A STUDY OF ENGINEERING AND TECHNICAL INSTITUTE FRESHMAN ENROLLEES AND DROPOUTS IN TERMS OF SELECTED INTELLECTIVE AND NON-INTELLECTIVE FACTORS

By

AARON J. MILLER

Bachelor of Science
Oklahoma State University
Stillwater, Oklahoma
1957

Master of Science
Oklahoma State University
Stillwater, Oklahoma
1960

Submitted to the Faculty of the Graduate School of
the Oklahoma State University
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Thesis Approved:

Thesis Adviser

Dean of the Graduate College

PREFACE

In this age of expanding technological knowledge and its applications, a continuous supply of well-trained engineers and technicians is essential for the continued growth of our technological society. Although many students enter our nation's engineering and technician training programs, approximately one-half of these students discontinue their training before it is completed. While much research has been done regarding the college student dropout, little of this research has focused specifically on the engineering and the technical institute student. The purpose of this study was to determine certain psychological, social, and intellective factors which might identify those who succeed in both the professional engineering curriculum and the technical institute curriculum.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

A number of significant changes in occupational patterns in industry have taken place over the past few decades. These changes have been caused by automation, new processes, new materials, and the phenomenal advances in all fields of science and technology. Perhaps one of the most significant changes in occupational trends within the technical fields has been the creation of the technical institute trained, semi-professional technical specialist, identified as the engineering technician.

The purpose of this study was to investigate certain intellective and non-intellective factors to determine their relationships to engineering and technical institute student dropout. The results of the investigation are reported in this dissertation.

An examination of the occupational requirements of some twenty or thirty years ago reveals that the professional engineer of that day was a person trained in both technical theory and practical laboratory skills. Today, however, the trend in engineering education at the bachelor's degree level has been toward greater instructional emphasis in scientific theory and analytical methods of research and development (33). Laboratory skills, on the other hand, have been de-emphasized almost to the point of excluding the more routine engineering tasks.

This trend has created the need for a semiprofessional person, trained both in fundamental technological theory and in laboratory skills, to do the more routine engineering tasks and shopwork. The third member of the engineering team, who finds his occupational position between the scientifically oriented professional engineer on the one hand and the crafts oriented tradesman on the other hand, is known as the engineering technician.

A summation of comparison between these three members of the engineering team is made by Emerson (17, p. 1).

> The skilled craftsman gives most of his energy to manipulating the tools of his trade. The engineer, on the other hand, spends most of his time thinking through his various problems. Between these extremes lie the occupations which have come to be known as technician jobs, which usually involve some manipulative work along with a considerable amount of mental effort.

Need for the Study

With the recent technological changes, trained manpower requirements for industry in the United States have changed drastically. The need for unskilled and semiskilled workers has been greatly reduced while the demand for comprehensively trained engineers and engineering technicians has increased at a phenomenal rate. "Technician Needs" surveys estimate that some 67,000 to 200,000 new technicians will be needed each year between now and 1970 (12). Data from other reports indicate that approximately 16,000 engineering technicians are now being graduated each year in the United States (18). According to these data, less than 25 per cent of the expressed minimum annual technician needs are being met by present technician training programs.

The demand for graduate engineers is just as great. A recent survey

released by the Engineering Manpower Commission indicates that the average annual demand for graduate engineers will be approximately 72,000 graduates per year for the next decade (19). This contrasts with the present rate of 34,700 engineering graduates per year.

During the past few years, the national dropout average for the technical institute students has been approximately 30 per cent (45). That is, approximately three out of every ten of the youth entering engineering technician training will not complete their training for one reason or another. By the same token, recent data indicate that the national dropout average for baccalaureate degree engineering programs is approximately 50 per cent (20). This means that, for some reason or another, one out of every two students entering professional engineering training programs will drop out before graduation.

There appear to be two essential elements to the solution of the "engineering manpower shortage" problem. First, a great number of qualified youth must be attracted into the fields of engineering science and technology. Secondly, steps must be taken to reduce the large percentage of dropouts in the present and future classes of trainees. It is the second facet of the problem with which this study is concerned.

Statement of the Problem

Numerous studies have been made in the area of engineering education relative to dropouts. A somewhat typical study of this type was the investigation made by Griffin and Borrow which indicates that a student with above average intelligence and a reasonably strong background in mathematics and science will generally succeed in an engineering program (28).

A similar type of study by Eichhorn and Kallas indicates that non-intellective factors, such as social class background, may be as important as the traditional intellective predictors in understanding the dropout (16). It is generally agreed, however, that a combination of variables made up of the intellective, sociological, and psychological factors might best describe the dropout.

Because there is a considerable difference in the educational program which prepares the engineering technician as opposed to the professional engineer, it is reasonable to assume that both intellective and non-intellective factors influence the students' original choice between programs. It would also seem that the general abilities and attributes of a successful engineering technician are somewhat different from those of the engineer. Likewise, factors and combinations of factors which are descriptive of the technical institute dropout may form a significantly different pattern from those which typify dropouts in other types of training programs. Therefore, the problem of whether there are differential personal attributes and abilities is the subject of this inquiry.

The purpose of this study was to determine the relationship of certain intellective and non-intellective factors with successful completion of the freshman year of study in a four-year professional engineering program compared with a two-year technical institute program.

The specific areas of investigation were to examine (1) the differences between technical institute freshmen and engineering freshmen with regard to certain intellective and non-intellective factors which might influence their choice between programs, and (2) the difference between

the engineering dropout and non-dropout, and the difference between the technical institute dropout and non-dropout with regard to certain intellective and non-intellective factors which might serve as dropout predictors.

Statistical analyses of the data were planned to determine if significantly different relationships existed between the sub-groups under examination ($P < .05$). The basic variables examined were (a) type of enrollment and (b) retention or withdrawal.

Limitations of the Study

This study was limited to freshmen students enrolling for the first time in the College of Engineering, Oklahoma State University, during the 1964 fall semester. This group included both Technical Institute freshmen and four-year engineering program freshmen. Students transferring into the College of Engineering as freshmen with twelve or more credit hours of previous college credit were excluded from this study.

Those who discontinued the training program during or at the end of the first year of study were considered dropouts. Past Technical Institute records at Oklahoma State University indicate that the majority of students who begin their second year of training complete their programs of study. College of Engineering records indicate that more engineering students discontinue their training programs during the freshman year than any succeeding year of study.

The group identified as dropouts includes all of those who discontinued their training program, for any reason, before the second year of study. Sub-groups within the dropout category, such as those who

discontinued because of low grades, finances, change of major field of study, etc., were identified; however, these sub-groups were not treated separately in the following statistical analyses.

The assumption was made that all students enrolled in the various engineering and technical institute programs were exposed to the same class of stimuli. While institutional factors such as quality of instruction, student-teacher rapport, grading criteria, etc., are extremely important, they were considered as random variables in this investigation.

CHAPTER II

REVIEW OF THE LITERATURE

Introduction

In this chapter, a review of literature relative to college dropouts has been made. While formal research in this area has been widespread over the past fifty years, this review deals with selected studies whose results bring into focus what seems to be some of the most significant intellective and non-intellective factors related to college withdrawal. The central purpose of this study is to build upon and extend the findings of earlier investigations reported in the review which follows.

Financial Factors

Financial difficulty or lack of adequate finances has been determined to be an important cause of college attrition. In a nationwide study of withdrawal of college students, Iffert (31, pp. 60-71) found that financial difficulty ranked third in importance as a reason for leaving college. It was further found that the median annual income of parents of non-graduating students was significantly less than the annual income of parents whose children graduate.

In 16 of 21 studies reviewed by Summerskill (64), finances were rated as one of the three most important factors in college student attrition.

While financial difficulty is an important factor in college attrition, a review of the literature seems to show no consistent relationship between part-time work or self-support and college grades. Studies by Mercer (42), Thompson (66), and Weigand (70) indicate that self-support enhances the probability of graduation, while similar studies by Cooper (8), Gable (23), Iffert (31), and Strabel (62) show that no clear relationships exist between self-support and graduation.

Interest and Motivation

Loss of interest or lack of motivation has been identified in numerous studies as a factor related to college dropout. However, the single common facet of these studies seems to be that the complexity of contributory factors prohibits any concise statement about the percentages of dropouts attributable to specific motivational factors. This is stated by Summerskill (64) as follows:

> Competent people who have studied attrition have concluded that lack of motivation with reference to college accounts for a substantial number of dropouts. The trouble . . . is that we do not know what motivational forces are actually predictive of college success and we do not know how to accurately assess such motives in students.

Ability and Achievement

Regardless of the number of psychological and sociological factors involved in the complex dropout picture, certain fundamental academic factors must necessarily relate to retention in college. These essential requirements for academic success are scholastic aptitude and academic performance. In any academic situation there are certain requirements of work to be done by the student; therefore, the student must have

sufficient prior training and ability to perform these required tasks to maintain a certain grade point average.

This is demonstrated in a study by Boyer and Koken (5) which indicates a strong positive correlation between aptitude differences as measured by American Council on Education Psychological Test scores and college grade point average, and a similar significant positive correlation between percentile rank on Ohio Psychological Test scores and grade point average.

Malloy (38) found that aptitudes, as measured by the American Council on Education Test, and scores on the Minnesota Paper Form Board Test were significant predictors of survival in the first year of engineering at Marquette University.

Righthand (53) found, in studying technical institute freshmen in Connecticut, that there was a significant correlation between retention in school and mathematics scores on the Engineering Physical Science Aptitude Test.

In a study involving engineering freshmen at the University of Minnesota, Berdie (4) found that the Numerical Ability Test score from the Differential Aptitude Test correlated significantly with first-quarter college grades.

Studies by Pattishall and Banghart (50), Brown (6), Freehill (22), and Johnson (32) further revealed that dropouts had significantly lower reading test scores than students who continued their studies.

A review of 16 similar studies by Summerskill (64) indicates that scholastic aptitude test scores were found to be lower for dropouts than for graduates. He further summarizes this review by stating:

> ...there is substantial evidence that college can reduce attrition by rejecting applicants whose scores on standardized tests of scholastic aptitude fall below the minimums set by the colleges.

According to Summerskill (64), one third of all college dropouts are due to poor grades. Likewise, numerous studies have shown a significant relationship between high school grades and college grades. Boyer and Koken (5) found a significantly positive correlation between high school rank and college grade point average. In a similar study, Smith (55) found high school grades to be highly efficient predictors of college grades.

After studying the attrition rate for men attending twenty colleges and universities, Iffert (31) concluded that the attrition rate would have been reduced 17.3 percent if admissions had been confined to the upper fifth of high school graduating classes. He further stated:

> The percentages...seem to show that standing in high school graduating class was a much better indicator of the probability of graduation than standing in the placement tests.

A study by Egermeier (15) summarizes the factors of financial difficulty, academic difficulty and loss of interest, and their rank in importance in selected college dropout studies. This summarization is shown in Table I.

Adjustment and Personality Factors

How college students have adjusted to a new and strange academic environment before withdrawal has been investigated in several studies. Iffert (31) found that approximately 15 percent of the dropouts under investigation were unhappy; however, they indicated that this fact had little to do with their decision to withdraw from school.

TABLE I

IMPORTANCE ATTACHED TO THREE COMMON WITHDRAWAL FACTORS APPEARING IN COLLEGE DROPOUT STUDIES

Author of Report	Period Studied	Rank in Importance As a Cause of Withdrawal		
		Financial Difficulty	Academic Difficulty	Change or Loss of Interest or General Dissatisfaction
Snitz (57)	1913-23	First	(not given)	Third
Smith (56)	1919-20	Second	First	Third
Moon (48)	1925-26	First	Fourth	Third
Pope (51)	1930	First	Third	Second
McNelly (41)	1931-36	Second	First	Third
Snyder (58)	1937-39	First	Fourth	Third
Mitchell (46)	1937-39	Second	First	Second
Cummings (9)	1947-48	Third	Second	First
Wiehe (71)	1947-52	Third	First	Second
Koelsche (36)	1948-52	First	Third	Fourth
Iffert (31)	1950-54	First	Third	Second
Brunstetter (7)	1951	Second	First	Second
Mathews (40)	1950-54	Fourth	First	Second
Moore (49)	1955	Second	First	Fourth

(From "Construction and Validation of a College Dropout Predictor Scale for the Minnesota Counseling Inventory" by John Charles Egermeier, Ed.D., Oklahoma State University, 1963.)

After reviewing eleven similar studies, Summerskill (64) concluded that approximately 10 percent of all dropouts were personally dissatisfied with their college experiences before terminating their studies. However, he likewise found that this dissatisfaction probably made a negligible contribution to the decision to leave school.

From an attrition study employing advisors' records, Mercer (42) concludes:

> ...there have been no difficulties given as a reason for leaving college that have not been encountered by students in the high ranking and low ranking (graduating) groups.

