A STUDY OF THE SELF CONCEPTS, OCCUPATIONAL PERSONAS, AND OCCUPATIONAL STEREOTYPES OF ENGINEERING STUDENTS

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ABSTRACT

A STUDY OF THE SELF CONCEPTS, OCCUPATIONAL PERSONAS, AND OCCUPATIONAL STEREOTYPES OF ENGINEERING STUDENTS

by Glenn Albert Chaffee

Super has theorized that vocational development is the implementation of a self concept. Galinsky and Fast and Stefflre have suggested that while for some choosing a vocation may be implementing a self concept, for others it may represent an effort to become or to appear to become like those involved in an occupational field through identification with them, and thereby taking on the characteristics attributed to them in the public mind.

In order to test this idea, an experimental sample was chosen from among undergraduate engineering students at Michigan State University. The criterion for inclusion in the sample was the extent of agreement between responses to the Gough Adjective Check List, each individual having checked the list for self concept--how he saw himself; occupational persona--how he would like others to think of him because of the work in which he was engaged; and occupational stereotype--how he saw engineers. One sub-group of the sample was chosen because it had the highest degree of similarity in

responses to the three lists, and the other was chosen because it had the lowest degree of similarity between responses on the list pairs, self concept--occupational persona and self concept--occupational stereotype. It was hypothesized that the High Agreement Group (HAG)--those implementing a self concept--would have characteristics more like those of engineers than the Low Agreement Group (LAG)--those seeking some sort of transformation.

Each subject completed a questionnaire, the Strong Vocational Interest Blank (SVIB), and the Edwards Personal Preference Schedule (EPPS). In addition, scores on the College Qualification Test (CQT) were compiled; and grade point averages were computed for engineering courses, courses other than engineering, and for all courses combined.

While the two groups proved to be quite similar along most dimensions studied, they were found to be significantly different in the following ways:

1. Factors extrinsic to engineering were more important for the HAG than for the LAG in the decision making process.

2. A higher proportion of the HAG was definitely committed to engineering as a vocation, though the major portion of both groups indicated they fully expected to become engineers.

3. The HAG scored higher on the M-F scale of the SVIB, the LAG scored higher on the psychologist scale.

4. The HAG scored higher on the endurance scale of the EPPS, and lower on the autonomy and intraspection scales.

5. The LAG had a higher mean score on the information sub-test of the CQT, and higher mean grade point averages over all subjects and in courses other than engineering.

6. The HAG participated more in athletic and student government activities in high school, while the LAG participated more in cultural and musical activities.

From the data it seemed clear that the two groups were more similar than they were different, and that both were much like engineers. This finding did not support the basic hypothesis. However, it was apparent that the groups differed in some important ways. Subsequent comparison of the Adjective Check Lists showed that the self concept of the LAG was significantly more negative than that of the HAG, while their occupational personas were almost identical. For the HAG the three adjective lists were very similar, as noted above, but for the LAG the occupational stereotype was much more like the occupational persona than it was the self concept. This seemed to suggest that the LAG, by choosing engineering as a vocation, was moving in the direction of its interests and characteristics with a view to implementing an occupational persona--an ideal self concept, while the HAG was seeking to implement a self concept.

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by

Glenn Albert Chaffee

A THESIS

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DEDICATED TO

My wife, Rachael

My daughter, Nancy

My son, Randy

Without whose patience, love, strong support and willing sacrifice this task could never have been completed

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CHAPTER I

THE PROBLEM

The technological upheaval in our society with its profound effect upon the world of work has brought into sharp focus the necessity for providing meaningful vocational guidance for a large segment of the population. This holds for those who must be retrained in order to enter different occupational fields after having been "phased out" due to technical advances, as well as for those newly entering the world of work.

Not only must the needs of the individuals in the society be considered, but the requirements of the society itself must be taken into account. As the nature of society becomes increasingly urban and technical, as opposed to rural and agricultural, the kinds of tasks performed by its people and necessary for its subsistence also change. It is very important that those with specialized abilities be identified and given the kind of guidance that will enable them to make vocational choices of benefit to themselves and society.

The Need

It is clear that the quality of the guidance available depends upon the extent to which the dynamics of

vocational development are understood. Calia (1966) recently undertook a review of the "state of the art" of vocational counseling in response to some who indicated it should be done away with. After building a case for its necessity, Calia concluded with this plea:

> Vocational planning and development is an immensely important aspect of the life of the individual, particularly the middle-class male. More knowledge is needed, therefore, in understanding the dynamics of this process. Certainly the complexity of the current state of knowledge in the field and the needs of a large segment of the pupil population clearly indicate that the school and/or vocational counselor has a large and demanding role to play in comprehending and enhancing the vocational behavior of his clients. For the moment, however, counselors will need to rely on their own resources and intuitions in assisting their less socio-economically fortunate charges, at least until more appropriate and valid vocational concepts are generated. (1966, p. 326)

Thus the need is for additional research that will help to make sense out of what is already known while adding to the basic knowledge of the process of vocational development.

Purpose of the Study

A major contribution to vocational theory has been made by Super who focused upon the idea that vocational choice is the implementation of a self concept (1951). Stefflre, however, sees this concept as being idealized suggesting that

> In those cases when all is well in the world this explanation seems to be a suitable one. Such consummations, however devoutly desired, do not seem to occur with sufficient frequency to be a complete explanation of the selection of work roles (1966, p. 611).

The purpose of this study will be to investigate the proposition that instead of implementing a self concept, there are those who make vocational choices motivated by a desire to be seen by others differently than they see themselves.

Theoretical Background

As noted above, Super has been the chief proponent for the theory that vocational development is in fact a process by which the individual ultimately makes a vocational choice, or series of choices, in an effort to implement his self concept. In his words:

> Tracing the processes of making a vocational choice and adjusting to an occupation is, essentially, describing two processes--that of developing a picture of the kind of person one is, and that of trying to make that concept a reality. Self concepts are the product of interaction between inherited aptitudes such as manual dexterity and perceptual speed, glandular factors affecting physical energy, opportunity in the form of chances to observe and try out a given type of activity with a given kind of competition, and impressions of the extent to which the results of trying something meet with the approval of superiors and fellows.
>
> . . . . . .
>
> The choice of an occupation is one of the points in life at which a young person is called upon to state rather explicitly his concept of himself, to say definitely 'I am this or that kind of person' (1951, p. 88).

On the other hand, Galinsky and Fast, drawing upon their clinical experience, suggest that

> Many people consciously or unconsciously think of choosing a particular occupation in the hope of assuming characteristics that seem to inhere in members of that occupation. What underlies such wishes is the desire to do away with some aspects of character which do not satisfy them or make them anxious. It is as if they could then put on a magic cloak and become all that they never were (1966, p. 91).

Stefflre also recognizes this possibility, observing that some individuals make choices precisely because they do not want people to see them as they think they "really are." He suggests that through some "magical transformation" they may hope to take on the characteristics associated in the public mind with those in the chosen occupation (1966, p. 614). Such a concept is clearly in the domain of role theory.

In order to articulate this idea, Stefflre uses the terms self concept, occupational persona, and occupational role expectation, hereafter referred to as occupational stereotype. Translated into these terms, self concept, occupational persona and occupational stereotype would be highly congruent for those choosing an occupation as an implementation of a self concept. On the other hand, self concept and occupational persona, and self concept and occupational stereotype would not be congruent for those seeking transformation in the choosing of an occupation.

Building upon these concepts, the following theoretical assumptions are presented:

1. There are those who choose a vocation as a means of implementing a self concept. They may be identified by measures which show self concept (SC), occupational persona (OP), and occupational stereotype (OS) to be similar.

2. There are those who choose a vocation as a means of seeking transformation. They may be identified by measures which show SC to differ from OP and OS.

3. Predictable and measurable differences exist in the characteristics of these two groups.

Research Hypotheses

The following eight research hypotheses are suggested for the testing of the above theoretical assumptions. They are expanded and restated in operational form in Chapter III.

1. The age of first consideration and the age of final commitment to a given vocation will be different for those making the choice as an implementation of a self concept and those making the choice as a means of seeking transformation.

2. The various vocationally related reference groups will be different for those implementing a self concept by their choice as compared to those seeking transformation.

3. Factors important in the final decision to enter a vocation will be intrinsic to the vocation and task oriented for those implementing a self concept, and extrinsic and status oriented for those seeking transformation.

4. Commitment to and satisfaction with a given vocation will vary in degree between those implementing a self concept by their vocational choice and those seeking transformation.

5. Job satisfaction in the chosen vocation will depend upon different factors for those implementing a self concept and for those seeking transformation.

6. Those implementing a self concept by their vocational choice will have a more realistic idea of the role expectations than those seeking transformation.

7. On the basis of interest and personality factors, those choosing a vocation to implement a self concept will be more like those already in the occupational field than those seeking transformation.

8. With respect to ability and performance, those implementing a self concept will show more aptitude for a given vocation than will those seeking transformation.

Limitations of the Study

The theoretical assumptions presented above are clearly generalizable to all occupational fields. However, the testing of these assumptions will be limited to the population represented by a selected group of undergraduate engineering students at Michigan State University.

Any number of possible research instruments are suggested by the statement of the hypotheses. Obviously only a selected group of these may be used. Therefore it is possible that some dimension of difference will not be detected.

Finally, some implications of the theoretical assumptions depend upon longitudinal observations for confirmation or rejection. Of necessity the present study is limited to cross-sectional considerations.

Definitions of Terms Used

The following terms have meanings that need to be understood in the context of this study:

> Self concept. That which one believes to be true about himself, taking into consideration all possible characteristics and properties.
>
> Occupational persona. The characteristics one wishes others to consider him to have when they view him in terms of his occupation.
>
> Occupational role expectation. That complex of responsibilities and duties considered essential to the fulfilling of a given occupational role. Since what is expected of one determines what his characteristics must be, occupational role expectation and occupational stereotype are considered to be expressive of the same property in the understanding of the motivation of the individual for the purposes of this study.

Overview of the Report

In Chapter II literature bearing upon various aspects of the study will be reviewed. Chapter III will be devoted to the delineation of the experimental design. The results of the study will be presented in Chapter IV. Chapter V will contain a summary of the findings and a discussion of their possible causes and implications along with suggestions for further research.

With the context of the study defined, a review of the pertinent literature follows.

CHAPTER II

REVIEW OF THE LITERATURE

The review of the literature will be divided into three parts. In the first, research related to the characteristics of engineers and engineering students will be considered. Following this, studies done in investigating the relationship between self concept and vocational development will be reviewed. Finally, literature pertaining to role theory, reference groups, and occupational stereotypes will be reported.

Characteristics of Engineers

The findings of various research studies involving engineers and engineering students have been quite consistent. In this review the major studies will be reported along with the summary of the findings resulting from an intensive review of the literature extant prior to 1957 given by Super and Bachrach (1957).

Intellectual and Aptitude Factors

Harrison, Hunt, and Jackson (1955a) studied 240 mechanical engineers engaged in research and development

activities for a large manufacturing company. Compared to the general population, they found them to be of superior intelligence in both verbal and quantitative areas. They were somewhat surprised to find that the engineers showed no greater superiority on tests which are usually regarded as indicative of engineering aptitude, such as mechanical comprehension and space relations, than on tests of general intelligence.

Research reviewed by Super and Bachrach (1957) confirmed the findings of Harrison, et al. With respect to verbal ability, various investigations revealed engineering freshmen to surpass high school students in verbal ability; found tests of general and technical verbal ability to have some validity for predicting success in engineering school; and discovered that verbal and reasoning factors became more significant as engineers advanced in training, with these factors differentiating significantly between those who dropped out of engineering school and those who graduated. Other studies showed that practicing engineers did as well on verbal tests as on non-verbal, and that the verbal aptitudes of engineers were about as good as those of the business man.

A longitudinal study of those students who graduated on schedule from the Newark College of Engineering done by Reid, Johnson, Entwisle, and Angers (1962) revealed that they scored higher on the comprehension score of the Cooperative Reading Test than those who did not, and that they

scored significantly higher on the verbal score of the College Ability Test.

It is clear that a high level of quantitative intelligence is essential for the engineer and the engineering student. However, studies reported by Super and Bachrach (1957) indicated that the relationship between quantitative ability and success in engineering schools was inconsistent, while quantitative ability and success in engineering were consistently correlated. In this vein, Reid, et al (1962), found that engineering graduates who completed their work on schedule scored significantly higher than those who did not on the mathematical score of the College Entrance Examination Board Scholastic Aptitude Test, on the quantitative score of the College Ability Test, and on the Cooperative Intermediate Algebra Test.

Personality Factors and Characteristics

Harrison, Tomblen, and Jackson (1955) studied the personality characteristics of 100 mechanical engineers using projective techniques, a personality inventory, personal history form, and clinical interview. They found that (1) they were emotionally stable, made compatible marriages, maintained comfortable human relations, were free of neurotic and psychosomatic symptoms; (2) their interpersonal relations were harmonious but casual, with impersonality being one of their more common traits; (3) analytical interest in people was rare; (4) they avoided introspection and self-examination; (5) they were straight

forward, direct, self-sufficient; (6) they were matter-of-fact, and outside their own field, often unimaginative; (7) they were energetic, goal oriented, serious minded, and conscientious with an aversion to ambiguity, being essentially authoritarian in approach; (8) their social participation was normal, but more a matter of conventionality and social conformity than profound interest in people. They concluded that it is not true that engineers are usually introverts. What sometimes makes them appear so is their characteristic impersonality.

