on the enclosed IBM answer sheet, using a soft lead pencil.

May I ask that you return the forms to me before March 22, 1974, so that I may complete my thesis by the first week in April. A self-addressed, stamped envelope is enclosed for your use.

Your assistance and cooperation will be greatly appreciated.

Sincerely,

Christiana S. Blume
Michigan State University

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