While a plethora of research has been done relating certain psychological characteristics and personality factors with academic achievement, few studies have been made which relate specifically to dropouts.

A study of personality factors and college attrition conducted by Grace (27) indicated that personality factors of independence, responsibility, and anxiety related to college attrition in the following ways:

(a) The bulk of dropouts were both dependent and irresponsible.

(b) Independent, responsible students were less anxious than dependent, irresponsible students.

(c) Attrition increases as anxiety increases.

In attempting to relate aptitudes, personality factors, and interests to grade averages of chemical engineering majors, Moffie and Milton (47) found that aptitude and achievement test scores alone related significantly with grades.

Similarly, Vorreyer (68) found that dropouts and non-dropouts did not score significantly different on the Bell Adjustment Inventory. He concluded, however:

> ...while other characteristics were not independently significant, students who remain in college or drop out tend to possess certain clusters of characteristics which enable these groups to be identified.

Studies in which psychological characteristics have been attributed to unsuccessful students have been summarized by Summerskill (64) as follows:

> Immaturity (26) (72)
> Rebellion and nonconformity (72) (21)
> Worry and anxiety (26) (21)
> Social inadequacy (21)
> Lack of independence and responsibility (27)
> Neurosis, character disorders, or psychosis (10) (29)

In a study conducted by Merrill and Murphy (44), personality factors of over-achieving freshmen were examined using the Edwards Personal Preference Schedule. The investigators concluded that the over-achieving group was more dominant and less autonomous (.01 level); more deferent, less exhibitionistic, less affiliative, less concerned about change, and more enduring (.05 level) than the group achieving as expected. Conversely, one might speculate that the underachievers, who are more likely to become dropouts, might also exhibit certain dissimilar clusters of expressed needs.

In a study by Gebhart and Hoyt (25) in which the Edwards Personal Preference Schedule was used, overachievers were found to score significantly higher than underachievers on the Achievement, Order, Intraception, and Consistency scales. Of particular interest in this study, however, is the fact that engineering students had significantly different scores than arts and science students of similar achievement groupings.

Sternberg (61), in studying personality trait differences in college students majoring in different fields, also found that certain

personality factors differed significantly between college majors. It was also noted by Sternberg (60) that the greatest differences were between music and English majors and those specializing in the scientific fields.

Personal Values

While many investigations have been made concerning the value structure of certain social groupings, few studies have been made which relate personal values to college student achievement. However, Rezler (52), in studying the academic achievement of 36 freshmen students at Roosevelt University, found that high achievers differed significantly from low achievers with respect to certain personal values. The high achievement group was found to believe that:

> ...work should provide opportunity for self-expression, independence, and advancement, not just in terms of money but in terms of having a more challenging and independent position.

On the other hand, the low achievement group was found to believe that:

> Of primary importance in getting a college degree is to achieve social prestige and high income without strenuous work.
>
> One should conform to group standards.
>
> One owes it to one's parents to attend college as an expression of gratitude.

In a study by Karn (35), the Vernon-Allport Study of Values Test was administered to 244 engineering freshmen at the Carnegie Institute of Technology. It was found that significant differences in values existed between engineering majors (electrical, mechanical, chemical engineers,

etc.). Karn concludes:

> The different scores may reflect a basic motivational difference in the type of person who elects a certain branch of engineering study.

In another similar study by Righthand (53), however, the Vernon-Allport Study of Values Test was administered to 375 male freshmen technical institute students enrolled in two public technical institutes in Connecticut. It was found that no significant differences in values existed between technical institute dropouts and non-dropouts.

Socio-Economic Background

Numerous investigations by social scientists and educators in the area of "effects of social class" have suggested that a student's social and economic background affects both his secondary school attendance and his later adjustment to college and is, therefore, a factor in attrition.

Davie (11), in a study involving all New Haven, Connecticut, school children between the ages of 16 and 18 years of age, socially stratified the families of the children according to ecological area of residence, family income, nationality, fathers' occupation, and social club membership. In this study it was found that the parents' position in the New Haven class system was an important determinant of their children's school attendance, and that the differences in the amount and type of schooling varied significantly with social level.

Washburn (69), in a study of freshmen students at a southwestern college and an eastern college, found that the more urban the residence background of the student, the better his academic performance is likely to be--up to a point. This point was the 500,000 population mark.

However, in a similar study by Kallas (34), it was found that when social class was held constant, the effect of a rural or urban background was insignificant when related to academic performance.

Studies by Suddarth (63), and Summerskill and Darling (65), conducted at two large universities, indicated that students whose fathers were in skilled, semiskilled, or service occupations tended more toward dropping out of school than those whose fathers were employed in white collar or professional jobs.

It is, therefore, reasonable to expect that the values attached to educational attainment are different between different socio-economic levels. This assumption is adequately supported in the literature and summarized in Table II by Hyman (30, p. 430) who concludes:

> It is clear that whatever measure of stratification is employed, the lower (socio-economic) groups emphasize college training much less.

Background for the Study

In summarizing a survey of the literature relating to both academic achievement and college dropouts, one can only conclude that the psychological and social forces which contribute to college attrition are both many and complex.

Besides the factors of finance, motivation, ability, personality traits, personal values, and socio-economic background being related to college retention, as previously discussed, other minor contributory factors such as age of the student, sex, hometown location and size, etc., must somehow fit into the total dropout causal explanation.

TABLE II

THE DIFFERENTIAL EMPHASIS AMONG ECONOMIC CLASSES UPON COLLEGE EDUCATION

Interviewer's Rating of Economic Level	Per Cent Recommending College Education	Number of Cases
Wealthy and Prosperous	68	512
Middle Class	52	1531
Lower Class	39	856
Occupation		
Professional	74	301
Businessmen and Proprietors	62	421
White Collar Workers	65	457
Skilled Labor	53	392
Semiskilled	49	416
Domestic	42	194
Farmers	47	417
Non-farm Laborers	35	132
Highest Education Achieved		
Attended College	72	564
Attended High School	55	1411
Attended Grammar School	36	926

(From "The Value Systems of Different Classes: A Social Psychological Contribution to the Analysis of Stratification" by H. H. Hyman in Class, Status, and Power, Reinhard Bendix and Seymore Lipset, eds., Glencoe, Illinois: The Free Press, 1957.)

Most all of the literature, however, deals with research involving dropout studies of college students who are baccalaureate degree (four-year degree) candidates. A few of the studies deal specifically with engineering students. But because of the relatively recent growth of technical institute programs, very little dropout research is available which concerns college level engineering technician students in associate degree (two-year degree) programs. One can only speculate that the forces which contribute to engineering student dropout also contribute, and to the same degree of magnitude, to technical institute student drop-out. This assumption, however, may not be true.

The literature reveals conclusive evidence of differences in personality traits among college majors, the greatest differences being noted between the general areas of the arts and the sciences. Although engineers and engineering technicians must obviously share similar interests and have somewhat similar aptitudes to successfully fill the occupational roles in their respective fields, the fact remains that some choose to be technicians and others choose to be engineers. Therefore, one might reasonably assume that the basis for these decisions was because of varying degrees of differences in personality traits, personal values, and/or socio-economic background. To date, however, there have been no published reports of research studies that might confirm these assumptions.

In summing up this review of the literature, it seems reasonable to hypothesize that both program choice and retention or dropout of freshmen engineering or technical institute students are related to socio-economic background and personality traits of the students.

Postulates

This investigation is based upon the following postulates:

(1) Socio-economic background is closely related to program selection in college.

(2) Socio-economic background is closely related to student persistence and retention in college.

(3) Measurable, non-intellective personality factors exist which are closely related to program selection in college.

(4) Measurable, non-intellective personality factors exist which are closely related to student persistence and retention in college.

(5) Personal values are closely related to both program choice in college and student persistence and retention in that program.

(6) Intellective factors, measurable by scholastic aptitude tests, exist which are closely related to program choice in college and to student persistence and retention in that program.

The purpose of this study is to investigate the differences in academic ability, selected personality factors, certain personal values, and socio-economic background between those students who choose to be engineers and those who choose to be engineering technicians; also, to investigate these same differences in academic ability, selected personality factors, certain personal values, and socio-economic background between engineering dropouts and non-dropouts, and between technical institute dropouts and non-dropouts. For further clarification of terms,

the following definitions are used:

Technical Institute refers to a post-high-school training program of two years' duration which trains engineering technicians. Its curriculum is an integrated sequence of college-level courses which lead to an associate of science degree. This training program on the Oklahoma State University campus is administered as a part of the College of Engineering.

Engineering refers to professional engineering training programs which are four to five years in duration and which lead to a baccalaureate degree.

Dropout is defined to include all subjects who began a technical institute or engineering program and discontinued that program before the end of the first year of study. Also included are those subjects who completed the first year of study but did not re-enroll in their respective programs (either technical institute or engineering) to begin the second year of study.

Non-Dropout is defined to include all subjects of the original groups of engineering or technical institute freshmen who satisfactorily completed the first year of study in their training programs and re-enrolled to begin work for the second year in their same respective programs.

Major Hypotheses of the Study

1. Freshmen students who choose to be engineers differ significantly from those who choose to be technicians in terms of intellective factors, non-intellective factors (personal attributes), and socio-economic background.
2. Engineering dropouts are significantly different from technical institute dropouts in terms of intellective factors, non-intellective factors (personal attributes), and socio-economic background.
3. Students who persist in an engineering program (non-dropouts) are significantly different from those who persist in a technical institute program (non-dropouts) in terms of intellective factors,

non-intellective factors (personal attributes), and socio-economic background.

Sub-Hypotheses to Be Tested

The preceding hypotheses were broken into the following specific sub-hypotheses for purposes of testing:

(a) Social class background, as measured by fathers' income, occupation, and education, will differ significantly between freshmen students who choose to be engineers and freshmen students who choose to be technicians.

(b) Social attitudes, as measured by the Edwards Personal Preference Schedule (on each of fifteen scales), will differ significantly between freshmen students who choose to be engineers and freshmen students who choose to be technicians.

(c) Social values, as measured by the Allport-Vernon-Lindzey Study of Values (on each of six scales), will differ significantly between freshmen students who choose to be engineers and freshmen students who choose to be technicians.

(d) Scholastic aptitude, as measured by the American College Testing Program Battery, will differ significantly between freshmen students who choose to be engineers and freshmen students who choose to be technicians.

(e) Perception of spatial relations, as measured by the Revised Minnesota Paper Form Board test, will differ significantly between freshmen students who choose to be engineers and freshmen students who choose to be technicians.

(f) Social class background, as measured by fathers' income, occupation, and education, will differ significantly between technical institute dropouts and technical institute non-dropouts.

(g) Social attitudes, as measured by the Edwards Personal Preference Schedule (on each of fifteen scales), will differ significantly between technical institute dropouts and technical institute non-dropouts.

(h) Social values, as measured by the Allport-Vernon-Lindzey Study of Values (on each of six scales), will differ significantly between technical institute dropouts and technical institute non-dropouts.

(i) Scholastic aptitude, as measured by the American College Testing Program Battery, will differ significantly between technical institute dropouts and technical institute non-dropouts.

(j) Perception of spatial relations, as measured by the Revised Minnesota Paper Form Board Test, will differ significantly between technical institute dropouts and technical institute non-dropouts.

(k) Social class background, as measured by fathers' income, occupation, and education, will differ significantly between engineering dropouts and engineering non-dropouts.

(l) Social attitudes, as measured by the Edwards Personal Preference Schedule (on each of fifteen scales), will differ significantly between engineering dropouts and engineering non-dropouts.

(m) Social values, as measured by the Allport-Vernon-Lindzey Study of Values (on each of six scales), will differ significantly between engineering dropouts and engineering non-dropouts.

(n) Scholastic aptitude, as measured by the American College Testing Program Battery, will differ significantly between engineering dropouts and engineering non-dropouts.

(o) Perception of spatial relations, as measured by the Revised Minnesota Paper Form Board test, will differ significantly between engineering dropouts and engineering non-dropouts.

CHAPTER III

METHODOLOGY

The basic purpose of this investigation was to examine the degree to which certain selected intellective and non-intellective factors were associated with entering engineering college and technical institute freshmen who do not continue in enrollment beyond the freshman year.

Also examined were differences in intellective and non-intellective factors which might characterize those entering freshmen who originally chose a program in professional engineering rather than a two-year technical institute program.

Instruments

In this investigation two standardized tests were used for the purpose of measuring non-intellective factors. The instruments used were the Allport-Vernon-Lindzey Study of Values (2) and the Edwards Personal Preference Schedule (14). An additional non-intellective factor was introduced for the purpose of classification of subjects. This classification was an assignment of a social class ranking of 1, 2, or 3, given to each student based on predetermined criteria.