Norman and Redlo (1952) used the Minnesota Multiphasic Personality Inventory to look for differences in the personality patterns of senior and graduate students in various major fields. The engineering group was distinguished by stability of behavior, masculinity, and low overt activity. Lehmann and Ikenberry (1959) found that students enrolled in engineering programs appeared to be more stereotypic in their thinking and to have less regard for the traditional values of puritan morality, i.e., of the meaning of work and responsibility, and emphasis on the future, than the students in the liberal-arts college.

Taking a life history approach in the study of mechanical engineering freshmen at Iowa State College, Kulberg found that those in this group who possessed typical engineering interests as measured by the Strong Vocational Interest Blank and Dunnette's additional engineering scales had a history of painful and/or not completely necessary or

successful personal-social contacts and of some adjustment problems. They also had histories of long career planning, of liking to work with things and ideas as opposed to people, and of enjoying creative work while disliking routine (Kulberg, 1960).

Izzard investigated differences between engineers and engineering students and the male norm group used for the Edwards Personal Preference Schedule (EPPS). He found engineers and engineering students to differ from the norm group, having significantly higher means on Achievement, Deference, Order, Dominance, and Endurance; and significantly lower means on Affinity, Intraspection, Succorance, Abasement, Nurturance, and Heterosexuality (Izzard, 1960). A more recent study using the EPPS was done by Gray (1963). Comparing secondary teachers, exclusive of math and science majors, and mechanical engineers, he found teachers to have significantly higher means on affiliation, intraception, succorance, and nurturance. The engineers, on the other hand, scored higher on achievement, order, dominance, and endurance. These results are clearly in keeping with those of Izzard.

Beall and Bordin relied upon what had been written about engineers and biographical data taken from reports by and of engineers in their investigation, from which they concluded that

> Engineering provides an excellent outlet for the person who prefers to work with well-defined concepts and who is irritated or disturbed by open-ended or ambiguously specified terms. The engineer

> eschews the subjective and introspective modes of thought. He likes the feeling of dealing with issues in depersonalized terms. Passions and other interpersonal affects are disturbing and must give way to the systematic and the analytical. . . In this sense of being concerned with action, preparing for action, and with exerting physical power, the engineer typifies a masculine role (1964, p. 25).

Confirming the findings of others, Davis (1965) concluded from his study of college and university undergraduates that engineers are distinguished by their masculinity, disinterest in people in that they would rather work with things, their interest in opportunities to be original and creative, and their interest in money. He also noted that engineers tended to come from lower socio-economic backgrounds.

Interests and Miscellaneous Factors

Harrison, Hunt, and Jackson (1955b) in their study of mechanical engineers found that (1) they are extremely fond of sports and active outdoor pursuits; (2) their strong mechanical and technical interests tend toward immediate application rather than toward basic science and research--they are more technologists than scientists; (3) they appear to be social conformists, showing close rapport with commonly accepted beliefs and practices; (4) they are basically more interested in things than people; (5) their values are masculine, and they have few cultural or esthetic interests; (6) their scope of interests relative to their potential is quite constricted. Their recreational pattern in college included athletics, usually in the form of intramural sports, social fraternities, and engineering societies.

Moore and Levy (1951) chose at random 30 engineers who were successful in the field. They found their group to be big physically, to have had an excellent record of scholastic achievement, to be ambitious, practical thinkers who disliked working with open-ended problems. Their extra-curricular activities as students included sports, school newspapers, special interest clubs, and student governments.

In a study of the freshman class of 1959 at Case Institute of Technology, Krulee and Nadler (1960) found that science students placed a higher value on independence and on learning for its own sake, while engineering students were more concerned with success and professional preparation. Typically, engineering students expected to get more satisfactions from their families than from their careers, while the reverse was true for science students. With respect to socio-economic background, the researchers concluded that careers in engineering and science are particularly attractive to students from working-class and lower-middle-class backgrounds. In a similar study at Northwestern University, Krulee and Baker (1963) found again that engineering students came from relatively lower socio-economic backgrounds than did either business or liberal arts students.

Elton and Rose (1967) did a study in which they sought to find factors that would distinguish between students who remained in engineering and those who transferred out. After applying multi-variate analysis to the results of the Omnibus Personality Inventory, they concluded that

those remaining in engineering were significantly higher on the factor of "scholarly orientation" than those transferring to commerce and significantly lower than those transferring to arts and sciences. From this finding they infer that the engineer is of a more practical turn of mind than those transferring to arts and sciences, but is less so than those transferring to commerce. Another factor, "tolerance and autonomy," did not produce significant differences. However, they went on to make the following inferences:

> [The dimension of tolerance and autonomy] portrays (the engineering student) as: dependent upon authority and unable to rebel against the strictures of family, school, church, or state; unlikely to protest the infringements of individual rights; inflexible, intolerant, and unrealistic in his dependence upon rules, rituals, and authority for managing social relationships; immature, conventional, religious, rigid, prejudiced, and emotionally suppressed (p. 915).

These inferences seem to move quite a distance from the available data.

Discussion

The studies have been amazingly consistent in their findings. Many of the studies have utilized relatively large numbers of students and engineers, and the various populations have been very diverse in geographical location and environmental setting. Therefore, it is with some degree of confidence that one can characterize engineers and engineering students as being more concerned with things than with people; being highly motivated toward academic achievement; being ambitious; having high needs for order,

dominance, and endurance; and enjoying creative work within their field. They are inclined to be self-sufficient, conforming, and self-confident. As a group, they are above average in both verbal and quantitative intelligence. Their interests are strongly masculine and occupation oriented. They often come from lower-middle-class environments. Personal relationships are generally very smooth, but lacking in depth.

Self Concept in Vocational Development

Super has been the major theorist presenting the view that vocational choice is in reality the implementation of a self concept. The statement of the theory has been published in many places, and some work has been done in an effort to validate it. In this section some aspects of the theory will be reviewed, followed by consideration of the research that has been reported.

Theory

In Chapter I the simple essence of Super's theory was presented (Super, 1951). This was further articulated in an address to the American Psychological Association in 1953:

> The process of vocational development is essentially that of developing and implementing a self concept; it is a compromise process in which the self-concept is a product of the interaction of inherited aptitudes, neural and endocrine make-up, opportunity to play various roles, and evaluation of the extent to which the results of role playing meet with the approval of superiors and fellows.

> The process of compromise between individual and social factors, between self concept and reality, is one of role playing, whether the role is played in fantasy, in the counseling interview, or in real life activities such as school classes, clubs, part-time work, and entry jobs.
>
> . . . . . .
>
> Work satisfactions and life satisfactions depend upon the extent to which the individual finds adequate outlets for his abilities, interests, personality traits, and values; they depend upon his establishment in a type of work, a work situation, and a way of life in which he can play the kind of role which his growth and exploratory experiences have led him to consider congenial and appropriate (Super, 1953, p. 190).

In 1957 Super's Psychology of Careers was published in which he restated his original formulations and expanded the discussion of the implications. In the same year the report of a special Scientific Careers Project was published (Super and Bachrach, 1957). Of particular interest in this work was the summary statement concerning vocational development. It reflected an increasing complexity in the original theory, making the implementation of a self concept but one factor, howbeit a major one, in a broad pattern. This formulation was presented as a series of twelve propositions:

> Proposition 1. Vocational development is an ongoing, continuous, generally irreversible process.
>
> Proposition 2. Vocational development is an orderly, patterned, and predictable process.
>
> Proposition 3. Vocational development is a dynamic process.
>
> Proposition 4. Self concepts begin to form prior to adolescence, become clearer in adolescence, and are translated into occupational terms in adolescence.
>
> Proposition 5. Reality factors (the reality of personal characteristics and the reality of society) play an increasingly important part in occupational choice with increasing age, from early adolescence to adulthood.

Proposition 6. Identification with a parent or parent substitute is related to the development of adequate roles, their consistent and harmonious interrelationship, and their interpretation in terms of vocational plans and eventualities.

Proposition 7. The direction and rate of the vertical movement of an individual from one occupational level to another are related to his intelligence, parental socio-economic level, status needs, values, interests, skill in interpersonal relationships, and the supply and demand conditions in the economy.

Proposition 8. The occupational field which the individual enters is related to his interests, values, and needs, the identifications he makes with parental or substitute role models, the community resources he uses, the level and quality of his educational background, and the occupational structure, trends, and attitudes of his community.

Proposition 9. Although each occupation requires a characteristic pattern of abilities, interest, and personality traits, there are tolerances wide enough to allow some variety of individuals in each occupation and some diversity of occupations for each individual.

Proposition 10. Work satisfactions and life satisfactions depend upon the extent to which the individual can find adequate outlets for his abilities, interests, values and personality traits in his job.

Proposition 11. The degree of satisfaction the individual attains from his work is proportionate to the degree to which he has been able to implement his self concept.

Proposition 12. Work and occupation provide a focus for personality organization for most men and many women, although for some persons this focus is peripheral, incidental, or even nonexistent, and other foci such as social activities and the home are central (Super and Bachrach, 1957, pp. 119-120).

More recently Super, et al (1963), have reviewed the theory and suggested some ways of making it more operational. This work centers mostly in further refinement of self concept as a concept and the various meaningful ways it might

be measured to give it more specific occupational significance. Even though the realities of vocational development as observed in individuals has forced a broadening and complicating of the theory, Super's position basically remains unchanged--vocational development is in its essence the implementing of a self concept.

Research

Four studies have been reported in which the relationship between self concept and vocational choice have been investigated for groups of nurses. In the first of these, Brophy (1959), using an adjective check list, looked at job satisfaction as a function of the relationship between self concept, ideal self concept, and the kind of person the nurses perceived the job as requiring them to be. He found that the discrepancy between self concept and the imposed occupational role, and self concept and ideal self were negatively related to job satisfaction. In this study the most critical job satisfaction factor was the relationship between self concept and ideal self.

Morrison (1962) used a Q-sort technique to study the relationships between self concept and occupational role descriptions for groups of nurses and teachers in training. He had each individual respond to the questions, how do you see yourself? How do you describe nurses? How do you describe teachers? He found that the self and "own" occupation sorts were significantly more similar than the self and "other" occupation sorts.

Kibrick (1963) studied the relationship between the student nurse's self concept and her conception of the nurse's role attributes with respect to remaining in or dropping out of the training program. She also compared self concept with role attributes expressed by the nurses' superordinates. Her sample consisted of 460 student nurses in seven different hospitals. The instrument used was developed for the study and was based upon Murray's needs. The results did not indicate any relationship between the variables that could be used to predict perseveration in or dropping out of the program.

Pallone and Hosinski (1967) used the Q-sort technique with Hanlon's Q-cards to study the relationships between self concept, ideal self, and occupational role percept for 168 student nurses, 24 each at seven levels of vocational experience and preparation. They found that congruence between ideal self and occupational role perception was more important to persistence in the profession and satisfaction with it, as measured by the length of time in the training program, than was self-ideal congruence. While all factors were highly correlated, correlations between ideal self and occupational role percepts were markedly higher. From this the investigators observed:

> Perhaps vocational choice, for the subjects in this study, may be regarded as a point in life at which the person states definitely both 'This is the kind of person I would like to be (or become)' and 'As I perceive my contemplated or implemented occupational role, it will allow me to be (or become) that kind of person.' Hence, it is suggested that, among the student nurses investigated,

> vocational choice represents a process of selecting an occupational role perceived as providing opportunities for actualizing the ideal self more than a process of accommodating the self as perceived in the here-and-now with the parameters of a given occupational role. Much of the process of vocational thinking in self-concept terms appears to be future-oriented rather than present oriented (Pallone and Hosinski, 1967, p. 670).

In other studies, Englander (1960) used a Q-sort technique in finding that college freshmen women elementary education majors had significantly greater self concept and elementary teacher personal characteristics agreements than did either other education majors or non-education majors. Warren (1961) did a rather complicated study with male National Merit Scholars in which he attempted to predict changes of major on the basis of a derived self-occupational role discrepancy score. The data seemed to indicate that the greater the discrepancy the greater the likelihood of a major change and the greater the change would be. This research was carried out during the spring terms of the freshman and sophomore years of these students. The methodology employed was rather vague so that the so-called discrepancy score is open to question. Super (1963) also notes that the personality inventory used by Warren forces the individual to declare his self concept on the basis of a structure imposed by the instrument that severely limits freedom of response, thus giving a biased measure and one to be questioned in terms of the theory.

In a study involving 12th grade boys, Blocher and Schutz (1961), used a 180 item Descriptive Check List,

developed for the study, which was responded to in four ways: self concept, ideal self, description of a member of the most interesting occupation on Strong's list of 45, description of a member of the least interesting occupation on the same list. They found that the subjects perceived both their self concepts and their ideal self concepts to be significantly more similar to their stereotypes of workers in occupations with high claimed interests than to their stereotypes of workers in occupations with low claimed interest.