The primary reason for utilizing the Allport-Vernon-Lindzey Study of Values in this investigation was that it would permit an extension of the findings of Karn (35), who used this instrument to investigate

differences in values existing between engineering majors. In addition, the use of this instrument would permit a comparison with and possible extension of the findings of Righthand (53), who investigated existing differences in values between technical institute dropouts and non-dropouts. The Allport-Vernon-Lindzey Study of Values also satisfied the criteria of acceptable reliability, suitable length, and ease of scoring.

This values instrument is designed to measure the relative strength of six basic motives in personality. These fundamental interests are: theoretical, economic, aesthetic, social, political, and religious. In the Allport-Vernon-Lindzey Study of Values, the personalities of men are viewed in terms of their values or evaluative attitudes. These basic personality factors are described as follows (2, pp. 4-5):

> The Theoretical
> The dominant interest of the theoretical man is the discovery of truth. In the pursuit of this goal he characteristically takes a "cognitive" attitude, one that looks for judgments regarding the beauty or utility of objects, and seeks only to observe and to reason. Since the interests of the theoretical man are empirical, critical, and rational, he is necessarily an intellectualist, frequently a scientist or philosopher. His chief aim in life is to order and systematize his knowledge.
>
> The Economic
> The economic man is characteristically interested in what is useful. Based originally upon the satisfaction of bodily needs (self-preservation), the interest in utilities develops to embrace the practical affairs of the business world--the production, marketing, and consumption of goods, the elaboration of credit, and the accumulation of tangible wealth. This type is thoroughly "practical" and conforms well to the prevailing stereotype of the average American businessman.
>
> The economic attitude frequently comes into conflict with other values. The economic man wants education to be practical, and regards unapplied knowledge as waste. Great feats of engineering and application result from the demands economic men make upon science. The value of utility likewise conflicts with the aesthetic value, except when art serves commercial ends. In his personal life the economic man is likely to confuse luxury with

beauty. In his relations with people he is more likely to be interested in surpassing them in wealth than in dominating them (political attitude) or in serving them (social attitude). In some cases the economic man may be said to make his religion the worship of Mammon. In other instances, however, he may have regard for the traditional God, but inclines to consider Him as the giver of good gifts, of wealth, prosperity, and other tangible blessings.

The Aesthetic

The aesthetic man sees his highest value in form and harmony. Each single experience is judged from the standpoint of grace, symmetry, or fitness. He regards life as a procession of events; each single impression is enjoyed for its own sake. He need not be a creative artist, nor need he be effete; he is aesthetic if he but finds his chief interest in the artistic episodes of life. The aesthetic attitude is, in a sense, diametrically opposed to the theoretical; the former is concerned with the diversity, and the latter with the identities of experience. The aesthetic man either chooses, with Keats, to consider truth as equivalent to beauty, or agrees with Memchken, that, "to make a thing charming is a million times more important than to make it true." In the economic sphere the aesthete sees the process of manufacturing, advertising, and trade as a wholesale destruction of the values most important to him. In social affairs he may be said to be interested in persons but not in the welfare of persons; he tends toward individualism and self-sufficiency. Aesthetic people often like the beautiful insignia of pomp and power but oppose political activity when it makes for the repression of individuality. In the field of religion they are likely to confuse beauty with purer experience.

The Social

The highest value for this type is love of people. In the Study of Values it is the altruistic or philanthropic aspect of love that is measured. The social man prizes other persons as ends, and is therefore himself kind, sympathetic, and unselfish. He is likely to find the theoretical, economic, and aesthetic attitudes cold and inhuman. In contrast to the political type, the social man regards love as itself the only suitable form of human relationship. Spranger adds that in its purest form the social interest is selfless and tends to approach very closely the religious attitude.

The Political

The political man is interested primarily in power. His activities are not necessarily within the narrow field of politics; but whatever his vocation, be betrays himself as a Machtmensch. Leaders in any field generally have high power value. Since competition and struggle play a large part in all life, many philosophers have seen power as the most universal and most

> fundamental of motives. There are, however, certain personalities in whom the desire for a direct expression of this motive is uppermost, who wish above all for personal power, influence, and renown.
>
> The Religious
> The highest value of the religious man may be called unity. He is mystical, and seeks to comprehend the cosmos as a whole, to relate himself to its embracing totality. Spranger defines the religious man as one "whose mental structure is permanently directed to the creation of the highest and absolutely satisfying value experience." Some men of this type are "immanent mystics," that is, they find their religious experience in the affirmation of life and in active participation therein. A Faust with his zest and enthusiasm sees something divine in every event. The "transcendental mystic," on the other hand, seeks to unite himself with a higher reality by withdrawing from life; he is the ascetic, and, like the holy men of India, finds the experience of unity through self-denial and meditation. In many individuals the negation and affirmation of life alternate to yield the greatest satisfaction.

While the reliability of this instrument is quite high, it admittedly does not allow for the valueless personality or for those who follow an expedient or hedonistic way of life. Neither does it allow for a mixture of values. Therefore, scores are in terms of the relative strength of each variable rather than in terms of the absolute strength of the variable.

The publisher comments on the measurement of the variables as follows (2, p. 8):

> A high score on one value can be obtained only by reducing correspondingly the scores on one or more of the other values. In interpreting the results, therefore, it is necessary to bear in mind that they reveal only the relative importance of each of the six values in a given personality, not the total amount of "value energy" or motivation possessed by an individual. It is quite possible for the highest value of a general apathetic person to be less intense and effective than the lowest value of a person in whom all values are prominent and dynamic.

Reliability coefficients for each value were obtained by the split-half method and the Spearman-Brown product moment technique. The mean

reliability coefficient, using a z transformation, is .90. Reliability data for the study of values are shown in Table III.

TABLE III

RELIABILITY DATA FOR THE STUDY OF VALUES
(N=100)

Value	Correlations
Theoretical	.84
Economic	.93
Aesthetic	.89
Social	.90
Political	.87
Religious	.95

The Edwards Personal Preference Schedule (EPPS) was selected as an instrument to measure non-intellective personality variables for two principal reasons. First, its use allowed an extension of the findings of Gebhart and Hoyt (25) in which differences in personal attributes, as measured by the EPPS, between engineering students and arts and science students were compared. Secondly, this instrument was designed primarily as a research and counseling instrument which could provide a number of relatively "normal" personality variables. In addition, it satisfied the criteria of acceptable reliability, suitable length, and ease of scoring.

The EPPS is composed of 225 pairs of forced choice statements. The

subject must choose the statement from the pair of statements with which he most nearly agrees.

Fifteen personality variables are measured by the EPPS. The names of these variables and the manifest needs associated with each are as follows (14, p. 11):

Achievement (ach)
To do one's best, to be successful, to accomplish tasks requiring skill and effort, to be a recognized authority, to accomplish something of great significance, to do a difficult job well, to solve difficult problems and puzzles, to be able to do things better than others, to write a great novel or play.

Deference (def)
To get suggestions from others, to find out what others think, to follow instructions and do what is expected, to praise others, to tell others that they have done a good job, to accept the leadership of others, to read about great men, to conform to custom and avoid the unconventional, to let others make decisions.

Order (ord)
To have written work neat and organized, to make plans before starting on a difficult task, to have things organized, to keep things neat and orderly, to make advance plans when taking a trip, to organize details of work, to keep letters and files according to some system, to have meals organized and a definite time for eating, to have things arranged so that they run smoothly without change.

Exhibition (exh)
To say witty and clever things, to tell amusing jokes and stories, to talk about personal adventures and experiences, to have others notice and comment upon one's appearance, to say things just to see what effect it will have on others, to talk about personal achievements, to be the center of attention, to use words that others do not know the meaning of, to ask questions others cannot answer.

Autonomy (aut)
To be able to come and go as desired, to say what one thinks about things, to be independent of others in making decisions, to feel free to do what one wants, to do things that are unconventional, to avoid situations where one is expected to conform, to do things without regard to what others may think, to criticize those in positions of authority, to avoid responsibilities and obligations.

Affiliation (aff)
To be loyal to friends, to participate in friendly groups, to do things for friends, to form new friendships, to make as many friends as possible, to share things with friends, to do things with friends rather than alone, to form strong attachments, to write letters to friends.

Intraception (int)
To analyze one's motives and feelings, to observe others, to understand how others feel about problems, to put one's self in another's place, to judge people by why they do things rather than by what they do, to analyze the behavior of others, to analyze the motives of others, to predict how others will act.

Succorance (suc)
To have others provide help when in trouble, to seek encouragement from others, to have others be kindly, to have others be sympathetic and understanding about personal problems, to receive a great deal of affection from others, to have others do favors cheerfully, to be helped by others when depressed, to have others feel sorry when one is sick, to have a fuss made over one when hurt.

Dominance (dom)
To argue for one's point of view, to be a leader in groups to which one belongs, to be regarded by others as a leader, to be elected or appointed chairman of committees, to make group decisions, to settle arguments and disputes between others, to persuade and influence others to do what one wants, to supervise and direct the actions of others, to tell others how to do their job.

Abasement (aba)
To feel guilty when one does something wrong, to accept blame when things do not go right, to feel that personal pain and misery suffered does more good than harm, to feel the need for punishment for wrongdoing, to feel better when giving in and avoiding a fight than when having one's own way, to feel the need for confession of errors, to feel depressed by inability to handle situations, to feel timid in the presence of superiors, to feel inferior to others in most respects.

Nurturance (nur)
To help friends when they are in trouble, to assist others less fortunate, to treat others with kindness and sympathy, to forgive others, to do small favors for others, to be generous with others, to sympathize with others who are hurt or sick, to show a great deal of affection toward others, to have others confide in one about personal problems.

Change (chg)
To do new and different things, to travel, to meet new people, to experience novelty and change in daily routine, to experiment and try new things, to eat in new and different places, to participate in new fads and fashions.

Endurance (end)
To keep at a job until it is finished, to complete any job undertaken, to work hard at a task, to keep at a puzzle or problem until it is solved, to work at a single job before taking on others, to stay up late working in order to get a job done, to put in long hours of work without distraction, to stick at a problem even though it may seem as if no progress is being made, to avoid being interrupted while at work.

Heterosexuality (het)
To go out with members of the opposite sex, to engage in social activities with the opposite sex, to be in love with someone of the opposite sex, to kiss those of the opposite sex, to be regarded as physically attractive by those of the opposite sex, to participate in discussions about sex, to read books and plays involving sex, to become sexually excited.

Aggression (agg)
To attack contrary points of view, to tell others what one thinks about them, to criticize others publicly, to make fun of others, to tell others off when disagreeing with them, to get revenge for insults, to become angry, to blame others when things go wrong, to read newspaper accounts of violence.

Split-half reliability coefficients for the 15 personality variables were determined by correlating row and column scores for each personality variable using 1509 subjects in the college normative group.

Stability coefficients for the EPPS were calculated using the test-retest method based on a group of 89 university students who took the EPPS twice with a one-week interval between administrations. These coefficients are shown in Table IV.

For the purpose of this investigation, a social class position was assigned to each subject. This position was based on Edwards Social-Economic Grouping of Occupations (13). In Edwards' index, the major dimensions for ranking of socio-economic position are income and

TABLE IV

COEFFICIENTS OF INTERNAL CONSISTENCY AND STABILITY FOR THE EPPS VARIABLES

Variable	Internal Consistency[a]	Stability[b]		
	r1I	r1I	Mean	SD
1. Achievement	.74	.74	14.46	4.09
2. Deference	.60	.78	12.02	3.68
3. Order	.74	.87	11.31	4.45
4. Exhibition	.61	.74	14.43	3.67
5. Autonomy	.76	.83	13.62	4.48
6. Affiliation	.70	.77	15.40	4.09
7. Intraception	.79	.86	17.00	5.60
8. Succorance	.76	.78	12.09	4.59
9. Dominance	.81	.87	15.72	5.28
10. Abasement	.84	.88	14.10	4.96
11. Nurturance	.78	.79	14.04	4.78
12. Change	.79	.83	16.17	4.88
13. Endurance	.81	.86	12.52	5.11
14. Heterosexuality	.87	.85	15.08	5.66
15. Aggression	.84	.78	11.55	4.57
N	1509		89	

[a]Split-half, based on 14 items against 14 items, corrected.

[b]Test and retest with one-week interval. Means and standard deviations are for first testing.

education as related to an occupational group. This scale is the most widely used scale of socio-economic grouping of workers in the United States, and is the basis on which the United States Census is made. The use of this method of classification allows comparison with census parameters, if desired, and enables generalizations to be made with reasonable confidence. Therefore in this study, social class position was determined by the fathers' occupation, the fathers' educational attainment, and the parents' annual income.

These three dimensions were combined for making categorical assignment as follows:

> Class I. This class represents highest occupational level, highest family income, and highest educational attainment by the father. For a subject to be in this class, the father works in a professional, proprietary or managerial capacity. The parents' annual income exceeds $9,000. The father has had some college work.
>
> Class II. This class represents a category of combinations which include all persons not in Class I or III. That is, whenever all three dimensions (subjects' fathers' educational attainment, occupation, and family income) are not at either the highest level or lowest level, the subject is placed in Class II.
>
> Class III. This class represents lowest occupational level, lowest family income, and lowest educational attainment by the father. For a subject to be in this class, the father works as a craftsman, operative, service worker, laborer, etc. The parents' annual income is less than $6,999. The father did not go beyond high school.

Factors and combinations of factors which determined social class assignments are shown in Table V and Table VI.

For the purposes of this investigation, two standardized test instruments were selected to provide a measurement of intellective factors. The instruments used were the American College Testing Program Battery (1) and the Minnesota Paper Form Board Test (37).

TABLE V

FACTORS DETERMINING SOCIAL CLASS ASSIGNMENT

	Father's Occupation	Parents' Annual Income	Education Attainment by Father
A	Professional Manager	$9,000 up	Some college work beyond high school
B	Clerical Sales	$7,000 to $8,999	High school graduate
C	Craftsman Operative Laborer	$0 to $6,999	No work beyond high school

In this investigation, a single score representing scholastic aptitude was desired. At Oklahoma State University, the American College Testing Program Battery (ACT Battery) was administered to all students as part of the freshman orientation program. Therefore, for the purposes of this study, the composite score of the ACT Battery was considered to provide an adequate measure of scholastic aptitude.

The ACT Battery is designed to measure a student's ability to perform the intellectual tasks which he will most likely have to perform in college. This test instrument places emphasis on the generalized skills of judgment, organization, evaluation, etc., rather than the knowledge of factual classroom material.

While the ACT Battery provides individual scores representing scholastic aptitude in English, mathematics, social studies, and natural science, it also provides a composite score which is a mean score based on the individual measures. The instrument's publisher defines the

composite score as follows (1, p. 10):

> The composite score is the mean of the four educational development scores. It is viewed as an index of total educational development and has proved to be the best single predictor of freshman success in college.

TABLE VI

COMBINATIONS OF FACTORS DETERMINING SOCIAL CLASS ASSIGNMENTS

Social Class Assignment	Combinations of Factors		
	Father's Occupation	Income	Education
Class III	C	C	C
Class II	A	A	C
	A	B	A
	A	B	C
	A	C	A
	A	C	C
	B	A	A
	B	A	C
	B	B	A
	B	B	C
	B	C	A
	B	C	C
	C	A	A
	C	A	C
Class I	A	A	A

In this investigation, it was most desirable to use a single score which might best represent scholastic aptitude. Therefore, the composite score of the ACT Battery was used.

Reliability coefficients for composite scores on the alternate forms of the ACT Battery were calculated to be .94 for Form 1-A and .95 for Form 1-B. The Spearman-Brown odds-even technique was used to obtain these coefficients from test scores of 1031 high school seniors tested with Form 1-A and 886 high school seniors tested with Form 1-B. A value of 1.1 standard score units was obtained as the standard error of measurement for the composite score for both forms.

For purposes of this investigation, it was desirable to select an instrument which might measure an intellective factor related to success in the broad area of engineering science or technology and yet not be directly related to verbal or numerical ability. The Revised Minnesota Paper Form Board Test (MPFB) seemed to meet this criterion in that it was designed to measure ability to perceive spatial relations. Futhermore, the use of this instrument might serve to extend the findings of Malloy (38) who used the Minnesota Paper Form Board Test to predict the success of freshmen engineering students. This instrument also satisfied the criteria of acceptable reliability, suitable length, and ease of scoring.

The publishers of this instrument describe the construction of and the abilities measured by this test as follows (37, p.2):

> The Revised Minnesota Paper Form Board Test consists of a series of two-dimensional diagrams cut into separate parts. For each diagram there are five figures with lines indicating the different shapes out of which they are made. From these, the subject chooses the one figure which is composed of the exact parts that are shown in the original diagram.

> There are considerable individual differences in the ability or abilities measured by this test. Scores have predictive values for achievement in mechanical fields and shopwork, especially for those aspects of engineering which involve design and drafting. Relationships to art ability and to inspection jobs have been demonstrated as well. Even though the ability to perceive spatial relations is measured with nonverbal and nonnumerical types of items, scores on this test are not entirely independent of measures of general intelligence. In fact, some users think of the test as measuring "concrete, nonverbal, intelligence." In any event, it does measure abilities which are relatively independent of intelligence, as usually defined by tests, and which also are important in educational and vocational guidance and in employee selection.

Reliability coefficients on the two alternate forms of the MPFB are .85 and .92 for forms AA and BB. These coefficients are based on results from 290 high school seniors in New York.

Samples

The subjects utilized in this study were selected from a population of 660 male freshmen students enrolling for the first time in the College of Engineering at Oklahoma State University in the fall of 1964. Students transferring into the College of Engineering as freshmen with twelve credit hours or more of previous college credit were excluded from this study.

These subjects were grouped into two categories determined by enrollment into either a technical institute program or a four-year engineering program. For further clarification of this grouping, the following definitions are used:

> Technical Institute refers to a post-high-school training program of two years' duration which trains engineering technicians. Its curriculum is an integrated sequence of college-level courses which lead to an associate of science degree. This training program on the Oklahoma State University campus is administered as a part of the College of Engineering.

Engineering refers to professional engineering training programs which are four to five years in duration and which lead to a baccalaureate degree.

At the conclusion of this study, all subjects had had the opportunity to complete one calendar year (two regular semesters and one summer semester) of study. With the beginning of the third regular semester of study, the two groups of engineering and technical institute students were further classified into sub-groups of "dropouts" or "non-dropouts" within their respective groups.

Statistical Design and Procedure

The group of subjects identified as technicians (technical institute freshmen) numbered eighty-four (N=84). This number included the entire population of male freshmen technical institute students with less than twelve credit hours of previous college work.

The sample of subjects identified as engineers numbered fifty (N=50). These male engineering freshmen were selected randomly from the larger population of over 600 male freshmen engineering students.

For each of the 134 subjects included in this study, a social class assignment was made according to the criteria set forth in Table V. In addition, the following scores were obtained for each subject:

(a) one composite ACT test score
(b) one Minnesota Paper Form Board score (MPFB)
(c) six Study of Values scores
(d) fifteen Edwards Personal Preference scores.

For the purpose of testing sub-hypotheses (a), (f) and (k), listed on pages 21 and 22 of this report, the Chi Square test was used as outlined by Garrett (24, pp. 262-266).

An analysis of variance, as suggested by Steel and Torrie (59, pp. 252-257), was computed for each score to test hypotheses (b), (c), (d), (e), (g), (h), (i), (j), and (l), (m), (n), (o). With this statistical design it was possible to first test for interaction between technical institute dropouts and engineering dropouts. If interaction were present, main effects could then be tested separately for both dropout groups. However, if interaction were not present, then both dropout groups could be statistically combined for further analysis.

CHAPTER IV

RESULTS OF THE INVESTIGATION

Introduction

The results of this investigation are reported in three areas as follows: program choice between professional engineering and technical institute programs; factors related to engineering and technical institute dropouts; and reasons, as expressed by students, for having dropped out of their respective programs.

Analysis of Factors Related to Program Choice

The number of subjects initially choosing a technical institute program numbered 84, while those choosing an engineering program totaled 50. Both of these groups are further broken down by choice of curriculum as shown in Table VII.

A social class assignment was given to each subject in both the engineering and technical institute groups. It will be recalled that the criteria for assignment to a particular class were as follows:

> Class I. Father's occupation is in a professional, proprietary or managerial capacity; father's education includes some college work; and total income of parents exceeds $9,000 per year.
>
> Class II. Father's occupation, educational attainment and family income are not all at either the highest level or the lowest level.

TABLE VII

TRAINING PROGRAM CHOICE OF 134 FRESHMAN STUDENTS

84 Technicians		50 Engineers	
Major Field Chosen	Choice in Percentage	Major Field Chosen	Choice in Percentage
Aeronautical	17.9	Agricultural	0.0
Construction	8.3	Architecture	22.0
Drafting	2.4	Chemical	10.0
Electrical	4.8	Civil	6.0
Electronics	23.8	Electrical	10.0
Fire Protection	9.4	General	4.0
Mechanical	19.1	Industrial	4.0
Metallurgy	14.3	Mechanical	14.0
Undecided	0.0	Undecided	30.0
Total	100.0	Total	100.0

Class III. Father of subject works as a craftsman, operative, or service worker; father's education stopped at high school or below; total income of parents does not exceed $6,999 per year.

A total of 3.4 percent of the technicians were in class I, while 18.0 percent of the engineers were in class I. Conversely, only 12.0 percent of the engineers were in class III, while 38.1 percent of the technicians were in this category.

The hypothesis that social class background differs significantly between those choosing to be engineers or technicians was tested using a Chi Square test as outlined by Garrett (24, pp. 262-266). A Chi Square value of 17.49 was obtained. This value was found to have an

associated probability value of less than .01 but greater than .005. On the basis of this test, the null hypothesis that technical institute or engineering program selection is independent of social class was rejected.

A classification of engineers and technicians by social class along with the Chi Square value associated with the differences in social class is shown in Table VIII.

TABLE VIII

SOCIAL CLASS ASSIGNMENTS FOR 134 FRESHMAN STUDENTS

	Technicians (N=84)		Engineers (N=50)	
	Number in Class	% of N in Class	Number in Class	% of N in Class
Class I	2	2.4	9	18.0
Class II	50	59.5	35	70.0
Class III	32	38.1	6	12.0
Totals	84	100.0	50	100.0
$X^2=17.49^{**}$ d.f.=2				

**Significant at .01 level

An analysis of variance, as described by Steel and Torrie (59, pp. 112-115), was used to compare composite ACT scores of those who chose engineering or technical institute curricula. Also, Minnesota Paper Form Board scores for the two groups were compared in the same way. The hypotheses that mean scores for the MPFB and mean scores for the Composite ACT would both differ significantly between engineers and

technicians were tested using an F test. An F ratio of 63.74 was obtained for the Composite ACT scores while an F ratio of 16.76 was obtained for MPFB scores. In both cases, these values were found to have associated probability values of less than .01.

The null hypothesis of no difference in the Composite ACT scores of those who chose engineering and those who chose the technical institute was rejected. Similarly, the null hypothesis of no difference in the MPFB scores of those who chose engineering and those who chose the technical institute was rejected.

The mean scores on these instruments for both groups along with the associated F values are shown in Table IX.

TABLE IX

COMPOSITE ACT SCORES AND MINNESOTA PAPER FORM BOARD SCORES FOR 134 FRESHMAN STUDENTS

Instrument	Technical (N=84) Mean	Engineer (N=50) Mean	F
Composite ACT	17.96	23.34	63.74**
MPFB	41.95	47.36	16.76**

*P $\leq$ .05
**P $\leq$ .01

A comparison was made between the scores of engineers and technicians on the fifteen different scales of the Edwards Personal Preference Schedule. An analysis of variance (59, pp. 112-115) was used to make this statistical comparison, thus testing the hypothesis that significant differences exist between the mean scores of those who chose engineering

and those who chose the technical institute.

An F test made for each of the fifteen scales of the EPPS revealed significant F ratios for three of the scales. These scales were the Achievement, Dominance, and Nurturance scales.

The F ratio obtained for the Achievement scale was 69.99. This value was found to have an associated probability value of less than .01. The F ratio obtained for the Dominance scale was 7.51. Similarly, this value was found to have an associated probability value of less than .01. The F ratio obtained for the Nurturance scale was 6.59, with an associated probability value of less than .05 but greater than .01.

The mean group scores on each scale of the EPPS along with the associated F values are given in Table X.

The hypothesis that mean scores on each of the six scales of the Study of Values differs significantly between those freshmen choosing to be engineers or technicians was tested by means of an analysis of variance (59, pp. 112-115). F ratios obtained for each of the scales indicated significant values for two of the six scales.

A significant F ratio of 9.21 was obtained for the Theoretical scale. A probability of less than .01 was associated with this value. The Social scale also had a significant F ratio of 9.54 with an associated probability of less than .01.

The mean group scores on each scale of the Study of Values along with the associated F values are given in Table XI.