Stephenson (1961) did a study of pre-medical students at the University of Minnesota in which he hypothesized that since this program required a high level of commitment, if the occupational self concept of the pre-medical student had crystallized prior to his request for entry into medical school, he would persist and ultimately pursue a vocation directly related to the medical field in spite of obstacles, such as rejection of his application to medical school. Out of 770 subjects, two-thirds were eventually admitted to a medical school and 80% of the total number were found ultimately in medical or related professions. Stephenson interpreted this finding to mean that the self concept of the pre-medical student had crystallized prior to his making application to a school of medicine.

However, Kehas (1962) took exception to Stephenson's conclusions. He raised the question as to where self concept entered into the study, and noted that there was no

attempt to measure occupational choice and self concept independently and then relate them. The conclusion was purely inferential from a theoretical bias. Kehas also suggested that:

> One might . . . ask if the notion of crystallization with reference to an occupation or an occupational choice is identical with crystallization with respect to self concept (p. 91).

Discussion

Englander noted that there had been little or no effort prior to that time (1960) to test the self concept theory of vocational development directly. This seems still to be the case, in spite of the fact that sixteen years have elapsed since Super's original statement (1951). In addition, none of the studies reported here bore any marked operational resemblance to each other. All used different instruments to gain the information needed, and then treated it uniquely.

The study reported by Pallone and Hosinski (1967) suggested another facet of the problem. They called attention to the fact that their student nurses did not seem to be implementing a self concept, but an ideal self concept. It is entirely possible that focus upon the one aspect of the vocational meaning of the self concept has obscured other important possibilities as to how self concept and occupational choice might be related. Kehas summed it up nicely:

> Despite its heuristic appeal, the Super proposition is complex and ambiguous. It does not readily lend itself to translation into operational terms. It is not denied that a person's choice of an occupation is related to his self concept. The unanswered and uninvestigated question concerns the nature of that relationship (1962, p. 91).

Role Theory, Reference Groups, and Occupational Stereotypes

These three concepts are being considered together because of their close relationship. The literature reviewed is limited to that directly pertinent to this study, though it is recognized that the concepts themselves, particularly role theory and reference groups, have far broader societal implications.

Role Theory

Neiman and Hughes (1951) surveyed the literature on role theory dating from 1900 to 1950. From this they were able to distill three categories of role definition. The first of these concerned role in terms of the dynamics of personality development. In this framework, role is the basic factor in the process of socialization, for taking on the role of others enables the self to grow and develop. Personality becomes "the sum and organization of all the roles one plays in all the groups to which one belongs (Neiman and Hughes, 1951, p. 142)." On a broader base, still considering personality development, role can be construed as a cultural pattern. The members of each society

perpetuate the culture by training each succeeding generation to its behavior patterns (roles) and values.

The second category included definitions in terms of society as a whole. In this connection, role is a social norm, status connections being implicit rather than explicit. Role may also be considered in this light as a synonym for behavior.

Finally, Neiman and Hughes found role definitions in terms of specific groups. In this context role becomes definitive as an activated status and a status-role continuity is observed. A role, then, represents the dynamic aspect of a status. There are no roles without statuses or statuses without roles. Put into group terms, role may be defined as participation in a specific group, such as the playing of a part in a social situation.

In a more specific vein, Turner offers this definition:

> By role we mean a collection of patterns of behavior which are thought to constitute a meaningful unit and deemed appropriate to a person occupying a particular status in society (e.g., doctor or father), occupying an informally defined position in interpersonal relations (e.g., leader or compromiser), or identified with a particular value in society (e.g., honest man or patriot) (1956, p. 316).

Bentley (1965) focused upon two aspects of role: Perception and expectation. Role expectations are the actions anticipated by others pertaining to the occupants of certain positions in the social structure. Role perceptions, on the other hand, are what the individual understands as being expected of him. Bentley notes that "Role perceptions,

as in the case of role expectations, are bicameral: certain rights or privileges are perceived by the individual as pertaining to his position, as well as certain obligations or duties (1965, p. 15)."

Feffer points to a conceptual problem for role theorists:

> Current role theory has the Janus-faced characteristic of pointing in one direction toward the internal organization of the individual and externally toward the social environment in which the individual participates. Oriented toward internal organization are such constructs as the 'self' and formal concepts which pertain to cognitive organization, e.g., differentiation and flexibility. The notion of 'role' has a more clear cut external reference, referring to an individual's organized pattern of social actions to which other individuals respond. Conceptually intermediate are such terms as role expectations and role taking which refer to the individual's cognitive structuring of the social actions of others. These definitions reflect a major problem with which role theorists are concerned, vis., the forging of a series of conceptual links between constructs pertaining to general internal organization, constructs pertaining to the internal organization of social content, and concepts which serve to order the 'external' social environment (1959, pp. 164-165).

As if in response to Feffer, Knoff takes a step in the direction of reconciling role theory and self concept:

> The system of social relationships in which a person is involved is not only of situational significance but through 'internalization' (or, better, learning) becomes constitutive of the personality itself. . . It seems logical to assume that roles available in a culture are similarly internalized (or learned), becoming a part of the ego: the sense of 'I', or 'who I am and how I act' (1961, p. 1013).

Super's idea of the way in which the self concept becomes implemented by the vocational choice may be viewed against this background of role theory and definition. He observes that "In fantasy, in school classes and activities,

in part time jobs, in regular employment, the individual tries himself out in various roles." He goes on to explain the process this way:

> In role playing, it seems, the individual has an opportunity to examine himself in the light of situational (i.e., occupational) information, to test his self concept and identifications against reality. He can, either in fantasy, in the semi-reality of a school club, or in the reality of the job, try out his abilities and his interests, test ways of meeting needs and achieving values, and evaluate the results of this reality testing as revealed in grades, in peer reactions, in supervisors' evaluations, etc. (1956, pp. 252-253).

On the face of it, Super has apparently overlooked the aspect of role playing pointed out by Knoff. Roles not only may be tried to see if they fit, they may be assumed as part of a change process. Rosenberg put it succinctly:

> Thus the individual who makes an occupational choice also commits himself to a certain pattern of thought and behavior for years to come. In many cases, if the role is sufficiently internalized, it may influence his entire personality structure (1957, pp. 2-3).

Reference Groups

The domain of reference group theory was sharply defined by Merton:

> That men act in a social frame of reference yielded by the groups of which they are a part is a notion undoubtedly ancient and probably sound. Were this alone the concern of reference group theory, it would merely be a new term for an old focus in sociology, which has always been centered on the group determination of behavior. There is, however, the further fact that men frequently orient themselves to groups other than their own in shaping their behavior and evaluations, and it is the problems centered about this fact of orientation to non-membership groups that constitute the distinctive concern of reference group theory (1957, p. 234).

Hyman, who was father of the concept, expressed it this way:

> The reference group idea reminds us that individuals may orient themselves to groups other than their own, not merely to their membership groups, and thereby explains why the attitudes and behavior of individuals may deviate from what would be predicted on the basis of their group membership (1960, p. 390).

Kelley (1965) identified two separate parts which reference groups play in the determination of individual attitudes. In the first place, the reference group could be one to which the individual aspires to belong or with which he identifies. On the other hand, the reference group may be one used by the individual as a reference point in making evaluations of himself and others. In this sense it could function either positively or negatively. This was well illustrated in one of the classical reference group studies done by Newcomb at Bennington College in which he sampled the attitudes toward public affairs of the entire student body of the school between the years 1935-1939. He found that while all were part of the same membership group--the student body--attitudes and opinions were held with respect to one or more reference groups. For some the membership group provided the reference--positively when the dominant membership group attitudes were assumed because they were dominant, and negatively when they were shunned because they were dominant. For others parents provided the positive or negative reference group. Newcomb observed:

> In this community, as presumably in most others, all individuals belong to the total membership group, but such membership is not necessarily a point of reference for every form of social adaptation, e.g., for acquiring attitudes toward public issues. Such attitudes, however, are not acquired in a social vacuum. Their acquisition is a function of relating oneself to some group or groups, positively or negatively. In many cases (perhaps in all) the referring of social attitudes to one group negatively leads to referring them to another group positively, or vice versa, so that the attitudes are dually reinforced (1965, p. 224).

On another front, Turner has sought to tie role theory and reference group theory together. Looking carefully at both concepts, he concludes:

> When a reference group is the source of values and perspectives, the identity of meaning with role-taking is apparent. One takes the role of a member of the group, which is synonymous with having a 'psychologically functioning membership' in the group, and one adopts the group's standpoint as one's own. Thus, except for emphasizing that the source of values need not be a group of which the individual is objectively a member, this use of reference group corresponds to one traditional usage of role taking (1956, p. 327).

Sherif and Sherif (1964) studied teen age behavior with particular emphasis upon the nature and effects of reference groups in the teen sub-culture. In pulling together some of the general findings of the study, they included a statement indicating the immense importance of reference groups to a feeling of self-identity (It should be noted that for the purposes of their study, they limited the definition of reference groups to the group with which the individual identifies or aspires to belong):

> One of the strongest promptings of human beings is to establish stable, secure social ties with others. . . [in order] to have a dependable anchor

> for a consistent and patterned self-picture, which is essential for personal consistency in experience and behavior, and particularly for a day-to-day continuity of the person's self-identity. Some stability of social ties is a prerequisite condition for the individual to experience himself as the 'same person' from day to day, with his characteristic attributes and moorings. There is very considerable evidence that lacking such ties, the individual has great difficulty in establishing a clear self-identity, and that, once developed, the absence of such ties promotes experiences of estrangement and uncertainty, accompanied by erratic and inconsistent behaviors (p. 270).

In other research studies bearing upon the operation of reference groups, Siegel and Siegel (1965) found that when divergent membership groups, represented by housing arrangements, were randomly imposed upon women students, attitude changes over time were a function of the normative attitudes of both imposed membership groups and the individuals' reference groups. The greatest attitude change occurred in subjects who came to take the imposed, initially nonpreferred, membership group as their reference group.

Hammond (1959) found that students who survived a five year engineering course at the Ohio State University tended across those years to shift their attitudes in the direction of the attitudes of the college faculty, which clearly had become for them a reference group.

Hartley (1960a, 1960b) investigated reference group phenomena as related to needs among male freshman students at a municipal junior college. She found that groups perceived as being able to meet the personal needs of individuals were most likely to be accepted as reference groups. She also found that perceptions of relatively large differences

in norms between established groups and new groups were associated with relatively less acceptance of the new groups as reference groups. Preference for the norms of the new group, however, was associated with acceptance of it as a reference group.

Bringing reference group behavior into the realm of vocational development, Hadley and Levy (1962) fit Super's theory into a reference group framework. They point out that "from the inception of the vocational development process, the family constitutes a highly significant reference group." It exerts strong influence on the emergent self concept and the world of work, and serves as a standard of comparison in the evaluating of the self in performance of certain work related tasks. In adolescence the family continues to be a reference group, but other groups become prominent, notably the peer group. In addition, as occupational information increases, more and more occupational groups become available as possible reference groups, some positive and some negative. The reference material comes to include not only the kinds of work activities associated with various occupations, but also the characteristics of the people who are in these occupations. Eventually, advancement in one's career is governed by the acceptance, or lack of it, of the norms of various reference groups. Likewise, reference groups are important in the establishment and maintenance phases of vocational development. "Hence the theory of vocational development is concerned

with reference group processes in work-relevant behavior domains (1962, p. 114)."

Finally, one more aspect of reference group theory which has a direct bearing upon vocational development, anticipatory socialization. This is Merton's term, and he describes its function as being

> . . . the acquisition of values and orientations found in statuses and groups in which one is not yet engaged but which one is likely to enter. It serves to prepare the individual for future statuses in his status-sequence. An explicit, deliberate, and often formal part of this process is of course what is meant by education and training. But much of such preparation is implicit, unwitting, and informal, and it is particularly to this that the notion of anticipatory socialization directs our attention (1957, p. 384-385).

Rosenberg suggests that this phenomenon begins to operate in the student while still in preparation for his occupational role:

> The image of his future occupational status is likely to influence the student's present attitudes, values, and behavior; he may start to think and behave in a way which he believes will be appropriate when he actually enters occupational practice (1957, p. 24).

Occupational Stereotypes

A stereotype can be considered as a set of fixed ideas which when taken altogether express a preconceived notion as to the properties or characteristics of an individual fulfilling a given role. Thus, the word "mother" calls forth a stereotype, as does the phrase "professional football player," or "nurse." In general terms, an

occupational stereotype would contain a set of fixed ideas associated with an occupational role.

Bordin (1943) pointed out that when an individual answers a Strong Vocational Interest Blank he is in effect expressing his acceptance of a particular view or concept of himself in terms of occupational stereotypes. As additional evidence of the existence of such stereotypes, Bordin refers to the research that has shown that the SVIB can be faked to show interest patterns characteristic of a given occupational group.

Beardslee and O'Dowd (1960) listed five different evidences of the existence of occupational stereotypes. The first was an experiment in which individuals were to match occupations with photographs. This they were able to do far more accurately than dictated by chance. Another evidence to which they referred was the uniformity with which groups rank occupations with respect to prestige value. Listing also the "fakability" of interest tests, they go on to mention that Holland's Vocational Preference Inventory, in which individuals are asked to choose occupations in which they might be interested, the choices then being analyzed to give information concerning vocational development, works because of the existence of stereotypes in the minds of those who take the inventory as well as in the minds of those who created it. Finally, Beardslee and O'Dowd mention studies that have been successful in finding support for the existence of widely shared occupational images.