TABLE X

EPPS SCORES FOR 134 FRESHMAN STUDENTS

Scale	Technical (N=84) Mean	Engineer (N=50) Mean	F
Achievement	15.20	17.24	69.99**
Deference	11.00	11.02	<1.0
Order	10.57	10.54	<1.0
Exhibition	14.32	14.52	<1.0
Autonomy	14.13	14.16	<1.0
Succorance	11.73	11.72	<1.0
Affiliation	14.13	13.42	<1.0
Intraception	13.63	14.70	2.03
Dominance	13.39	15.70	7.51**
Abasement	14.75	13.68	1.86
Nurturance	13.96	10.98	6.59*
Change	16.85	17.16	<1.0
Endurance	15.36	15.34	<1.0
Heterosexuality	18.21	17.86	<1.0
Aggression	12.55	12.14	<1.0

*P $\leq$ .05
**P $\leq$ .01

TABLE XI

VALUES TEST SCORES FOR 134 FRESHMAN STUDENTS

Scale	Technical (N=84) Mean	Engineer (N=50) Mean	F
Economic	44.90	45.78	1.0
Theoretical	43.25	46.80	9.21**
Aesthetic	32.94	33.86	1.0
Social	34.70	31.16	9.54**
Political	41.76	44.02	2.36
Religious	41.19	38.60	3.38

*P $\leq$ .05
**P $\leq$ .01

Analysis of Factors Related to Engineering and Technical Institute Dropouts

An analysis of variance, as described by Steel and Torrie (59, pp. 252-257), was used to test the differences between engineering dropouts and technical institute dropouts. This analysis was for data having a two-way classification with disproportionate subclass numbers. The mathematical description of this model is as follows:

$$Y_{ijk} = \mu + \beta_i + \mathcal{T}_j + (\beta\mathcal{T})_{ij} + \epsilon_{ijk}$$

where

μ = overall mean

β_i = effect associated with program selection (engineering or technical institute)

$\mathcal{T}_j$ = effect associated with dropout or non-dropout

$(\beta\mathcal{T})_{ij}$ = effect associated with interaction of program selection and dropout and non-dropout

ϵ_{ijk} = random error

F values were computed for interaction, effect due to program selection, and effect due to dropout, for all variables being analyzed. No significant interaction was found to exist. Therefore, all dropouts were combined statistically into a common group.

Mean sums of squares and F ratios from the analysis of variance used to test the significance of any interactions between scores for engineering dropouts and technical institute dropouts are shown in Table XII.

The hypotheses that mean scores on the Composite ACT test and mean scores on the Minnesota Paper Form Board test would differ significantly between dropouts and non-dropouts were tested using an analysis of variance. An F ratio of 14.95 was obtained for the Composite ACT test scores. This value was found to have an associated probability value of less than .01. An F ratio of less than one was obtained for the MPFB test score.

The mean scores on these instruments for both dropouts and non-dropouts along with mean sums of squares and F ratios are shown in Table XIII.

To test the hypothesis that mean scores on the Edwards Personal Preference Schedule would differ significantly between dropouts and non-dropouts, an analysis of variance was again used. Calculated F ratios obtained for each of the fifteen scales indicated that three of the scales significantly discriminated between the two groups. These scales were the Achievement scale, the Affiliation scale, and the Nurturance scale. An F ratio of 8.41 was obtained for the Achievement scale with

TABLE XII

MEAN SUMS OF SQUARES AND F RATIOS FROM ANALYSIS OF VARIANCE OF SCORES FOR ENGINEERING DROPOUTS AND TECHNICAL INSTITUTE DROPOUTS

Instrument	Source	df	M.S.	F
Composite ACT	Interaction	1	23.59	1.84
	Error	130	17.78	
MPFB	Interaction	1	9.73	1.0
	Error	130	62.97	
EPPS				
Achievement	Interaction	1	4.83	1.0
	Error	130	17.27	
Deference	Interaction	1	28.26	2.23
	Error	130	12.64	
Order	Interaction	1	38.31	1.85
	Error	130	20.67	
Exhibition	Interaction	1	17.00	1.28
	Error	130	13.28	
Autonomy	Interaction	1	2.93	1.0
	Error	130	16.39	
Succorance	Interaction	1	89.74	3.49
	Error	130	25.70	
Affiliation	Interaction	1	4.28	1.0
	Error	130	16.93	
Intraception	Interaction	1	1.27	1.0
	Error	130	19.55	
Dominance	Interaction	1	.10	1.0
	Error	130	22.54	
Abasement	Interaction	1	.52	1.0
	Error	130	22.03	
Nurturance	Interaction	1	1.36	1.0
	Error	130	26.41	
Change	Interaction	1	1.33	1.0
	Error	130	21.22	

TABLE XII (continued)

Instrument	Source	df	M.S.	F
Endurance	Interaction	1	7.57	1.0
	Error	130	28.89	
Heterosexuality	Interaction	1	64.79	1.55
	Error	130	41.80	
Aggression	Interaction	1	.81	1.0
	Error	130	20.62	
Study of Values				
Theoretical	Interaction	1	32.48	1.0
	Error	130	42.66	
Economic	Interaction	1	4.90	1.0
	Error	130	27.89	
Aesthetic	Interaction	1	71.57	1.19
	Error	130	59.99	
Social	Interaction	1	.09	1.0
	Error	130	40.33	
Political	Interaction	1	22.06	1.0
	Error	130	46.67	
Religious	Interaction	1	45.51	1.0
	Error	130	62.80	

*$F_{.05}$ = 3.92 (table value)

an associated probability value of .01. An F ratio of 5.12 was obtained for the Affiliation scale with an associated probability value of .05. The F ratio obtained for the Nurturance scale had a value of 4.16 with an associated probability value of .05.

The mean scores on the various scales of this instrument, along with mean sums of squares and F ratios, are shown in Table XIV.

TABLE XIII

ANALYSIS OF VARIANCE OF THE COMPOSITE ACT SCORES AND MINNESOTA PAPER FORM BOARD SCORES FOR ALL DROPOUTS AND ALL NON-DROPOUTS

Instrument	Dropouts Mean Score	Non-Dropouts Mean Score	Source	df	M.S.	F
Composite ACT	18.09	20.89	Between	1	191.08	14.95**
			Within	130	12.78	
MPFB	43.27	43.98	Between	1	5.43	1.00
			Within	130	62.97	

*P $\leqq$ .05
**P $\leqq$ .01

TABLE XIV

ANALYSIS OF VARIANCE OF THE EPPS SCORES FOR ALL DROPOUTS AND ALL NON-DROPOUTS

Scale	Dropouts Mean Score	Non-Dropouts Mean Score	Source	df	M.S.	F
Achievement	14.41	16.72	Between	1	145.35	8.41**
			Within	130	17.27	
Deference	11.30	10.87	Between	1	5.47	1.0
			Within	130	12.64	
Order	9.59	11.03	Between	1	61.75	2.98
			Within	130	20.67	
Exhibition	13.91	14.63	Between	1	15.13	1.14
			Within	130	13.28	
Autonomy	14.59	13.92	Between	1	13.30	1.0
			Within	130	16.39	
Succorance	11.48	11.77	Between	1	2.69	1.0
			Within	130	25.70	
Affiliation	14.98	13.22	Between	1	86.84	5.12*
			Within	130	16.93	
Intraception	14.16	13.97	Between	1	1.76	1.0
			Within	130	19.55	
Dominance	14.16	14.30	Between	1	.03	1.0
			Within	130	22.54	

TABLE XIV (continued)

Scale	Dropouts Mean Score	Non-Dropouts Mean Score	Source	df	M.S.	F
Abasement	14.95	14.06	Between	1	21.28	1.0
			Within	130	22.03	
Nurturance	13.84	11.80	Between	1	109.96	4.16*
			Within	130	26.41	
Change	17.30	16.69	Between	1	11.65	1.0
			Within	130	21.22	
Endurance	14.25	15.89	Between	1	79.63	2.75
			Within	130	28.89	
Heterosexuality	18.16	18.04	Between	1	.27	1.0
			Within	130	41.80	
Aggression	12.64	12.28	Between	1	3.40	1.0
			Within	130	20.62	

*P $\leqq$ .05
**P $\leqq$ .01

The hypothesis that mean scores on the various scales of the Study of Values would differ significantly between dropouts and non-dropouts was tested using an analysis of variance. Calculated F ratios indicated that two of the six scales significantly discriminated between the two groups. These scales were the Economic scale and the Social scale. An F ratio of 4.94 was obtained for the Economic scale with an associated probability of less than .05. An F ratio of 5.50 was obtained for the Social scale which also had an associated probability of .05.

The mean sums of squares, F ratios, and mean scores on the various scales of this instrument are shown in Table XV.

A social class assignment was made for the entire group of 44 dropouts and 90 non-dropouts using the same criteria for classification as previously outlined. A total of 6.8 percent of the dropouts were in Class I while 8.9 percent of the non-dropouts were in this same class. A total of 20.4 percent of the dropouts were in Class III while 31.1 per cent of the non-dropouts were in Class III.

The hypothesis that social class background differs significantly between those who drop out and those who do not drop out was tested using a Chi Square test. A Chi Square value of 3.32 was obtained. This value was found to have an associated probability value of greater than .05. Therefore, on the basis of this test, the null hypothesis that dropout or retention in the freshman year of a technical institute or engineering program is independent of social class was not rejected.

A classification of dropouts and non-dropouts by social class along with the Chi Square value associated with the differences in social class is shown in Table XVI.

TABLE XV

ANALYSIS OF VARIANCE FOR THE VALUES TEST SCORES
FOR ALL DROPOUTS AND ALL NON-DROPOUTS

Scale	Dropouts Mean Score	Non-Dropouts Mean Score	Source	df	M.S.	F
Theoretical	43.36	45.17	Between	1	78.95	1.85
			Within	130	42.66	
Economic	44.41	46.90	Between	1	187.19	4.94*
			Within	130	37.89	
Aesthetic	34.41	32.73	Between	1	87.60	1.46
			Within	130	59.99	
Social	35.34	32.43	Between	1	221.87	5.50*
			Within	130	40.33	
Political	42.82	42.50	Between	1	5.39	<1.0
			Within	130	46.67	
Religious	40.27	40.20	Between	1	108.00	<1.0
			Within	130	62.80	

*p $\leq$ .05
**p $\leq$ .01

TABLE XVI

SOCIAL CLASS ASSIGNMENTS FOR DROPOUTS AND NON-DROPOUTS

Social Class	Dropouts (N=44)	Percent of Dropouts	Non-Dropouts (N=90)	Percent of Non-Dropouts
Class I	3	6.8	8	8.9
Class II	32	72.8	54	60.0
Class III	9	20.4	28	31.1
Totals	44	100.0	90	100.0

X^2=3.32, not significant.

A summary of the significant differences in the various scores of all dropouts and all non-dropouts is shown in Table XVII.

Further Analysis of Significant Scores

In an effort to determine which of the measures might discriminate maximally between dropouts and non-dropouts, a further analysis of the data was made using a Kolmogorov-Smirnov two-sample test (54, pp. 127-136). This statistic was used to establish a "cutoff" score at which each significant scale discriminated maximally between all dropouts and all non-dropouts. In addition, the percentages of dropouts and non-dropouts scoring above or below each "cutoff" score was determined.

For the Composite ACT score, the "cutoff" score was found to be 17, with 45.5 percent of all dropouts scoring on or below this point with

only 17.8 percent of all non-dropouts scoring on or below this point.

TABLE XVII

SUMMARY OF DIFFERENCES IN SCORES BETWEEN DROPOUTS AND NON-DROPOUTS

Instrument	Group Scoring Highest	Level of Significance
Composite ACT	Non-dropouts	.01
Values		
Social	Dropouts	.05
Economic	Non-Dropouts	.05
EPPS		
Achievement	Non-dropouts	.01
Affiliation	Dropouts	.05
Nurturance	Dropouts	.05

On the Social scale of the Values measure, 40.9 percent of the dropouts scored on or above the "cutoff" score of 37, while only 21.1 percent of the non-dropouts scored on or above this point.

On the Economic scale of the Values measure, 88.6 percent of the dropouts scored on or below the "cutoff" score of 50, while 67.8 percent of the non-dropouts scored on or below this point.

On the Achievement scale of the EPPS, 43.2 percent of the dropouts scored on or below the "cutoff" score of 13, while 21.1 percent of the non-dropouts scored on or below this point.

For the Affiliation scale of the EPPS, 88.6 percent of the dropouts scored on or above the "cutoff" score of 11, and 68.8 percent of all

non-dropouts scored on or above this point.

On the Nurturance scale of the EPPS, 84.0 percent of the dropouts scored on or above the "cutoff" score of 10, while 61.0 percent of the non-dropouts scored on or above this point.

A summary of the "cutoff" scores for the various significant scales is shown in Table XVIII.

The three measures which seemed to offer maximum discrimination between dropouts and non-dropouts were the Composite ACT score, the Achievement scale score of the EPPS, and the Social scale score of the Allport-Vernon-Lindzey Study of Values. These three scales were analyzed in combinations of twos and a combination of all three to determine the discriminatory power of these combinations. It was found that the combination of scores which discriminated maximally between dropouts and non-dropouts was the Composite ACT score, with a "cutoff" score of 17, and the Achievement scale score of the EPPS, with a "cutoff" score of 13. When considered together, 75.0 percent of all dropouts scored on or below the "cutoff" score on both of these measures. An analysis of these three scales is shown in Table XIX.

Reasons Expressed by Students for Withdrawal

A total of 134 subjects were initially chosen for this study. Of this number, 84 chose a technical institute program and 50 chose a professional engineering program. At the beginning of the sophomore year of study, a total of 44 subjects had withdrawn from the programs in which they had initially enrolled. Of this group of withdrawals, 15

TABLE XVIII

PERCENTAGE OF DROPOUTS AND NON-DROPOUTS
SCORING ABOVE AND BELOW "CUTOFF"
SCORES ON SIGNIFICANT SCALES

Instrument	Score	Percent of Dropouts Scoring At or Below Cutoff Score	Percent of Non-Dropouts Scoring At or Below Cutoff Score	Percent of Dropouts Scoring At or Above Cutoff Score	Percent of Non-Dropouts Scoring At or Above Cutoff Score
Composite ACT	17	45.5	17.8		
Values					
Social	37			40.9	21.1
Economic	50	88.6	67.8		
EPPS					
Achievement	13	43.2	21.1		
Affiliation	11			88.6	68.8
Nurturance	10			84.0	61.0

subjects had withdrawn from the original group of 50 engineers, and 29 subjects had withdrawn from the original group of 84 technicians.

TABLE XIX

PERCENTAGE OF DROPOUTS WHO SCORED ABOVE AND BELOW "CUTOFF" SCORES ON COMBINATIONS OF MOST SIGNIFICANT SCALES

Instrument	Cutoff Score	Percent of Dropouts Who Scored Beyond Cutoff Scores on Both Measures	Percent of Dropouts Who Scored Beyond Cutoff Scores on All Three Measures
Composite ACT	17	75.0	
EPPS: Achievement	13		
EPPS: Achievement	13	56.2	
Values: Social	37		
Composite ACT	17	50.0	
Values: Social	37		
Composite ACT	17		55.6
EPPS: Achievement	13		
Values: Social	37		

A questionnaire was mailed to each dropout asking for specific reasons for withdrawal from the program in which the subject was originally enrolled. From these 44 dropouts, a total of 24 (55 percent) of the questionnaires were returned.

The responses of all dropouts, whether engineers or technicians, were grouped together. Because of the relatively small number of questionnaires returned and the relatively large number of responses on each questionnaire to which each subject could respond, the conditions for a valid Chi Square analysis of data were not met.

The reasons, as expressed by dropouts, for discontinuing their programs are given in Table XX.

TABLE XX

REASONS FOR CHANGING OR DROPPING OUT OF THE PROGRAM

Reasons for Dropping	Percent	Number of Responses
Transferred to another educational program	27.1	13
Low grades	20.9	10
Lack of interest in major field	14.6	7
Lack of funds--plan to return at a later date	10.4	5
Lack of interest in college	8.3	4
Family problems	6.3	3
Lack of funds--do not plan to return	4.2	2
Joined the armed forces	4.2	2
Health problems	2.0	1
Moved place of residence	2.0	1
Totals	100.0	48

Note: This was a multiple response item which accounts for the large number of responses.

Listed in Table XXI is a summary of the subjects' ratings of the instructional level of the programs which they discontinued.

TABLE XXI

RATING OF INSTRUCTIONAL LEVEL BY DROPOUTS

Rating of Program	Percent	Number of Responses
Too theoretical	13.0	3
Just about proper level	70.0	16
Too practical	8.7	2
All other	8.7	2
Totals	100.4	23

For the purposes of this study, a dropout was defined as a subject who began a technical institute or engineering program and discontinued that program before or at the end of the first year of study. This definition would also include those who transferred at the end of the first year of study from a technical institute or engineering program into some other academic program within the University.

Reasons expressed by those subjects who dropped out of an engineering or technical institute program to transfer to some other academic program are summarized in Table XXII.

Summary of Results

Statistical tests were made upon data received from a total of 134 freshmen students who were enrolled as first semester freshmen in the

College of Engineering at Oklahoma State University. Of this number, 84 were Technical Institute enrollees and 50 were enrollees in baccalaureate degree engineering programs.

TABLE XXII

REASONS GIVEN FOR TRANSFERRING TO SOME OTHER ACADEMIC PROGRAM

Reasons for Transfer	Percent	Number of Responses
I felt I would gain more prestige and satisfaction in another field	28.6	8
No longer interested in being a technician (or engineer)	14.3	4
A technician's (or engineer's) work isn't what I thought it was	10.7	3
Wanted a career with greater financial potential	10.7	3
I was doing poorly in my courses	10.7	3
I liked courses but felt unsuited for work in that field	7.1	2
I liked my courses but found other courses more interesting	7.1	2
All other reasons	10.7	3
Totals	99.9	28

Note: These were multiple response items.

The results of this investigation are summarized in this section along with the hypotheses tested and the statistical methods used in the tests.

I. Hypothesis

Freshmen students who choose to be engineers come from significantly higher social class backgrounds than freshmen students who choose to be technicians.

Statistical Test

Chi Square, one-tailed test (24, pp. 253-258).

Results

Chi Square approximation (d.f. = 2) = 17.49; a probability of less than .01 was found to be associated with the rejection of the null.

Disposition of Hypothesis

Null: Rejected

Alternate: Confirmed

II. Hypothesis

Freshmen students who choose to be engineers will score significantly higher on the composite score of the ACT test than freshmen students who choose to be technicians.

Statistical Test

Analysis of Variance, F ratio (59, pp. 112-115).

Results

An F ratio was calculated = 63.74; a one-tailed probability of less than .01 was associated with this F value.

Disposition of Hypothesis

Null: Rejected

Alternate: Confirmed

III. Hypothesis

Freshmen students who choose to be engineers will score

significantly higher on the Revised Minnesota Paper Form Board Test than freshmen students who choose to be technicians.

Statistical Test

Analysis of Variance, F ratio (59, pp. 112-115).

Results

An F ratio was calculated = 16.76; a one-tailed probability of less than .01 was associated with this F value.

Disposition of Hypothesis

Null: Rejected

Alternate: Confirmed

IV. Hypothesis

Freshmen students who choose to be engineers will have significantly different scores on the various scales of the Study of Values Test than freshmen students who choose to be technicians.

Statistical Test

Analysis of Variance, F ratio (59, pp. 112-115).

Results

F ratios with associated probabilities of less than .01 were found to exist for two of the six value scales. These scales were the Theoretical scale and the Social scale, with the engineers scoring significantly higher on the Theoretical scale and the technicians scoring significantly higher on the Social scale.

Disposition of Hypothesis

Null: Rejected for the following scales: Theoretical and Social.
Not rejected for the following scales: Economic, Aesthetic, Political, Religious.

Alternate: Confirmed for the following scales: Theoretical and Social. Not confirmed for the following scales: Economic, Aesthetic, Political, Religious.

V. Hypothesis

Freshmen students who choose to be engineers will have significantly different scores on the various scales of the Edwards Personal Preference Schedule than freshmen students who choose to be technicians.

Statistical Test

Analysis of Variance, F ratio (59, pp. 112-115).

Results

F ratios of 69.99 and 7.51, with associated probabilities of less than .01 were found to exist for the Achievement scale and the Dominance scale respectively. An F ratio of 6.50 with an associated probability of less than .05 but greater than .01 was found to exist for the Nurturance scale. No other scale was found to have an F ratio with an associated probability as low as .05. The engineers scored significantly higher on the Achievement and Dominance scales (.01 level) while the technicians scored higher on the Nurturance scale (.05 level).

Disposition of Hypothesis

Null: Rejected for the following scales: Achievement, Dominance, Nurturance. Not rejected for all other scales.

Alternate: Confirmed for the following scales: Achievement, Dominance, Nurturance. Not confirmed for all other scales.

VI. Hypothesis

A significant interaction will be found to exist between certain selected intellective and non-intellective factors (Composite ACT scores, MPFB scores, Study of Values scores, and EPPS scores) and engineering dropouts versus the technical institute dropouts.

Statistical Test

Analysis of Variance, F ratio (59, pp. 173-175).

Results

In no instance was an F ratio having an associated probability as low as .05 found for any score.

Disposition of Hypothesis

Null: Not rejected for any scale.

Alternate: Not confirmed for any scale.

VII. Hypothesis

Freshmen students who do not drop out will score significantly higher on the composite scale of the ACT test than freshmen who drop out.

Statistical Test

Analysis of Variance, F ratio (59, pp. 112-115).

Results

An F ratio was calculated to be = 14.95; a probability of .01 was found to be associated with the rejection of the null.

Disposition of Hypothesis

Null: Rejected

Alternate: Confirmed

VIII. Hypothesis

Freshmen students who do not drop out will score significantly higher on the Revised Minnesota Paper Form Board test than freshmen who drop out.

Statistical Test

Analysis of Variance, F ratio (59, pp. 112-115).

Results

An F value of 1.0 was obtained which indicated that the probability associated with rejection of the null could not be significant.

Disposition of Hypothesis

Null: Not rejected

Alternate: Not confirmed

IX. Hypothesis

Freshmen students who drop out will have significantly different scores on the various scales of the Study of Values than freshmen who do not drop out.

Statistical Test

Analysis of Variance, F ratio (59, pp. 112-115).

Results

F ratios with associated probabilities of less than .05 but more than .01 were found to exist for the Nurturance and the Affiliation scales, with F values of 4.16 and 5.12 respectively. An F ratio of 8.41 with an associated probability of less than .01 was found for the Achievement scale. Dropouts were found to score significantly higher on the Nurturance and the Affiliation scales, while non-dropouts scored significantly higher on the Achievement scale.

Disposition of Hypothesis

Null: Rejected for the Nurturance, Affiliation, and the Achievement scales. Not rejected for all other scales.

Alternate: Confirmed for the Nurturance, Affiliation, and the Achievement scales. Not confirmed for all other scales.

XI. Hypothesis

Freshmen students who persist in college come from significantly higher social class backgrounds than freshmen students who drop out.

Statistical Test

Chi Square, one-tailed test (24, pp. 253-258).

Results

Chi Square approximation (df=2) = 3.32; a probability of .18 was found to be associated with the rejection of the null.

Disposition of Hypothesis

Null: Not rejected

Alternate: Not confirmed

CHAPTER V

DISCUSSION OF FINDINGS

Program Choice

Upon analyzing the results of this investigation, it appears that a pattern emerges which generally characterizes the group that chose an engineering program as opposed to those who chose a technical institute program.

Those who chose to be engineers came from a significantly higher socio-economic classification. They also scored significantly higher on the composite score of the ACT test and on the Minnesota Paper Form Board test. In addition, the engineers scored significantly higher on the Theoretical scale of the Values instrument, and significantly higher on the Achievement and Dominance scales of the Edwards Personal Preference Schedule.

Those who chose to be technicians rather than engineers scored significantly higher on the Social scale of the Values instrument and the Nurturance scale of the Edwards Personal Preference Schedule. These differences are summarized in Table XXIII.

The data seem to justify the interpretation of the significant difference in socio-economic backgrounds of the two groups as indicating that the choice of a four-year engineering program rather than a two-year technical institute program was influenced by the income of the

parents, or more directly, the parents' ability to pay for two additional years of college.

TABLE XXIII

SIGNIFICANT DIFFERENCES IN THOSE WHO CHOSE ENGINEERING VERSUS THOSE WHO CHOSE TECHNICAL INSTITUTE PROGRAMS

Measure	Group Scoring Highest	Level of Significance
Social Class	Engineering	.01
Composite ACT	Engineering	.01
MPFB	Engineering	.01
Values		
Theoretical	Engineering	.01
Social	Technical Institute	.01
EPPS		
Achievement	Engineering	.01
Dominance	Engineering	.01
Nurturance	Technical Institute	.05

The data further suggest that motivation for achievement in college has been affected by social class background. This interpretation would be reinforced by the findings of Hyman (30, p. 430) who showed that parents from higher socio-economic groups emphasize college training to their children to a much greater degree than parents from lower socio-economic groups; thus, it appears that parents who are able to afford

the expense of a college program of greater duration, emphasize the importance of college training, and endeavor to motivate their youngsters toward a baccalaureate degree program.

The program choice of engineering likewise appears to be related to the need to dominate or be regarded as a leader. The engineer likewise appears to be more interested in theoretical orientations. Significantly higher Composite ACT scores and MPFB scores seem to indicate that the engineer is also better prepared to achieve academically than the technician.

On the other hand, those who chose to be technicians appear to have a more intense need for the acceptance, love, and respect of others in order to gratify their need for belongingness.

This does not suggest that either group has certain needs or characteristics that are absent in the other group. Rather it suggests that both groups have common psychological needs, but to different degrees.