After Katz and Braly (1933) found evidence that racial stereotypes exist in college students, Walker (1958) used a similar method to discover the occupational stereotypes of 124 university students. He asked each student to choose five adjectives from a list of 112 to describe a typical worker in each of ten occupations. His findings indicated that occupational stereotypes were just as valid as Katz and Braly's ethnic stereotypes.

Dipboye and Anderson (1961) made the assumption that one aspect of occupational perceptions, occupational stereotypes, which an individual may have can be expressed in terms of the potential of the occupation to satisfy needs. In their study they defined occupational stereotype as the pattern of manifest needs which is exhibited in the presumed behavior of a typical person engaged in a given occupation. They constructed an instrument which listed 70 phrases, five for each of fourteen needs as described by Edwards (1958). The heterosexual need was not included. 448 high school seniors, 193 boys and 255 girls, were asked to check the phrases that best described typical people who were high school teachers, scientists, elementary school teachers, and school principals. In addition, girls checked lists for nurse and social worker and boys for engineer and physician. In every case, very clear stereotypes were evident. Of particular interest to this study is the stereotype for the engineer. According to the responses of the boys, the highest manifest needs of engineers are for

achievement, endurance, and order. The lowest needs were for succorance, intraception, aggression, exhibition, and affiliation. Clearly this agrees with the information presented above.

Beardslee and O'Dowd (1962) found another aspect to occupational stereotypes among students at Wesleyan University. In interviews the students talked freely about occupations. Interestingly, however,

> the students chose to talk primarily about the aspects of these occupations that may best be called their implications for a style of life. They commented spontaneously on how a lawyer, doctor, or engineer and his family live rather than on the character of his work. They described easily and naturally the community status associated with different occupational roles, the possessions and activities that follow from these roles; the personality and the quality of family relationships implied by each of several different jobs were regularly mentioned. In general, occupations were primarily seen as leading to different ways of life that varied considerably in attractiveness (pp. 598-599).

In another study done with random samples of senior and freshman classes at Wesleyan University, a highly selective men's liberal arts college, a highly selective women's liberal arts college, and a state university college of arts and sciences, the subjects were asked to describe typical people in each of fifteen occupations by means of a semantic differential over 34 descriptive words or phrases. Beardslee and O'Dowd (1962) reported high correlations on the stereotypes among all groups for all fifteen occupations.

Charters (1963) criticizes studies of stereotypes, particularly those related to stereotypes of teachers. In the first place he suggests that studies using adjective

check lists do not give concrete representations of any one group held by any one individual since the stereotypes are arrived at by the statistical combination of discreet, abbreviated responses. He goes on to say that

> theoretical discussions presume that the stereotype held by an individual actively enters into and governs the interaction between him and members of the category. No measures of stereotype certify this. Indeed, the usual research methods force subjects to respond in stereotyped terms even though their manifest behavior in interaction with others may not in the least be governed by stereotypes (p. 759).

Finally, he points out that the conceptual definitions of stereotype specify that the image must be widely shared. In spite of this, attempts to validate stereotypes on this basis are rare, and, at best, oblique.

Discussion

In assessing the concepts of role theory, reference groups and occupational stereotypes, it is clear that all have a place in contributing to the understanding of vocational development. Super's concept of role playing as the means by which the individual comes to the occupational implementation of a self concept as well as Hadley and Levy's translation of Super's theory into reference group terms make a great deal of sense. However, in both instances the power of the role and of the reference group, through the roles assumed, to change the self concept has been overlooked. Therefore, the possibility that a role could be assumed for the purpose of transforming the self has been neglected.

Summary

The findings reported in the literature concerning the various characteristics of engineers and engineering students have been quite consistent over time. Engineers as a group tend to be more concerned with things than people, with a high motivation for academic achievement. They like things to be orderly, and this includes an effort to approach problem solving in their personal lives in a very precise, direct manner. They enjoy creative work directly related to their interests. They are inclined to be self-sufficient, conforming, and self-confident. As a group, they are above average in both verbal and quantitative intelligence. Their interests are strongly masculine. They tend to come from the lower socio-economic strata. Their interpersonal relationships are relatively smooth, but they are not characterized by any great depth.

With respect to Super's theory of vocational development as the implementing of a self concept, relatively few studies have been reported bearing directly upon the basic concept. Those that have been tend to show some evidence that vocational choice is related in some way to the implementing of the self concept, but all of the studies have used different instruments to measure self concept and have attempted to relate it to vocational choice in different ways. A significant finding by Pallone and Hosinski, with regard to the present study, was that the group of nurses in their experimental sample seemed to be implementing an

ideal self concept by their vocational choice rather than a self concept. It is clear from the literature that much more work needs to be done in operationalizing the theory and in expanding its framework.

Role theory and reference group theory clearly have a place in any effort to clarify the process of vocational development. One way in which they fit in is through their relationship to occupational stereotypes. As the literature definitely indicates, the occupational stereotypes held by individuals become in effect reference groups which are used to test the suitability of a contemplated occupational choice, or, on the other hand, to prepare the individual in advance for the occupational role which he expects to fill. Super's view of role playing as a means of trying out the self concept in occupational terms is very plausible. However, since role playing has been found useful in bringing about changes in personality, the possibility of assuming an occupational role for the purpose of being changed should not be overlooked.

In Chapter three the over-all design of the study will be presented and the information gathered through this review of the literature will be used in further specifying the research hypotheses.

CHAPTER III

THE EXPERIMENTAL DESIGN

In this chapter the experimental sample is described, as are the various instruments used in the choosing of the sample and the subsequent gathering of the necessary information. In addition, the research hypotheses are restated in testable form, and the methods to be used in the analysis of the data are presented.

The Sample

The nature of the theoretical assumptions being tested required a sample characterized by a reasonably high degree of commitment to a vocation; and, since so little is known about the dynamics of vocational choice for women, a group of men was considered necessary. Accordingly, the Office of Student Affairs of the College of Engineering was contacted, the project described, and permission received to conduct the study using engineering students, who clearly meet both criteria.

The Sample Population

In order to minimize the difficulty of contacting a

potential sample population, the Office of Student Affairs was asked to suggest classes containing just engineering students, preferably on the sophomore level. The latter condition was placed upon the sample because, on the one hand, a reasonable degree of commitment was desired; and on the other, younger students were assumed to be less homogeneous in many characteristics that were important to the study. As a result, two courses required of students in metallurgical, civil, mechanical, and agricultural engineering; and two courses required of students in chemical engineering were suggested as possible sources for a sample population. All four courses are typically taken by sophomores, and they are the first engineering courses offered in the college.

The two instructors having responsibility for the chemical engineering courses, ChE 202 and 203, were contacted and they agreed to allow their classes to participate in the study. The other two courses, MMM 205 and 206, are offered in the Metallurgy, Mechanics, and Materials Science Department. The Department Chairman was approached and he readily agreed to ask the instructors involved to let their classes be part of the investigation. All seven of the men made their sections of the courses available. This provided a sample population of approximately 240 undergraduate engineering students, most of whom were sophomores, but which included some juniors and seniors.

The Independent Variable

The nature of the independent variable necessarily determined the criteria for the choosing of the experimental sample from the sample population. A theoretical assumption upon which the study was to be based was that in such a sample population there would be those whose self concepts, occupational personas, and occupational stereotypes would be much alike; and there would be those whose self concepts would be quite different from their occupational personas and occupational stereotypes. It is clear that the entire study depended upon whether or not this were true, for the degree of agreement between self concepts, occupational personas, and occupational stereotypes was in fact the independent variable in the study. Consequently, when the experimental sample was determined, as outlined below, the group having the greatest agreements was differentiated from the group having the least agreements arbitrarily on the basis of the data provided by the instrument used. This became the objective criterion for the variation in the independent variable.

The Experimental Sample

The instrument chosen to differentiate the group having the highest level of agreement between self concepts, occupational personas, and occupational stereotypes from the group having the lowest level of agreement was the Gough Adjective Check List (ACL). The rationale for its

choice and its psychometric properties are discussed below.

The ACL consists of 300 descriptive words. Each student was asked to respond to the list three times in accordance with the following instructions:

1. Each one of us has some idea as to what he is like. If you think a descriptive word is very much like you, circle 3; if somewhat like you, circle 2; if very little like you, circle 1; if not at all like you, circle 0. Be sure you respond to every word. Work as carefully and as rapidly as you can. (Self concept)

2. Each of us would like others to think of us in certain ways when they view us as workers in our various occupations. If a descriptive word is very much like you want to be thought of by others because of your work, circle 3; if somewhat like you want to be thought of, circle 2; if very little like you want to be thought of, circle 1; if not at all like you want to be thought of, circle 0. Be sure you respond to every word. Work as carefully and as rapidly as you can. (Occupational persona)

3. Undoubtedly you have some ideas about what an engineer practicing his profession is like. Circle 3 for those descriptive words very much like your idea of an engineer; circle 2 for those somewhat like your idea of an engineer; circle 1 for those very little like your idea of an engineer; and circle 0 for those not at all like your idea of an engineer. Be sure you respond to every word. Work as carefully and as rapidly as you can. (Occupational stereotype)

These three statements became the operational definitions for self concept, occupational persona, and occupational stereotype, respectively, for this study. The three lists of descriptive words were arranged in random order in booklets with a cover sheet having general instructions and blanks to be filled in with information necessary for describing the sample, and the locating of the individual in the event he was chosen to be part of the experimental sample.

(The booklet as used is in Appendix A.) The booklets were appropriately coded for data processing and taken to each of the ten sections of the four courses.

In each of the classes a brief explanation of the project was given, and the booklets were handed out. The students were requested to return the booklets to the instructor the following week. Only one visit was made to each class, with a total of 229 of the booklets being handed out. Of the 229 distributed, 129 of the booklets were ultimately collected and the responses compiled.

Since the options "very much," "somewhat," "very little," and "not at all" were not considered to represent equal intervals on a continuum; and since a pilot study, described below, indicated that responses were approximately divided equally between "very much--somewhat" and "very little--not at all," the data were dichotomized on this basis prior to processing. The data were then analyzed to yield three measures of similarity in the way the lists were marked by each individual: a multiple correlation coefficient with occupational persona and occupational stereotype being related to self concept, correlation coefficients between each pair of the lists, and a count of the number of adjectives marked similarly for each pair of the lists. Inspection of the data thus produced showed that the best indicator of the properties desired was the number of adjectives marked similarly for each pair of the lists. By using this criterion it was possible to select those whose

self concept, occupational persona, and occupational stereotype were most similar as well as those whose self concepts were least similar to their occupational personas and occupational stereotypes, while being able to insure that these latter differences were of approximately the same order of magnitude. Appendix B contains a list of the number of agreements for each pair of the lists for each subject.

As a result of this selection process, two groups of forty students each having the most extreme characteristics on the basis of the criterion out of the sample population of 129 became the experimental sample. The next step was to arrange the necessary research instruments in packets with cover letters included which explained the procedure for the remainder of the study. The packets and each of the instruments--a questionnaire, the Edwards Personal Preference Schedule, and the Strong Vocational Interest Blank--were coded for group identification purposes. These were handed out to each of the subjects by the instructors. Again the deadline for returning the completed materials was given as the following week. (The cover letter as well as the letter of explanation given to each of the instructors are displayed in Appendix C.) Seventy-seven of the eighty distributed packets were returned. Of this number, thirty-six from each group contained usable materials.

The group of thirty-six having the highest number of agreements between lists ranged in age from 18 to 25 with a mean of 20.58 years. It consisted of 21 sophomores, 13

juniors, and 2 seniors. Of these, 7 were chemical engineering students, 19 were mechanical engineering students, 7 were civil engineering students, and 3 were metallurgical engineering students.

The group of thirty-six having the lowest number of agreements between lists ranged in age from 19 to 21 with a mean of 19.61 years. It consisted of 29 sophomores and 7 juniors. Of these, 9 were in chemical engineering, 15 were in mechanical engineering, 7 were in civil engineering, 3 were in metallurgical engineering, and 2 were in agricultural engineering.

The number of self concept--occupational persona agreements for the "high" group ranged from 251 to 300 with an average of 266. For the "low" group agreements ranged from 147 to 236, and averaging 206. The number of self concept--occupational stereotype agreements for the "high" group ranged from 248 to 298 with an average of 265. For the "low" group agreements ranged from 152 to 234, and averaging 202. The number of occupational persona--occupational stereotype agreements ranged from 250 to 294 for the "high" group, with an average of 269; and ranged from 174 to 277 for the "low" group, with an average of 237.

The Instrumentation

The instrumentation for the study consisted of the Gough Adjective Check List, the Strong Vocational Interest Blank, 1966 revision, the Edwards Personal Preference

Schedule, and a questionnaire. In addition, data were collected from the previous administering of the College Qualification Test, and various Grade Point Averages were computed from the available student records.

The Adjective Check List

Of crucial importance to the study was the separating of the sample population into sub-groups comprising the experimental sample. The need was for a reasonably reliable instrument, simply administered, that would provide opportunity to express a broad range of personality characteristics. The Gough Adjective Check List (ACL) developed at the Institute for Personality Assessment Research at the University of California, Berkeley, seemed to meet these requirements. It has had widespread use for similar purposes.