Dropouts and Non-Dropouts

A close examination of the data reveals some differences between engineering dropouts and technical institute dropouts. There are also some differences between engineering non-dropouts and technical institute non-dropouts. However, these differences within the groups were not significant. These differences are shown in a graphical representation of mean scores in Figure 1 and Figure 2. As there was no significant statistical interaction within the dropout group or within the non-dropout group, all dropouts were combined into one group and all

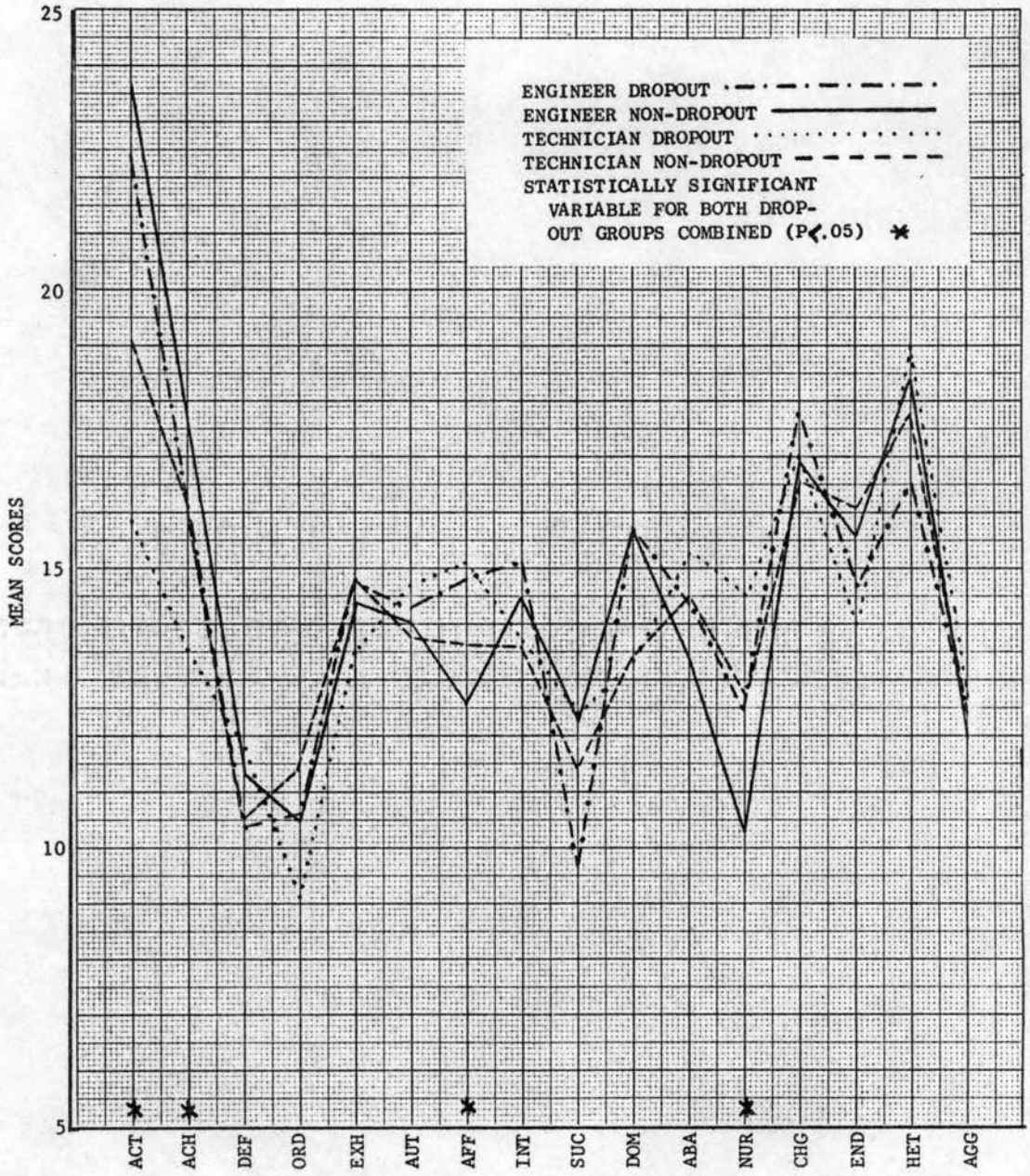

Figure 1. Mean ACT and EPPS Scores for All Groups

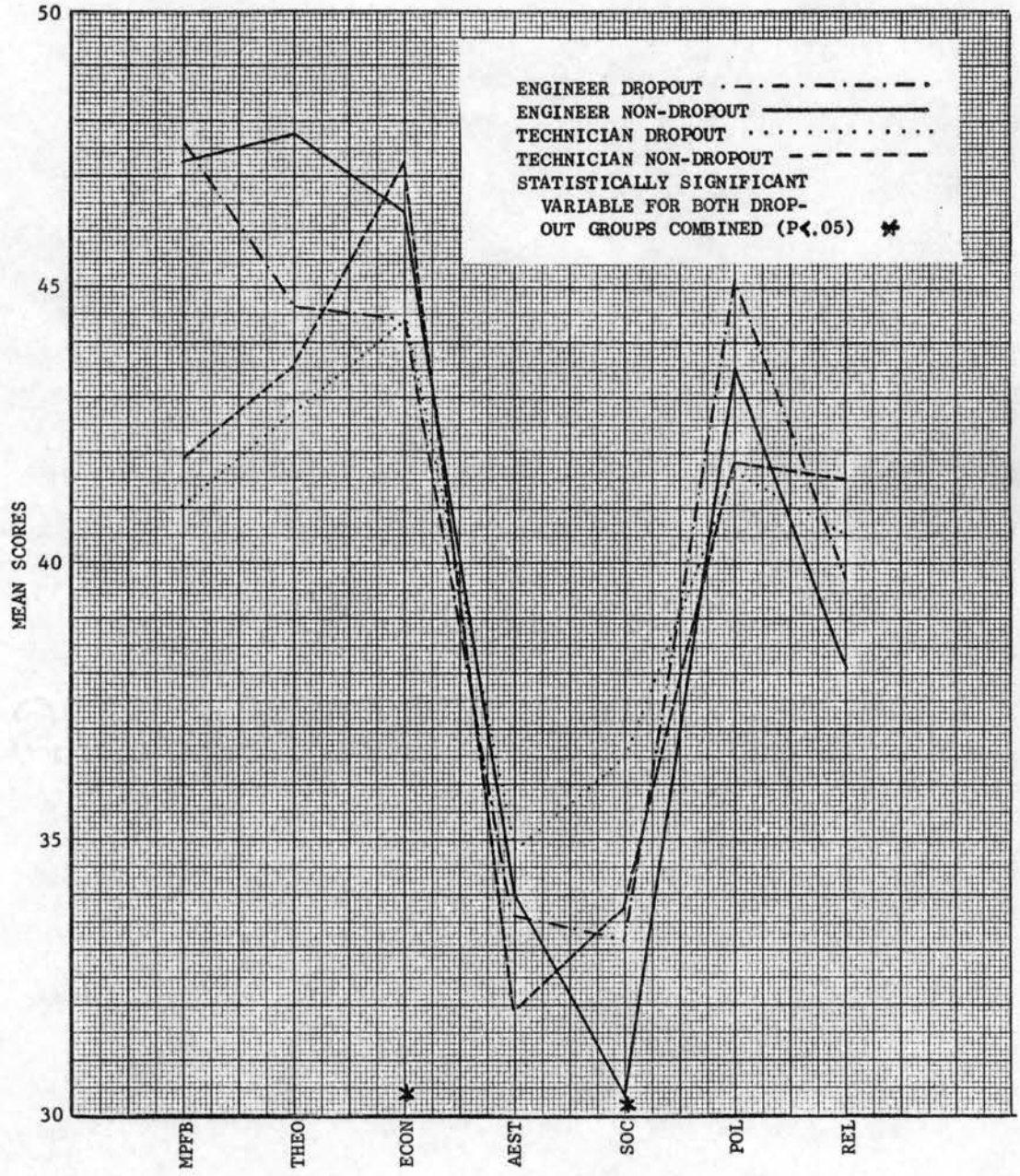

Figure 2. Mean MPFB and Values Scores for All Groups

non-dropouts were combined into another group for further analysis.

The data revealed that the non-dropout group scored significantly higher on the Composite ACT score, the Economic scale of the Values instrument, and the Achievement scale of the EPPS. The dropouts, on the other hand, scored significantly higher on the Affiliation and Nurturance scales of the EPPS, and the Social scale of the Values instrument.

These data imply that those who have succeeded, as defined by this study (non-dropouts), possess personality characteristics very similar to the self-actualizer, as described by Maslow (39, pp. 199-234). Similarly, the person who is a non-dropout very closely resembles the autonomous person, as described by Angyal (3, pp. 3-29).

In this study, the non-dropout group was significantly higher than the dropout group in motivation for achievement, as measured by the Achievement scale of the EPPS. This scale attempts to measure one's motivation to do one's best, to try to succeed, to try to accomplish difficult things or do things better than others.

In much the same way, Maslow (39) identifies the self-actualizer as one who channels his energies toward some task rather than toward ego-centered problems. He has full use of his talents, capacities, and potentialities and exploits these abilities.

Angyal (3) describes the autonomous person as one who is motivated to seek knowledge for not only what it can achieve, but for the sake of knowing. He has the tendency to resist any encroachment into his sphere of achievement by others.

In contrast it would appear that within this same area the dropout

has many personality characteristics of the heteronomous person, as described by Angyal (3). The heteronomous person is characterized as one who lacks motivation to achieve. His course is determined by external happenings. He is directed mainly by circumstance. He has strong feelings of self-importance which affect his behavior and may bring about an actual reduction of his self-determination.

The non-dropout scored significantly higher than the dropout in the area of economic interest as measured by the Values instrument. This scale attempts to measure one's interest in the tangible and useful. This person is interested in the utility of things. He wants education and wants to apply it to practical ends. He is interested in achieving "things" and surpassing other people.

Similarly, Angyal (3) describes the autonomous man as one who is also interested in the practical application of knowledge. He is motivated to acquire and accumulate property or "goods" to express his drive toward mastery.

The dropout group scored significantly higher than the non-dropout group in the areas of social needs, and affiliation and nurturance needs, as measured by the Values instrument and the EPPS respectively. The Social scale of the Values instrument attempts to identify one who needs the love of people. This person has a self-image of philanthropic and altruistic love toward others, with a need for the sympathy of others.

The need for affiliation, as measured by the EPPS, attempts to identify one who needs to participate in groups, to do things with and for friends, to share with friends and form strong attachments. The nurturance need, as measured by the EPPS, attempts to identify one who

needs to help and be helped by friends, and to be treated with kindness and sympathy by others.

The person with a syndrome of nurturance-type needs appears to be similar to the heteronomous person, as defined by Angyal (3). That is, he is an excessive conformist who has great difficulty in disagreeing with others. He is dependent on the help of others far in excess of necessity.

Conversely, the person who succeeds in his college program, the non-dropout, displays the nurturance-type needs to a significantly lower degree than the dropout. In this respect, the non-dropout group again resembles the self-actualizer described by Maslow (39). The self-actualizer is described as a person detached from an excessive need for others. This person requires a certain amount of privacy. He relies on his own interpretation of situations and not on the interpretation of others. In fact, this person may be hampered by others. The self-actualizer is, to a large degree, independent of the feelings and opinions of others.

Similarly, the non-dropout resembles the autonomous person as described by Angyal (3). This person is characterized as one who is relatively independent of the need for others. He resents and resists intrusion into his activities by others and protects his privacy.

From these data one might imply that those with excessive affiliation-nurturance types of self-needs, as characterized by Maslow's (39) deficiency motivated person and Angyal's (3) heteronomous person, are much less likely to succeed in a technical institute or engineering program than those without these kinds of needs. These data also

suggest that those who do not have excessive affiliation-nurturance types of self-needs have a much greater chance of success in an engineering or technical institute program.

CHAPTER VI

SUMMARY AND CONCLUSIONS

The primary purpose of this study was to determine if certain psychological, social, and intellective factors could be identified which might provide a valid pattern of factors characteristic of engineering and technical institute dropouts.

The subjects utilized in this study were male freshmen students enrolling for the first time in the College of Engineering at Oklahoma State University. This group was composed of both technical institute freshmen who were beginning associate degree programs and engineering freshmen who were beginning baccalaureate degree programs. Subjects who withdrew or transferred from their respective programs before the beginning of their second year of training were considered to be dropouts for the purposes of this study.

On the basis of their fathers' income, occupation, and education, the subjects were classified into one of three social class groupings. A one-tailed Chi Square test indicated that the difference in the subjects' socio-economic backgrounds was significant at the .01 level, the engineering subjects being in the highest class.

An analysis of variance further indicated that the engineering group had significantly higher scholastic aptitudes and ability to visualize spatial relationships. These differences were significant at

the .01 level.

The data further revealed, through an analysis of variance, that the engineering group was more theoretically oriented with a significantly higher need for dominance and motivation for achievement. These differences were significant at the .01 level. Those who chose to be technicians, however, had a significantly greater need for nurturance than the engineers. This difference was significant at the .05 level.