With respect to the reliability of the instrument, Gough (1960) reports a test-retest median phi coefficient for 100 subjects of .57. When the ACL was used as a personality assessment instrument for the evaluation of subjects by others, the inter-observer phi coefficient was .60. This reliability estimate was felt to be within the allowable range for use in the study.

There was some concern about the length of the ACL and the amount of time involved in completing it three different times, especially since it seemed advisable to allow a broader range of choice than just checking those adjectives which applied. Accordingly, a pilot study was done using as

subjects ten individuals of approximately the age and background of the expected experimental sample. Three of the ten were asked to complete the ACL three times as noted in the instructions given above, choosing for each adjective from among the possibilities of "very much like," "somewhat like," "very little like," and "not at all like." The other seven were asked to choose between "like" and "not like" for the same three lists. It took approximately one hour for those choosing between four alternatives to complete the task, and about half that long for those considering but two alternatives. However, those who chose between "like" and "not like" expressed dissatisfaction with being forced to choose on that basis. They indicated that they would have much preferred additional alternatives. Since this seemed to be an important factor, and since one hour seemed like a realistic investment of time, it was decided that the final form of the ACL would include the instructions as formulated with the subjects being asked to choose between the four alternatives for each descriptive word.

An additional bit of interesting information was gleaned from the pilot study. All ten of the subjects said that the interpretation they used as a guide for the conceptualization of the occupational persona was the ideal self. That is, when asked to describe how they wanted others to think of them as workers in their occupations, they thought in terms of how they would like to be, ideally.

Strong Vocational Interest Blank

Important to the testing of the theory was a comparison of the interest profiles of the two sub-groups of the experimental sample. The most meaningful comparison was considered to be along vocational lines. Therefore, the Strong Vocational Interest Blank (SVIB) was decided upon as the instrument to be used in making this comparison. The scored profile indicates the extent of similarity between the subject's interest pattern and the interest patterns of people successful in 54 different occupational classifications. It was decided that the architect, mathematician, physicist, chemist, engineer, psychiatrist, psychologist, rehabilitation counselor, social worker occupational scales; and the masculinity-femininity scale would be used in the analysis.

The SVIB has been extensively analyzed in terms of reliability and validity. Test-retest reliability for intervals ranging from two weeks to thirty years have been computed. These range from coefficients of .91 for the two week period to .56 for the thirty year delay. Concurrent and predictive validity have been investigated and found to be substantial. These data are extensive and may be found in Strong and Campbell (1966).

Edwards Personal Preference Schedule

Personality factors were also important to the study. The Edwards Personal Preference Schedule (EPPS) was chosen

as the research instrument to gather this information since it is easily administered and has been used extensively in similar investigations. The EPPS produces scores indicating a personality need pattern. It consists of fifteen scales, each one representing a basic human need. These are achievement, deference, order, exhibition, autonomy, affinity, intraspection, succorance, dominance, abasement, nurturance, change, endurance, heterosexuality, and aggression.

Test-retest reliabilities for each of the scales with a one week interval vary from .74 to .88, as reported by Edwards (1959). Corrected internal consistency coefficients for each of the scales vary from .60 to .87. With respect to validity, Edwards reports various correlations with the Taylor Manifest Anxiety Scale and the Guilford-Martin Personnel Inventory. These tend to be low, with but 19 out of a possible 60 being significant. Other efforts to validate the EPPS have produced equivocal results. However, since the EPPS has been used with some degree of consistency in results for similar populations, it was included in this study.

The Questionnaire

Additional information was needed which could only be gathered by means of a questionnaire developed for the study. It was considered important to structure the instrument so that the response mode was always of the multiple choice variety. This procedure was followed throughout, with the exception of four questions for which it was felt some important response possibilities might have been

overlooked. In these four instances "other" was given as a possible response with a blank provided and the instruction to "specify." Through the questionnaire six areas pertinent to the study were explored. A copy of the questionnaire as used in the investigation is contained in Appendix D.

Biographical Data Of interest were the age at which engineering was first considered as a career possibility, the age at which the final decision was made to enter an engineering school, the present age, and the father's present occupation. Direct questions were used to ascertain this information.

Reference Group and Interest Data The subject was asked to specify certain characteristics of his reference groups by identifying an engineer if there was one whom he observed, and who became an influence upon him to enter engineering; to rank in order of importance the three greatest influences at work in moving him toward engineering; and to rank in order of importance the three sources from which he developed his ideas concerning the kind of work an engineer does.

As a means of tapping a specific segment of the subject's interests, a question was included which asked the high school and university extra-curricular activities in which he participated.

Intrinsic and Extrinsic Job Factors This aspect of career choice was explored through asking for responses to statements that were patterned after those devised by

Rosenberg (1957) in his study of occupations and values. Changes were made to make the statements relate directly to engineering, and additional statements were added to round out the intrinsic--extrinsic dimension. The result was sixteen statements. Four judges were used to determine the appropriate classification of each statement. Seven were judged to be extrinsic factors, and 6 were judged to be intrinsic factors by at least three out of the four judges. On three of the statements the judges tied, and these factors were left out of the analysis. Those statements included in the intrinsic category were: (1) Engineering provides an opportunity to use my special abilities or aptitudes; (2) Engineering enables me to work with things rather than people; (3) Being an engineer allows me to be a man among men in a traditionally masculine vocation; (4) Engineering gives me a chance to identify interesting problems and to work out solutions to them; (5) Engineering provides opportunity to work with and understand complicated machinery and/or processes; (6) As an engineer I will have opportunity to use mathematical procedures in arriving at the solutions to various problems. Those included in the extrinsic category were: (1) Engineering provides an opportunity to earn a good deal of money; (2) Engineering permits me to be creative and original; (3) As a profession, engineering gives social status and prestige; (4) As a successful engineer I could look forward to a stable, secure future; (5) As an engineer I will have opportunity

to be helpful to others; (6) By becoming an engineer I can repay my parents for all they have done for me; (7) The engineering profession will enable me to enjoy a higher standard of living than my parents were able to enjoy. The three in the "tie" category, and which were left out of the analysis, were: (1) As an engineer I could be relatively free of supervision by others; (2) Engineering provides an opportunity to exercise leadership; (3) Engineering offers adventure.

The stimulus to which the subject was asked to respond was:

> Certain factors entered into your final choice prior to entering the field of engineering as a student. Indicate the extent to which the following factors were important in your decision.

The response possibilities were: "very great importance," "great importance," "moderate importance," and "little importance."

Satisfaction and Commitment Two questions comprised this section. The first required an indication of the extent to which the subject was satisfied with the course of study as he had experienced it, and the second an indication of the extent to which he felt committed to engineering as a vocation.

"Job" Satisfaction Some measure was desired of the kinds of factors that the subjects considered of importance in anticipated job satisfaction. Researches on the subject reported by Brayfield and Rothe (1951), Brayfield and Crockett (1955), Friedlander (1963), and reviewed by

Robinson, et al (1966) were all directly related to circumstances of workers presently engaged in occupational activities.

However, a study done by Blai (1964) in an attempt to relate human needs and job satisfaction suggested a way in which the kinds of satisfactions expected could be explored. In the original study, Blai sought to develop an instrument that could be used to estimate job satisfaction from measures of need satisfaction. Basic to the creating of the instrument was Maslow's need heirarchy and the needs considered by Murray and Centers. Synthesizing these elements, Blai adopted fourteen statements representing various needs spanning Maslow's eight basic need groups (physiological, safety, belongingness and love, respect, information, understanding, beauty, and self-actualization). Nine of these statements had been previously used by Centers (1961). The essence of the fourteen statements was as follows: (1) Enjoyable, outdoor work; (2) Chance to be a leader; (3) Being looked upon very highly; (4) Being well paid; (5) Security of a steady job; (6) Not having to make decisions; (7) Opportunities to use my abilities fully; (8) Telling other people what to do on a job; (9) Helping others; (10) Working with people I like; (11) Interesting job duties; (12) Freedom from too close supervision; (13) Opportunity for advancement; (14) Opportunity for competition. In Blai's study each subject was asked to respond to these fourteen statements five different times. Each time the

statement was phrased differently and appeared in a different place among the thirteen others. The five different stimuli were: (1) What do you find most satisfying in your present job? (2) If you had complete freedom of choice, which of the following would you choose? (3) Which of the following did you consider in accepting your present job? (4) What are the most satisfying things you would want in any job you selected? (5) Whether or not you find them in your present job, what do you consider to be the three things most important to job satisfaction in jobs of the kind you are now in? In each case, the individual was to choose the three most important factors and rank them in order of importance. These responses were then related to expressions by the subject of his satisfaction with his job.

Clearly, the stimuli used by Blai were not suitable for this study, nor was it considered necessary to ask for five different responses. Instead, the subjects were asked to respond in the same way, but to three stimuli: (1) What do you expect to find most satisfying in your job as an engineer? (2) If you had complete freedom of choice, which of the following would you choose? (3) Which of the following did you consider in deciding to go into engineering? The form of the statements of need used was the same as Blai used for the approximately corresponding stimuli. However, inadvertently in the preparing of the questionnaire the statement, "A job with good pay," was left out of the list for the "complete freedom of choice" stimulus.

Blai did not report any effort to determine the reliability of the instrument. He did, however, claim construct validity for it based upon the way in which it was developed.

Occupational Role Expectations Finally, some indication was desired of the extent to which the subjects understood the tasks and responsibilities of engineers. With engineering tasks being so diverse, and since the experimental sample included people studying in different branches of the profession, the development of this section of the questionnaire proved difficult. The requirement was for a series of statements that could be checked as right or wrong in the judgment of the responder and that when scored would give a measure of the degree of understanding of engineering duties.

In order to put together such a series of statements, representatives coming to the Michigan State University campus to interview engineering students for placement with their companies were contacted through the MSU Placement Bureau, and conferences arranged with them. Included in this group were personnel people from IBM; Firestone Tire and Rubber Company; Miles Laboratories; City of Detroit Civil Service Commission; Cities Service Oil Company; Consumers Power Company; the Gilbert Company, a Consulting Engineering Firm; Arthur Andersen and Company, an accounting firm. Although the work done by engineers in these companies was very diverse, the kinds of things engineers

were involved in seemed to be quite similar if a limitation to the first three years of the engineer's work experience was placed upon the information gathered. Thus it was decided that the question should be phrased as follows:

> Following is a list of tasks or responsibilities that may or may not be part of an engineer's job. If you think that one of the listed items would likely be part of an engineer's function during the first three years of his working in the field, place an (X) under "yes" in the space provided. If you think an item does not represent an appropriate engineering responsibility or represents a task or responsibility more appropriate for an engineer with more than three years experience, place an (X) under "no" in the space provided.

After the information was gathered from the various representatives it was reviewed with a faculty member of the Chemical Engineering Department of the MSU College of Engineering. This faculty member had just recently left a position with Dow Chemical Corporation for whom he had worked a number of years. With his help statements were formulated which seemed to have application to all branches of engineering, some of which represented potential responsibilities for young engineers and some of which did not. All of them, however, represented engineering tasks at some level of experience. Subsequently, the accuracy of these statements in the context of the question asked was checked in interviews with people from the personnel departments and supervising engineering personnel from both the AC Spark Plug and Oldsmobile divisions of General Motors. Of the twenty-four statements, sixteen were "true" and eight "false." The statements as used, with the correct responses,

are included in the questionnaire displayed in Appendix D.

College Qualification Test (CQT)

The CQT is routinely administered to all incoming freshmen and transfer students at Michigan State University. Results from this test were available from student records, from which they were compiled for use in this study.

The CQT consists of three parts: verbal, information based upon social studies and scientific knowledge, and a section testing numerical skills. The test thus provides three sub-scores and a total score indicative of academic aptitude.

The validity of the CQT has been investigated in terms of its ability to predict first term grade point averages of high school seniors entering college. An over-all coefficient of .44 for men on the CQT total score has been reported (Bennett, et al, 1961, p. 49). Reliability coefficients varying from .89 to .97 have been reported for various populations based upon both test-retest and corrected split-half methods of determination (p. 53).

Grade Point Averages

Through access to student records it was possible to compute for each subject a grade point average for engineering and science courses and for non-engineering and non-science courses, as well as an over-all grade point average. These data were also included in the study.

Statistical Hypotheses

By way of implementing the research design, the research hypotheses will now be presented in testable form using the information collected through the review of the literature, and structured to apply to the experimental sample. Basic to the prediction of directional alternate hypotheses is the theoretical assumption that the experimental group having the greatest agreement between self concept, occupational persona, and occupational stereotype will have characteristics more like those of engineers than will the sub-group whose self concepts differ from their occupational personas and occupational stereotypes. In each instance the null form of the hypothesis will be presented first, followed by its directional alternates, if any.

In the statements following, the group whose self concepts, occupational personas, and occupational stereotypes are most similar will be referred to as the High Agreement Group (HAG), and the group whose self concepts are least similar to their occupational personas and occupational stereotypes will be referred to as the Low Agreement Group (LAG).

Hypothesis 1

Null hypothesis: The mean age at which engineering was first considered as a possible occupation will not be different for the HAG as compared to the LAG.

Alternate hypothesis: The mean age of the first consideration of engineering as an occupation will be lower for the HAG as compared to the LAG.

Hypothesis 2

Null hypothesis: The mean age at which educational commitment to engineering took place will not be different for the HAG as compared to the LAG.

Alternate hypothesis: The mean age at which educational commitment took place will be lower for the HAG as compared to the LAG.

Hypothesis 3

Null hypothesis: Reference groups and reference individuals will not be different in type for the HAG as compared to the LAG.

Hypothesis 4

Null hypothesis: Factors important in the final decision to enter engineering training will not be different for the HAG as compared to the LAG.

Alternate hypothesis: Factors important in the final decision to enter engineering training will be intrinsic to engineering for the HAG, and extrinsic to engineering for the LAG.

Hypothesis 5

Null hypothesis: There will be no difference in the extent of commitment to engineering as a vocation between the HAG and the LAG.

Alternate hypothesis: The HAG will be more committed to engineering as a vocation than the LAG.

Hypothesis 6

Null hypothesis: There will be no difference in the extent of satisfaction with the engineering course of study between the HAG and the LAG.

Alternate hypothesis: The HAG will be more satisfied with the course of study than the LAG.

Hypothesis 7

Null hypothesis: There will be no difference in the factors contributing to anticipated job satisfaction for the HAG as compared to the LAG.

Hypothesis 8

Null hypothesis: There will be no difference in the extent of understanding of occupational role expectations for the HAG as compared to the LAG.

Alternate hypothesis: The HAG will demonstrate a better understanding of occupational role expectations than the LAG.

Hypothesis 9

Null hypothesis: There will be no differences in interest patterns for the HAG as compared to the LAG.

Alternate hypothesis: The interest patterns of the HAG will be more like those of engineers than those of the LAG.

Hypothesis 10

Null hypothesis: There will be no differences in personality characteristics for the HAG as compared to the LAG.

Alternate hypothesis 1: The personality characteristics with respect to achievement, deference, order, dominance, and endurance will be more salient for the HAG than for the LAG.

Alternate hypothesis 2: The personality characteristics with respect to affinity, intraspection, succorance, abasement, nurturance, and heterosexuality will be more salient for the LAG than for the HAG.

Hypothesis 11

Null hypothesis: There will be no difference in the means on measures of academic aptitude between the HAG and the LAG.

Alternate hypothesis: The HAG will have higher means on measures of academic aptitude than the LAG.

Hypothesis 12

Null hypothesis: There will be no differences on measures of academic performance for the HAG as compared to the LAG.

Alternate hypothesis 1: On a measure of academic performance in engineering subjects, the HAG will have a higher mean score than the LAG.

Alternate hypothesis 2: On a measure of academic performance in non-engineering subjects, the HAG will have a higher mean score than the LAG.

Analysis

Because of the manner in which the experimental sample is being determined, it is assumed that it is a random sample of a population having the characteristics being studied normally distributed within it. Therefore, the continuous data will be analyzed using an analysis of variance model. The 95% level of confidence will be

considered necessary for statistical significance.

The non-continuous data of the study will be analyzed by means of a chi-square analysis. Since some of the data are descriptive, the results will be reported in a manner appropriately displaying its characteristics.

Summary

From a population of undergraduate engineering students at Michigan State University a group of thirty-six whose self concepts, occupational personas, and occupational stereotypes tended to be similar was distinguished from a group of thirty-six whose self concepts differed from their occupational personas and occupational stereotypes. The Gough Adjective Check List was used to make the differentiation.

The two groups completed a questionnaire, the Strong Vocational Interest Blank, and the Edwards Personal Preference Schedule. For each individual the over-all, engineering, and non-engineering grade point averages were computed; and the scores on the College Qualification Test collected. A series of twelve hypotheses were presented which will be tested through an analysis of the data collected.

The analysis of variance and chi-square models will be used to test for significant differences between the two groups, with the 95% level set as the criterion for significance. Descriptive data will be collated in a convenient form.

In Chapter 4 the results of the investigation will be presented.

CHAPTER IV

ANALYSIS OF RESULTS

This chapter which contains the results of the investigation will present the findings in relationship to the hypotheses with which they were associated in the exploration.

The Results

The hypotheses in this section will be stated as in Chapter 3, with the null form being presented first and followed by the alternates. It should be kept in mind that the experimental sample was composed of two sub-groups: members for one were chosen because they had the highest number of response agreements between the self concept--occupational persona, and self concept--occupational stereotype adjective lists among the sample population of 129 engineering students; and members for the other were chosen because they had the lowest number of response agreements among the sample population. From this point on the High Agreement Group will be known as the HAG, and the Low Agreement Group as the LAG. It should also be remembered that a basic theoretical assumption is that the HAG will be more like engineers than the LAG.

Hypothesis 1

Null hypothesis: The mean age at which engineering was first considered as a possible occupation will not be different for the HAG as compared to the LAG.

Alternate hypothesis: The mean age of the first consideration of engineering as an occupation will be lower for the HAG as compared to the LAG.

TABLE 4.1

COMPARISON BY GROUPS OF AGE OF FIRST CONSIDERATION OF ENGINEERING AS A VOCATION

Group	Mean Age, years	d.f.	F
HAG	15.47	1,70	0.228*
LAG	15.17		

*Not statistically significant

Since the difference in mean ages did not reach statistical significance, the null hypothesis was accepted.

Hypothesis 2

Null hypothesis: The mean age at which educational commitment to engineering took place will not be different for the HAG as compared to the LAG.

Alternate hypothesis: The mean age at which educational commitment took place will be lower for the HAG as compared to the LAG.

TABLE 4.2

COMPARISON BY GROUPS OF AGE OF EDUCATIONAL COMMITMENT TO ENGINEERING

Group	Mean Age, Years	d.f.	F
HAG	17.56	1,70	0.606*
LAG	17.22		

*Not statistically significant

Since the difference in mean ages did not reach statistical significance, the null hypothesis was accepted.

Hypothesis 3

Null hypothesis: Reference groups and reference individuals will not be different in type for the HAG as compared to the LAG, in terms of the specific reference groups and reference individuals named on the research questionnaire.

The subjects were asked to respond to three questions. In the first they were to choose an engineer, if any, who had been influential in their decision to enter engineering; to choose the three influences other than engineers, from a list of eleven, that were most important in moving them toward engineering; and to name the three most important sources, from a list of thirteen, for their ideas concerning the work an engineer does. Tables 4.3, 4.4, and 4.5 contain the tabulated responses of the two groups.

TABLE 4.3

COMPARISON BY GROUPS OF INFLUENCE
OF ENGINEERS ON VOCATIONAL CHOICE

Individual Engineer	% of HAG Choosing	% of LAG Choosing	Chi-square
Father	11.1	22.2	
Brother	2.8	2.8	
Uncle	0.0	5.6	
Close friend of family	13.9	5.6	**
Employer	19.4	0.0	
Knew an engineer but had no influence	11.1	25.0	
Didn't know any engineers	33.3	33.3	
Other	8.3	5.6	

**None of the chi-squares approached significance

There was no significant difference between groups in the influence exerted by specific engineers on vocational choice.

TABLE 4.4

COMPARISON BY GROUPS OF INFLUENCES OTHER THAN ENGINEERS ON VOCATIONAL CHOICE

Influence	% of HAG Choosing	% of LAG Choosing	Chi-square
Father	44.5	66.7	
Mother	8.3	13.9	
Uncle	8.3	5.5	
Brother	5.6	11.0	
Grandparents	2.8	0.0	
Friends	25.0	27.8	**
High School Counselor	19.5	19.5	
High School Teacher	25.0	13.9	
Books, magazines	52.8	44.5	
School courses	89.0	83.4	
Other	19.5	13.9	

Note: Each subject made 3 choices. Therefore, totals add to 300%.

** None of the chi-squares approached significance

There was no significant difference between groups in the nature of specific influences other than engineers on vocational choice.

TABLE 4.5

COMPARISON BY GROUPS OF SOURCES OF INFORMATION FOR OCCUPATIONAL ROLE EXPECTATIONS

SOURCE	% of HAG Choosing	% of LAG Choosing	Chi-square
Close relatives, engineers	19.5	27.8	
Close relatives, not engineers	13.9	13.9	
High school teachers	27.8	30.6	
High school counselors	25.0	19.5	
Family friend	16.7	16.7	
Neighbor	8.3	0.0	
Books on engineering	38.9	30.6	
Working with engineers	38.9	27.8	
Technical magazines or journals	22.2	25.0	
Popular Science, etc.	16.7	27.8	
Movies	8.3	13.9	
Newspapers	25.0	47.2	3.85, 1 d.f.*
Other	22.2	16.7	

Note: Each subject was to make three choices. However, not all did. Therefore, totals do not add to 300%

*$p < .05$

Of the thirteen sources of information to choose from, one showed a significant difference with respect to its importance for the two groups.

There were 32 reference group or reference individual choices offered. One of these choices produced a significant difference between the HAG and the LAG. Therefore, the null hypothesis was only partially rejected.

Hypothesis 4

Null hypothesis: Factors important in the final decision to enter engineering training will not be different for the HAG as compared to the LAG.

Alternate hypothesis: Factors important in the final decision to enter engineering training will be intrinsic to engineering for the HAG (i.e., opportunity to use special abilities, work with things rather than people, masculine vocation, solve interesting problems, work with machinery and processes, use mathematics); and extrinsic to engineering for the LAG (i.e., earn good deal of money, opportunity to be creative and original, social status and prestige, stable and secure future, opportunity to help others, repay parents for all they have done, have higher standard of living than parents).

The subjects were asked to rate each factor on the basis of "Very Great Importance," "Great Importance," "Moderate Importance," and "Little Importance." Tables 4.6 and 4.7 show the comparison between the two groups on the factors.

TABLE 4.6

COMPARISON BY GROUPS OF IMPORTANCE OF EXTRINSIC FACTORS IN CHOICE OF ENGINEERING

Factor	Freq. of choice, HAG[1] VGI-GI	MI-LI	Freq. of choice, LAG VGI-GI	MI-LI	Chi-Square
Earn much money	27	9	19	17	3.85, 1 df*
Be creative, original	24	12	20	16	
Social status	18	18	10	26	
Secure future	30	6	26	10	
Helpful to others	25	11	14	22	6.77, 1 df*
Repay parents	12	24	7	29	
Higher std. of living than parents	16	20	7	29	5.17, 1 df*
Over-all frequencies	152	100	103	149	19.06, 1 df*

[1]Note: Response possibilities were "Very Great Importance (VGI)," "Great Importance (GI)," "Moderate Importance (MI)," and "Little Importance (LI)." These were collapsed as indicated for purposes of analysis.

*$p < .05$

The differences between the groups as indicated by Table 4.6 are clearly significant. The null hypothesis was rejected at a high level of confidence. The frequency distribution indicates that these extrinsic factors were more important for the HAG than the LAG. Therefore, on the basis of extrinsic factors, the alternate hypothesis was also rejected.

TABLE 4.7

COMPARISON BY GROUPS OF IMPORTANCE OF INTRINSIC FACTORS IN CHOICE OF ENGINEERING

FACTOR	Freq.of choice, HAG[1]		Freq.of choice, LAG		Chi-Square
	VGI-GI	MI-LI	VGI-GI	MI-LI	
Use abilities	31	5	26	10	
Things vs. people	4	32	9	27	
Masculine vocation	10	26	5	31	**
Solve problems	30	6	28	8	
Work with machinery and processes	28	8	22	14	
Use mathematics	18	18	13	23	
Over-all frequencies	121	95	103	113	

[1]See note for Table 4.6

**None of the chi-squares were significant

Since there was no significant difference between groups on intrinsic factors, the alternate hypothesis was also rejected on that basis.

Hypothesis 5

Null hypothesis: There will be no difference in the extent of commitment to engineering as a vocation between the HAG and the LAG.

Alternate hypothesis: The HAG will be more committed to engineering as a vocation than the LAG.

Table 4.8 portrays the relationship between groups on the dimension of commitment to engineering as a vocation. The four alternatives for choice were: Engineering is definitely my choice as a vocation, I will probably go on to become an engineer, right now I'm not sure what I'm going to do, and chances are that I will not become an engineer.

TABLE 4.8

COMPARISON BY GROUPS OF COMMITMENT TO ENGINEERING AS A VOCATION

Extent of commitment	% HAG indicating	% LAG indicating	Chi-square
Definite	44.4	22.2	4.00, 1 df*
Probably will	38.9	52.8	
Not sure	16.7	16.7	
Probably won't	0.0	8.3	

*$p < .05$

On the basis of the significant difference between the proportions of the HAG and the LAG definitely committed to engineering as a profession, the null hypothesis is rejected and the alternate hypothesis is accepted.

Hypothesis 6

Null hypothesis: There will be no difference in the extent of satisfaction with the engineering

course of study between the HAG and the LAG.

Alternate hypothesis: The HAG will be more satisfied with the course of study than the LAG.

The comparison between groups on the dimension of satisfaction with the engineering course of study is presented in Table 4.9. The subjects chose between the four alternatives following: I like it very much, I am satisfied, I'm not very happy with it, and I don't like it at all.

TABLE 4.9

COMPARISON BY GROUPS OF SATISFACTION WITH COURSE OF STUDY

Extent of satisfaction	% HAG indicating	% LAG Indicating	Chi-square
Very satisfied	33.3	13.9	
Satisfied	52.8	72.3	**
Not very happy	13.9	11.1	
Don't like	0.0	2.7	

**None of the chi-squares were significant

In view of the fact that there were no significant differences between the groups on any of the responses, the null hypothesis was accepted.