With regard to dropouts, statistical tests revealed no significant difference in the social class background or ability to visualize spatial relationships between those who drop out and those who stay in school.

An analysis of variance indicated that the non-dropouts had significantly higher scholastic aptitudes than the dropouts (.01 level). Furthermore, the non-dropouts indicated a significantly higher motivation to achieve (.01 level) and a significantly higher economic needs orientation (.05 level) than the dropout group.

The dropout group indicated a significantly higher need for affiliation, nurturance, and general social needs than the non-dropouts. The dropouts' needs were higher in all three of these areas at the .05 level, as determined by an analysis of variance.

Those who drop out appear to be more deficiency motivated, as described by Maslow (39). That is, they must have other people available for their ego needs. Those who do not drop out appear to possess personality characteristics similar to those of the self-actualizer, as described by Maslow. These people fully use and exploit their talents, capacities, and potentialities.

Limitations

Before interpreting the findings of this study, the reader should be aware of certain limiting factors which may have affected the results reported in this investigation.

One limitation associated with the study was the relatively small number of subjects selected as a random sample of the freshmen engineering group. Although this group numbered fifty subjects in all, the number of dropouts from this engineering group, identified one year later, numbered fifteen. Likewise, a sample of 84 technical institute freshmen were selected as subjects, with 29 dropouts identified one year later. With larger samples of both groups, an appropriate statistic might have been used to further analyze the reasons given by the dropouts for discontinuing their respective programs.

A second limitation of the study is in the criteria for the classification of dropouts. For the purposes of this study, all subjects who did not begin the second year of study in the program in which they originally enrolled (either the technical institute or engineering school) were classified as dropouts. This method of classification would, of course, miss the subjects who withdrew beyond the second year of study. Also classified as dropouts were those who transferred before the beginning of the second year of study into some program outside of the College of Engineering.

Conclusions and Recommendations

Because of the limitations previously mentioned, no attempt to generalize beyond the scope of this study should be made.

In summarizing the findings of this study, it would appear that factors relating to social class background relate to program choice; specifically, the decision whether to enroll in an engineering or a technical institute program. It would further appear that factors related to success or failure in either program are independent of socio-economic background.

The lack of a significant difference between dropouts and non-dropouts on the dimension of social class background would seem to underscore the statistical significance of the non-intellective personality dimensions on which the two groups significantly differ. Non-intellective personality variables did not seem to discriminate with regard to program choice, but these personality variables do discriminate relative to success or failure once the choice is made.

Based upon the results of this study, it is suggested that further research is needed to more clearly identify and clarify the optimum non-intellective predictors of engineering and technical institute dropouts. A replication of this study with an increased number of subjects, and the study extended to include similar technical institute-engineering college relationships at other universities, might be profitable in further identifying social and psychological factors identified with engineering and technical institute dropouts.

In retrospect it would appear that some measure of level of aspiration would further enhance this study. Such a measurement might serve to further identify a subject in terms of program choice. It might further identify the subjects whose level of aspiration is inconsistent with their capacity to achieve.

A future study, similar to this investigation, might be further enhanced by isolating scholastic aptitude and statistically holding that factor constant while further analyzing all non-intellective factors.

It would appear that certain intellective and non-intellective factors and combinations of factors are related to both selection and to success and failure in an engineering or technical institute program. It would further appear, on the basis of these data, that there would be some utility in using the instruments utilized in this investigation for counseling, screening, and selection of students in these two kinds of programs. However, further studies would be needed to obtain reliable norms for this use.

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APPENDIX A

PERSONAL INFORMATION A

Name (print): _____
Last Name First Name Middle Name

Stillwater Address _____

Permanent Address _____

I. Marital Status (circle one): Single---Married---Divorced---Widowed
(1) (2) (3) (4)

II. Present Student Status (circle one) Freshman-Sophomore-Junior-Senior
(1) (2) (3) (4)

III. Total college credit hours earned from all institutions to present date (check one):

(1) ☐ None

(2) ☐ Less than 15 semester credit hours

(3) ☐ 16 to 30 semester credit hours

(4) ☐ 31 to 60 semester credit hours

(5) ☐ 61 to 90 semester credit hours

(6) ☐ 91 to 120 semester credit hours

(7) ☐ More than 120 semester credit hours

IV. Degree program in which you are presently enrolled (check one):

(1) ☐ Associate of Technology degree program in the Technical Institute

(2) ☐ Bachelor of Science degree program in Engineering

APPENDIX A (continued)

V. Major field of study (check one):

(1) Technical Institute

(10) ☐ Aeronautical Technology

(11) ☐ Construction Technology

(12) ☐ Drafting and Design Technology

(13) ☐ Electrical Technology

(14) ☐ Electronics Technology

(15) ☐ Fire Protection Technology

(16) ☐ Mechanical Technology

(17) ☐ Metals Technology

(18) ☐ Other_____

(19) ☐ Undecided

(2) Engineering

(20) ☐ Agricultural

(21) ☐ Architecture

(22) ☐ Chemical

(23) ☐ Civil

(24) ☐ Electrical

(25) ☐ General

(26) ☐ Industrial

(27) ☐ Mechanical

(28) ☐ Other_____

(29) ☐ Undecided

APPENDIX A (continued)

VI. Education of Father: (Please check the highest level of education that was attained by your father.)

(1) ☐ 6th grade or less

(2) ☐ 7th - 8th grade

(3) ☐ 9th - 10th grade

(4) ☐ 11th - 12th grade

(5) ☐ Graduated from high school

(6) ☐ Some college, but no degree

(7) ☐ Earned a bachelor degree but no additional graduate or professional education

(8) ☐ Had some graduate work or earned a graduate or professional degree

VII. Occupation of Father: (If deceased, indicate his occupation at time of death.)

(1) ☐ Professional, technical, or kindred worker. (Includes accountants, engineers, lawyers, personnel workers, technicians, etc.)

(2) ☐ Manager, official, proprietor, farm manager

(3) ☐ Clerical and kindred workers. (Includes bookkeepers, cashiers, clerks, storekeepers, etc.)

(4) ☐ Sales worker

(5) ☐ Craftsmen, foreman, and kindred workers. (Includes carpenters, electricians, machinists, printers, etc.)

(6) ☐ Operatives and kindred workers. (Includes apprentices, assemblers, truck drivers, deliverymen, welders, etc.)

(7) ☐ Service workers, including private household. (Includes janitors, guards, watchmen, etc.)

(8) ☐ Laborer, including farm

(9) ☐ Other (Please specify)_____

APPENDIX A (continued)

VIII. Approximate annual income of parents or guardians in 1963

(1) ☐ Under $5,000

(2) ☐ $5,000 to $6,999

(3) ☐ $7,000 to $8,999

(4) ☐ $9,000 to $11,999

(5) ☐ $12,000 to $15,000

(6) ☐ Above $15,000

APPENDIX B

OKLAHOMA CITY PUBLIC SCHOOLS
900 North Klein
Oklahoma City 6, Oklahoma

Vocational, Technical
and Continuing
Education

September 7
1 9 6 5

Dear Mr._____:

The College of Engineering (Technical Institute) is constantly trying to improve its instructional program through various methods of evaluation. One such method of evaluation is through gathering opinions directly from former students.

In checking our enrollment records we find that you have not re-enrolled in the College of Engineering (Technical Institute) at Oklahoma State University. You could help us immeasurably in our instructional evaluation if you would fill out the enclosed questionnaire and return it to us as soon as possible. An enclosed, self-addressed, stamped envelope is enclosed for your convenience.

Please be assured that all information from these questionnaires will be held in strict confidence.

Thank you for your cooperation in this project.

Sincerely,

APPENDIX C

ENGINEERING
QUESTIONNAIRE B

Name (Please Print)_____
Last Name First Name Middle Name

I. Reasons for transferring or dropping from the O.S.U. College of Engineering (check all that are appropriate):

(1) ☐ Because of lack of funds, I was unable to stay in school but I plan to return to school at some later date.

(2) ☐ Because of lack of funds, I was unable to continue my education.

(3) ☐ Because of low grades.

(4) ☐ Because of problems in my family.

(5) ☐ Because of health problems.

(6) ☐ Because of lack of interest in college.

(7) ☐ Because of lack of interest in my selected major field.

(8) ☐ Because I have moved my place of residence, but I plan to continue my education at another institution.

(9) ☐ I have joined the armed forces.

(10) ☐ I have been drafted into the armed forces.

(11) ☐ I have transferred into another educational program (please indicate below).

College_____

School_____

Major_____

APPENDIX C (continued)

(12) ☐ Other reasons (please indicate)_____

II. Student's rating of the level of instruction at the O.S.U. College of Engineering: (please check one)

(1) ☐ The program was too theoretical.

(2) ☐ The program was just about the proper level.

(3) ☐ The program was too practical.

(4) ☐ Other_____

TO BE ANSWERED ONLY BY TRANSFER STUDENTS. (Students who have transferred out of the College of Engineering into some other program)

III. Reasons for my transferring from the College of Engineering are: (check where applicable)

(1) ☐ I was no longer interested in being an engineer.

(2) ☐ I was doing poorly in my courses.

(3) ☐ An engineer's work is not what I thought it was.

(4) ☐ I liked my courses but felt unsuited for work in that field.

(5) ☐ I felt that I would gain more prestige and satisfaction in another field.

(6) ☐ Though my courses interested me, I found other courses more interesting.

(7) ☐ My friends interested me in another field.

(8) ☐ I became interested in a career that offered greater financial potential.

(9) ☐ Other_____

APPENDIX D

TECHNICAL INSTITUTE
QUESTIONNAIRE B

Name (Please Print) _____
Last Name First Name Middle Name

I. Reasons for transferring or dropping from the O.S.U. Technical Institute (check all that are appropriate):

(1) ☐ Because of lack of funds, I was unable to stay in school but I plan to return to school at some later date.

(2) ☐ Because of lack of funds, I was unable to continue my education.

(3) ☐ Because of low grades.

(4) ☐ Because of problems in my family.

(5) ☐ Because of health problems.

(6) ☐ Because of lack of interest in college.

(7) ☐ Because of lack of interest in my selected major field.

(8) ☐ Because I have moved my place of residence, but I plan to continue my education at another institution.

(9) ☐ I have joined the armed forces.

(10) ☐ I have been drafted into the armed forces.

(11) ☐ I have transferred into another educational program (please indicate below).

College _____

School _____

Major _____

(12) ☐ Other reasons (please indicate)_____

II. Student's rating of the level of instruction at the O.S.U. Technical Institute: (please check one)

(1) ☐ The program was too theoretical.

(2) ☐ The program was just about the proper level.

(3) ☐ The program was too practical.

(4) ☐ Other_____

TO BE ANSWERED ONLY BY TRANSFER STUDENTS. (Students who have transferred out of the Technical Institute into some other program)

III. Reasons for my transferring from the Technical Institute are: (check where applicable)

(1) ☐ I was no longer interested in being a technician.

(2) ☐ I was doing poorly in my courses.

(3) ☐ A technician's work is not what I thought it was.

(4) ☐ I liked my courses but felt unsuited for work in that field.

(5) ☐ I felt that I would gain more prestige and satisfaction in another field.

(6) ☐ Though my courses interested me, I found other courses more interesting.

(7) ☐ My friends interested me in another field.

(8) ☐ I became interested in a career that offered greater financial potential.

(9) ☐ Other_____

VITA

Aaron Julius Miller

Candidate for the Degree of

Doctor of Education

Thesis: A STUDY OF ENGINEERING AND TECHNICAL INSTITUTE FRESHMEN ENROLLEES AND DROPOUTS IN TERMS OF SELECTED INTELLECTIVE AND NON-INTELLECTIVE FACTORS

Major Field: Higher Education

Biographical:

Personal Data: Born at Kansas City, Missouri, July 5, 1929, the son of Aaron J. and May Emily Miller.

Education: Received the Technicians Certificate with a major in Electronics Technology from Oklahoma State University, Stillwater, Oklahoma, in May, 1950; received the Bachelor of Science degree from the Oklahoma State University with a major in Trade and Industrial Education in August, 1957; received the Master of Science degree from the Oklahoma State University, with a major in Trade and Industrial Education, in August, 1960; completed requirements for the Doctor of Education degree at Oklahoma State University in May, 1966.

Professional Experience: Served in the United States Air Force as electronics instructor and ground electronics officer, 1951 to 1953; instructor of Electronics Technology, Oklahoma State University, Stillwater, Oklahoma, 1955 to 1958; assistant professor of Electronics Technology, and Technical Education, 1958 to 1964; Director of Vocational-Technical and Continuing Education, Oklahoma City Public Schools, Oklahoma City, Oklahoma, 1964 to 1966.

Professional Organizations: American Society for Engineering Education, American Vocational Association, Phi Delta Kappa, Iota Lambda Sigma.