Hypothesis 7

Null hypothesis: There will be no difference in the factors contributing to anticipated job satisfaction for the HAG as compared to the LAG.

Job satisfaction factors were explored in three contexts: Factors linked with anticipated satisfaction in engineering, factors linked with decision to enter engineering, and factors linked with "ideal" job. Tables 4.10, 4.11, and 4.12 display the comparisons between the groups. Each subject was asked to choose three from each list. However, not all did. Therefore, the percentage columns do not add up to 300%.

TABLE 4.10

COMPARISON BY GROUPS OF SALIENT FACTORS IN ANTICIPATED JOB SATISFACTION IN ENGINEERING

Factor	% HAG choosing	% LAG choosing	Chi-square
Enjoyable, outdoor work	16.7	19.4	
Chance to be a leader	11.1	11.1	
Being look upon very highly	11.1	13.9	
Being well paid	41.7	27.8	
Security of steady job	22.2	41.7	
Not having to make decisions	0.0	0.0	**
Opportunity to use abilities fully	52.8	44.4	
Telling others what to do	0.0	0.0	
Helping others	19.4	8.3	
Working with people I like	13.9	8.3	
Interesting job duties	58.4	58.4	
Freedom from close supervision	5.6	16.7	

TABLE 4.10 (continued)

Factor	% HAG choosing	% LAG choosing	Chi-square
Opportunity for advancement	30.6	27.8	
Opportunity for competition	8.3	11.1	

**None of the chi-squares were significant

TABLE 4.11

COMPARISON BY GROUPS OF SALIENT FACTORS CONSIDERED IN DECIDING TO ENTER ENGINEERING

Factor	% HAG choosing	% LAG choosing	Chi-square
Enjoyable, outdoor work	11.1	13.9	
Chance to be a leader	5.6	8.3	
Being looked upon very highly	19.4	5.6	
Being well paid	44.4	25.0	
Security of steady job	19.4	13.9	
Not having to make decisions	0.0	0.0	
Opportunities to use abilities fully	55.5	52.8	**
Telling others what to do	0.0	5.6	
Helping others	8.3	2.8	
Working with people I like	16.7	16.7	
Interesting job duties	55.5	55.5	
Freedom from close supervision	11.1	22.2	
Opportunity for advancement	30.6	33.3	
Opportunity for competition	5.6	8.3	

** None of the chi-squares were significant

TABLE 4.12

COMPARISON BY GROUPS OF SALIENT FACTORS IN "IDEAL" JOB

Factor	% HAG choosing	% LAG choosing	Chi-square
Enjoyable, outdoor work	19.4	25.0	
Chance to be a leader	8.3	19.4	
Being looked upon very highly	16.7	5.6	
Security of steady job	5.6	11.1	
Not having to make decisions	0.0	2.8	
Opportunities to use abilities fully	50.0	30.6	**
Telling others what to do	5.6	13.9	
Helping others	5.6	5.6	
Working with people I like	47.3	44.4	
Interesting job duties	75.0	72.3	
Freedom from close supervision	19.4	25.0	
Opportunity for advancement	30.6	30.6	
Opportunity for competition	8.3	5.6	

**None of the chi-squares were significant

It is clear from the data that there were no significant differences between the HAG and the LAG on any of the factors in any of the job satisfaction contexts. Therefore, the null hypothesis was accepted.

Hypothesis 8

Null hypothesis: There will be no difference in the extent of understanding of occupational role

expectations for the HAG as compared to the LAG.

Alternate hypothesis: The HAG will demonstrate a better understanding of occupational role expectations than the LAG.

Table 4.13 shows the comparison of the mean scores on the questionnaire item testing accuracy of occupational role expectations.

TABLE 4.13

COMPARISON BY GROUPS OF ACCURACY OF OCCUPATIONAL ROLE EXPECTATIONS

Group	Mean score*	d.f.	F
HAG	16.89	1,69	2.77
LAG	17.77		

*Perfect score was 24

The difference between groups was not statistically significant. Therefore, the null hypothesis was accepted.

Hypothesis 9

Null hypothesis: There will be no differences in interest patterns for the HAG as compared to the LAG.

Alternate hypothesis: The interest patterns of the HAG will be more like those of engineers than those of the LAG, as measured by selected scales from the Strong Vocational Interest

Blank (SVIB) and indication of involvement in extra-curricular activities in high school and at the University.

From the basic assumption that the HAG will be more like engineers than the LAG, it was predicted that the HAG would score higher on the Architect, Mathematician, Physicist, Chemist, Engineer, and Masculine-Feminine scales of the SVIB. Since engineers have been found to be more interested in things than people, it was predicted that the LAG would score higher on the Psychiatrist, Psychologist, Rehabilitation Counselor, and Social Worker scales of the SVIB. Table 4.14 shows the comparative scores of the two groups on the SVIB.

TABLE 4.14

COMPARISON BY GROUPS OF SCORES ON SELECTED SCALES OF THE STRONG VOCATIONAL INTEREST BLANK (SVIB)

SVIB Scale	Mean score HAG	Mean score LAG	d.f.	F
Architect	29.72	30.61	1,70	0.090
Mathematician	23.08	25.39	1,70	0.773
Physicist	28.53	29.83	1,70	0.182
Chemist	39.78	41.28	1,70	0.264
Engineer	38.44	37.94	1,70	0.035
Psychiatrist	23.31	26.58	1,70	1.173
Psychologist	24.17	29.61	1,70	4.320*
Rehab. Couns.	24.39	23.78	1,70	0.053
Social Worker	18.28	21.06	1,70	0.843
Masc. - Fem.	58.19	54.86	1,70	4.179*

*$p < .05$

There were significant differences on two of the scales of the SVIB in the direction predicted by the alternate hypothesis.

As reported in Chapter 2, engineers and engineering students have been characterized by their intense interest in athletics, their involvement in activities closely related to their vocational interest, and their involvement in student government on the high school level. They have been noted to have little interest in more cultural type activities. Therefore, it was predicted that the HAG would indicate greater involvement than the LAG in such high school extra-curricular activities as individual sports, team sports, science and math clubs, JETS club, and student government. On the other hand, it was predicted that the LAG would indicate greater involvement in musical organizations, dramatics, publications, speech and debate, and foreign language clubs. Table 4.15 shows the comparison of the two groups on this dimension.

The single significant difference in high school extra-curricular activities was in the direction predicted by the alternate hypothesis. However, out of the ten possibilities for comparisons, all ten were in the predicted direction. Applying the Sign Test to these data yields a probability of such an occurrence happening by chance of less than 0.3%. Therefore, the two groups may be considered to differ significantly in the predicted direction.

TABLE 4.15

COMPARISON BY GROUPS OF HIGH SCHOOL EXTRA-CURRICULAR ACTIVITIES

Activity	% HAG choosing	% LAG choosing	Chi-square
Individual sports	61.2	47.3	
Team sports	72.3	50.0	
Science, Math clubs	44.4	33.3	
JETS Club	13.9	2.8	
Musical organizations	25.0	41.7	
Dramatics	13.9	19.4	
Publications	22.2	36.1	
Speech and Debate	13.9	16.7	
Foreign lang. club	33.3	38.9	
Student government	47.3	22.2	4.96, 1 df*
No participation	5.6	8.3	
Other	16.7	25.0	

*$p < .05$

With respect to University extra-curricular activities, Johnson (1965) made a study of the patterns of extra-curricular activities of students on the Michigan State University campus. He found that engineering students characteristically involved themselves in athletic activities, either as participants or as observers, while taking little interest in cultural, musical, or social events. Thus it was predicted that the HAG would show greater participation in sporting events, and the LAG show greater

participation in cultural, musical, and social events. By virtue of the engineer's tendency to have interests vocationally related, it was also predicted that the HAG would indicate greater participation in the Career Carnival and engineering exhibits. Table 4.16 shows the comparison of the two groups in terms of University extra-curricular participation.

TABLE 4.16

COMPARISON BY GROUPS OF UNIVERSITY EXTRA-CURRICULAR ACTIVITIES

Activity	Freq. of choice, HAG[1]		Freq. of choice, LAG		Chi-square
	R - O	S - N	R - O	S - N	
Attend varsity sports events	32	4	30	6	
Participate in intramural sports	26	10	19	16	
Social events	16	20	16	20	
Theater productions	12	24	10	26	**
Musical events	5	31	8	28	
Art exhibits	7	29	6	30	
Lectures	5	31	5	31	
Film programs	13	23	9	27	
Career carnival, engineering exhibits	22	14	22	14	

[1]Four response modes were possible: Regularly, occationally, seldom, and never. These were collapsed as indicated for purposes of the analysis.

**None of the chi-squares were significant.

There were no significant differences in university extra-curricular activities between the two groups. However, since there were significant differences on other factors in the direction predicted by the alternate hypothesis, the null hypothesis was partially rejected and the alternate hypothesis partially accepted.

Hypothesis 10

Null hypothesis: There will be no differences in personality characteristics for the HAG as compared to the LAG.

Alternate hypothesis 1: The personality characteristics with respect to achievement, deference, order, dominance, and endurance as measured by the Edwards Personal Preference Schedule (EPPS) will be more salient for the HAG than for the LAG.

Alternate hypothesis 2: The personality characteristics with respect to affinity, intraspection, succorance, abasement, nurturance, and heterosexuality as measured by the EPPS will be more salient for the LAG than for the HAG.

The directional suggestions for the alternate hypotheses were taken directly from the findings of other investigators as reported in Chapter 2. The mean scores for each group on all of the fifteen need scales of the EPPS are contained in Table 4.17. This includes the scales of

exhibition, autonomy, change, and aggression for which no directional estimate was made.

TABLE 4.17

COMPARISON BY GROUPS OF MEAN SCORES ON EDWARDS PERSONAL PREFERENCE SCHEDULE NEEDS

Need Scale	Mean score, HAG	Mean score, LAG	d.f.	F
Achievement	18.00	17.81	1,69	0.044
Deference	11.15	10.83	1,69	0.133
Order	11.55	9.61	1,69	2.481
Exhibition	14.60	13.83	1,69	0.834
Autonomy	13.20	16.25	1,69	11.034*
Affinity	14.23	13.19	1,69	0.672
Intraspection	13.03	15.89	1,69	5.983*
Succorance	9.18	11.33	1,69	3.357
Dominance	15.95	14.69	1,69	1.167
Abasement	13.29	14.28	1,69	0.702
Nurturance	12.37	13.33	1,69	0.506
Change	15.95	15.31	1,69	0.312
Endurance	17.29	14.00	1,69	7.472*
Heterosexuality	18.31	16.25	1,69	2.667
Aggression	11.97	13.19	1,69	1.211

*$p < .05$

Since there were significant differences between groups on the EPPS need scales of autonomy, intraspection, and endurance the null hypothesis was rejected. Two of the differences were in directions predicted in alternate hypotheses 1 and 2. Therefore, these alternates were partially accepted.

Hypothesis 11

Null hypothesis: There will be no difference in the means on measures of academic aptitude between the HAG and the LAG.

Alternate hypothesis: The HAG will have higher means on the verbal, information, and numerical scales of the College Qualification Test than the LAG.

The direction of the alternate hypothesis was based upon the demonstrated fact that as a whole engineers are intellectually superior. Comparative mean scores on the scales of the College Qualification Test are presented and analyzed in Table 4.18.

TABLE 4.18

COMPARISON BY GROUPS OF ACADEMIC APTITUDE ON BASIS OF COLLEGE QUALIFICATION TEST (CQT) SCORES

CQT scale	Mean score, HAG	Mean score, LAG	d.f.	F
Verbal	52.08	54.33	1,68	0.605
Information	52.56	56.92	1,68	4.021*
Numerical	42.71	42.75	1,68	0.001
Total	147.36	153.44	1,68	1.244

*$p < .05$

There was a significant difference in mean scores on the information scale of the College Qualification Test. To the extent that this score represents academic aptitude, the null hypothesis was rejected. However, the difference was contrary to the direction predicted. Therefore, the alternate hypothesis was also rejected.

Hypothesis 12

Null hypothesis: There will be no differences on measures of academic performance for the HAG as compared to the LAG.

Alternate hypothesis 1: On a measure of academic performance in engineering subjects, grade point average, the HAG will have a higher mean score than the LAG.

Alternate hypothesis 2: On a measure of academic performance in other subjects, grade point average, the HAG will have a higher mean score than the LAG.

Because of the observed intellectual superiority of engineers, the directional alternate hypotheses predicted better academic performance for the HAG than for the LAG. Table 4.19 contains the comparative grade point averages for the two groups with the indication of the significance of their differences.

TABLE 4.19

COMPARISON BY GROUPS OF ACADEMIC PERFORMANCE

Subject area	Mean GPA, HAG	Mean GPA, LAG	d.f.	F
Engineering and science courses	2.60	2.79	1,70	2.345
Other courses	2.66	2.99	1,70	6.550*
All courses	2.62	2.86	1,70	4.604*

*$p < .05$

There were significant differences in academic performance between the two groups, the LAG having a higher mean Grade Point Average in both non-engineering courses and over-all. Therefore, the null hypothesis was rejected. Since the difference in mean GPA for engineering courses did not reach significance, alternate hypothesis 1 was rejected. The direction of the significant difference for the mean GPA's on non-engineering courses was opposite to the prediction, therefore alternate hypothesis 2 was also rejected.

Summary

In this chapter data pertinent to the testing of the various statistical hypotheses were presented. The resulting analysis showed that there were no significant differences between the sub-group of the experimental sample having the highest degree of similarity between self concepts, occupational personas, and occupational stereotypes; and the sub-group having the least similarity between self concepts and occupational personas and occupational stereotypes along the following dimensions:

1. Age of first consideration of engineering as an occupation.
2. Age of educational commitment to engineering as an occupation.
3. Reference groups and reference individuals important in the decision making process, except

that the "least similarity" group relied significantly more on the newspaper for information pertaining to the work an engineer does.

4. The extent of satisfaction with the engineering course of study.

5. The factors considered important in anticipated job satisfaction.

6. The extent of understanding of occupational role expectations for engineers.

On the other hand, the two groups were found to differ in the following ways:

1. Factors extrinsic to engineering were significantly more important in the decision process for the "greatest similarity" group than for the "least similarity" group. There was no difference between groups on the importance of intrinsic factors.

2. A significantly higher proportion of the "greatest similarity" group was definitely committed to engineering as a vocation.

3. In the area of interests, the "greatest similarity" group scored significantly higher on the masculinity-femininity scale of the Strong Vocational Interest Blank (SVIB), and on extent of participation in student government in high school. The "least similarity" group scored significantly higher on the psychologist scale of the SVIB.

4. With respect to personality characteristics, the "greatest similarity" group scored significantly higher on the endurance scale of the Edwards Personal Preference Schedule (EPPS), while the "least similarity" group scored significantly higher on the autonomy and intraspection scales of the EPPS.

5. The "least similarity" group scored significantly higher on the information scale of the College Qualification Test.

6. The "least similarity" group had significantly higher grade point averages over all subjects and in courses other than engineering.

In Chapter 5 the entire study will be summarized, conclusions stated, the findings discussed, and implications for further research presented.

CHAPTER V

SUMMARY AND CONCLUSIONS

This chapter contains a summary of the study, some supplementary information, conclusions drawn from the results of the investigation, and a discussion of the findings. Finally, some implications for further research are suggested.

Summary of the Study

Super (1951) has long advocated the proposition that vocational choice is in fact the implementation of a self concept. Galinsky and Fast (1966) and Stefflre (1966) have challenged this position by suggesting that vocational choice may also represent an effort on the part of an individual to experience a "magical" transformation through his choice of an occupation in which he could become like those in his chosen field, and more like he would like to be. In testing this alteration of Super's position, three theoretical assumptions were presented:

1. There are those who choose a vocation as a means of implementing a self concept. They may be identified by measures which show self concept, occupational persona, and occupational stereotype to be similar.

2. There are those who choose a vocation as a means of seeking transformation. They may be identified by measures which show self concept to differ from occupational persona and occupational stereotype.

3. Predictable and measurable differences exist in the characteristics of these two groups.

In this context, self concept was considered to consist of all that one believes to be true about himself, taking into consideration all possible characteristics and properties; occupational persona was considered to consist of all the characteristics one wishes others to consider him to have when they view him in terms of his occupation; and occupational stereotype was considered to consist of those characteristics thought to be peculiar to an individual carrying out that complex of responsibilities and duties considered essential to the fulfilling of a given occupational role.

It was hypothesized that those individuals implementing a self concept by their vocational choice have characteristics more like people in the occupational field than have those individuals who are seeking transformation. It was also hypothesized that those implementing a self concept considered the occupation as a possibility and committed themselves to it at earlier ages, had different vocationally related reference groups, and had a more realistic idea of role expectations in the occupation than those seeking transformation. Likewise, it was predicted that commitment to and satisfaction with a given vocation would be greater

for those implementing a self concept; that while those seeking transformation would decide to enter a vocation on the basis of extrinsic job factors, those implementing a self concept would choose on the basis of intrinsic factors, and that job satisfaction factors would be different for the two groups.

A review of the literature included studies dealing with the characteristics of engineers and engineering students, since a sample population of engineering students had been decided upon. The findings were amazingly consistent, with the engineer being found to be more concerned with things than people, to have a high motivation for academic achievement, to like things orderly, and to approach problem solving in his personal life in a very precise, direct manner. He enjoys creative work directly related to his interests, is inclined to be self-sufficient, conforming, and self-confident. As a group, engineers are above average in both verbal and quantitative intelligence, and their interests are strongly masculine. They tend to come from the lower socio-economic strata. Their interpersonal relationships are relatively smooth, but they are not characterized by any great depth. They are not socially introverted as a group, and they have very little need for self inspection.

In the further review of the literature, relatively few studies were found bearing directly upon Super's basic concept of vocational development. Those studies reported

tended to show some evidence that vocational choice is related in some way to the implementing of the self concept, but all of them used different instruments to measure self concept and attempted to relate it to vocational choice in different ways. A significant finding by Pallone and Hosinski (1967) was that the group of nurses in their sample seemed to be implementing an ideal self concept by their vocational choice rather than a self concept.

Literature pertaining to role theory, reference groups and occupational stereotypes was also reviewed. A synthesis of the findings in terms of vocational development theory pointed up the fact that occupational stereotypes held by individuals may become reference groups which are used to test the suitability of a contemplated occupational choice, or, on the other hand, to prepare the individual for the occupational role which he expects to fill. Also, Super's use of role theory to explain the accommodation of the self concept to occupational roles, as well as Hadley and Levy's (1962) casting of Super's theory in reference group terms, seemed quite appropriate. However, it was clear that not all of role or reference group theory had been incorporated, for the personality changing possibilities in adopting a role or a reference group were not taken into account with respect to vocational choice.

The experimental sample was taken from a sample population of undergraduate engineering students at Michigan State University. By means of the Gough Adjective Check

List, thirty-six whose self concepts, occupational personas, and occupational stereotypes tended to be similar was distinguished from a group of thirty-six whose self concepts differed from their occupational personas and occupational stereotypes. The two groups completed a questionnaire, the Strong Vocational Interest Blank, and the Edwards Personal Preference Schedule. For each individual the over-all, engineering, and "other than" engineering grade point averages were computed; and the College Qualification Test scores collected. The data collected were used to test a series of twelve hypotheses with the following results:

No significant differences were found between the two groups with respect to the age at which engineering was first considered as an occupational possibility, and the age of educational commitment to engineering. The reference groups and reference individuals important in the decision making process were not different in character, except that the group having the least similarity between self concepts and occupational personas and occupational stereotypes relied significantly more on the newspaper for information pertaining to the work an engineer does. Both groups were equally satisfied with the engineering course of study, and considered the same factors as important in anticipated job satisfaction. There was no difference between them on the extent of understanding of occupational role expectations for engineers.

Significant differences were found between the two groups in that while intrinsic job factors were of about equal importance to them in the decision making process, factors extrinsic to engineering were more important for those having the greatest similarity between self concepts, occupational personas, and occupational stereotypes, and a greater proportion of them was "definitely" committed to engineering as a vocation. The "greatest similarity" group scored significantly higher on the masculinity-femininity scale of the Strong Vocational Interest Blank (SVIB), and on the extent of participation in student government in high school. The "least similarity" group scored significantly higher on the psychologist scale of the SVIB. The "greatest similarity" group scored significantly higher on the endurance scale of the Edwards Personal Preference Schedule (EPPS) and significantly lower on the autonomy and intraspection scales. The "least similarity" group scored significantly higher on the information scale of the College Qualification Test, and had significantly higher grade point averages over all subjects and in courses other than engineering.

Supplementary Analysis

Additional information was gathered during the study that did not fit directly into the experimental design, but which was considered of interest. It is presented here in order to round out the findings of the investigation.

Socio-economic Background

Alba Edwards' socio-economic classification of occupations was adapted in order to place the occupations of the fathers of the experimental subjects into two classifications: white collar occupations and blue collar occupations. Included in the first group were professional, managerial and official, and clerical occupations; and in the second group skilled, semi-skilled, and unskilled occupations. On the basis of this division, fathers of the group having the greatest similarity between self concept, occupational persona, and occupational stereotype were distributed in the ratio of 16 to 20 in the blue and white collar occupations, respectively, while the ratio in the "least agreement" group was 9 to 27. While this falls short of a significant difference on the basis of a chi-square analysis, those seeing themselves in the same terms as they see engineers apparently tend to come from blue collar families more often than those who see engineers and themselves differently.

Additional Interest Scales

Table 5.1 displays the relationships between the two groups on five additional scales from the Strong Vocational Interest Blank. (HAG refers to the group having the greatest similarity between self concept, occupational persona, and occupational stereotype. LAG refers to the group having the least similarity.)

TABLE 5.1

COMPARISON BY GROUPS OF SCORES ON SELECTED SCALES OF THE STRONG VOCATIONAL INTEREST BLANK (SVIB)

SVIB scale	Mean score, HAG	Mean score, LAG	d.f.	F
YMCA Secretary	25.56	20.47	1,70	2.969
Minister	3.77	10.37	1,70	4.379*
Artist	26.19	29.14	1,70	1.383
Musician, performer	30.58	33.47	1,70	1.830
Achievement	44.44	46.97	1,70	1.013

*$p < .05$

Analysis of the Adjective Check List

An analysis of the responses of the two groups on the three adjective check lists, i.e., self concept, occupational persona, and occupational stereotype, revealed some significant differences in the way the two groups responded. Of special interest were the self concept differences. Out of 300 adjectives on the list, there were significant differences between the two groups on 132 of them. Eighty-seven adjectives were marked differently by the two groups in degree, i.e., the majority of both groups marked them the same way, but the proportions marking them each way were significantly different. On the other hand, 45 adjectives were marked in opposite directions by the two groups, i.e., while the majority of one group saw the adjective as applying to it, the majority of the other group saw the adjective as not applying.

In this context the LAG described itself as being

more:

Absent minded	*	Foolish		Self centered	*
Aloof	*	Frivolous		Selfish	
Arrogant	*	Gloomy	*	Slow	*
Awkward	*	Greedy		Smug	
Bitter		Hard hearted		Spineless	*
Bossy		High strung		Stingy	*
Careless		Immature	*	Submissive	
Cold	*	Interests Narrow		Timid	*
Commonplace	*	Intollerant		Touchy	*
Complaining	*	Irritable	*	Unaffected	
Cynical	*	Lazy	*	Unassuming	*
Despondent	*	Noisy	*	Unstable	*
Disorderly	*	Opinionated		Vindictive	
Dull	*	Pessimistic	*	Warm	
Egotistical		Retiring	*	Weak	*
Fearful	*	Rigid			

(The asterisks indicate adjectives which were marked in the "more" direction by the LAG with a frequency at least ten greater than the HAG.)

By the same token, the LAG described itself as being

less:

Active		Humorous		Poised	*
Adventurous		Imaginative		Precise	
Affectionate		Ingenious	*	Quick	*
Aggressive	*	Initiative		Relaxed	*
Attractive	*	Insightful	*	Self confident	*
Clever	*	Inventive	*	Sharp witted	*
Confident	*	Natural		Sociable	*
Courageous		Opportunistic		Strong	*
Easy going		Optimistic	*	Tactful	*
Efficient	*	Original	*	Thrifty	
Enterprising	*	Painstaking	*	Versatile	
Generous	*	Patient	*	Witty	
Good looking		Peaceable			
Handsome		Planful			

(The asterisks indicate adjectives which were marked in the "less" direction by the LAG with a frequency at least ten greater than the HAG.)

A majority of the LAG described themselves as being:

Complicated	Impatient	Sarcastic
Confused	Impulsive	Self pitying
Defensive	Indifferent	Self punishing
Dissatisfied	Inhibited	Shy
Distractible	Meek	Suspicious
Dreamy	Moody	Tactless
Evasive	Nervous	Tense
Fault finding	Outspoken	Unconventional
Forgetful	Peculiar	Wary
Hard headed	Prejudiced	Withdrawn
Hasty	Preoccupied	Worrying
Hurried	Restless	

The majority of the HAG, however, indicated that these adjectives were not descriptive of them.

Finally, a majority of the LAG described themselves as <u>not</u> being:

Charming	Outgoing	Stern
Contented	Polished	Talkative
Daring	Praising	
Dignified	Sophisticated	

On the other hand, a majority of the HAG saw themselves as being described by these adjectives.

Differences in occupational persona were very small. The LAG indicated that it wanted to be seen as more hurried and more self-punishing than the HAG did, while the HAG wanted to be seen as more obliging than the LAG. Also, the HAG wanted to be seen as formal, pleasure seeking, and stern while the LAG did not want to be thought of in these ways.

Finally, there were 41 significant differences in the way the two groups described the occupational stereotype. A majority of the HAG described engineers as mild, but a majority of the LAG indicated that this was not characteristic of engineers. On the other hand, a majority of the

LAG described engineers as bossy and hurried, characteristics not subscribed to by the HAG. Also, the LAG saw engineers as more:

Absent minded	Dull	Rebellious
Arrogant	Egotistical	Retiring
Awkward	Forgetful	Self centered
Boastful	Hard headed	Show off
Cold	Hard hearted	Smug
Complaining	High strung	Tactless
Complicated	Impatient	Touchy
Conceited	Interests narrow	Unscrupulous
Demanding	Intollerant	Withdrawn
Dissatisfied	Peculiar	Worrying

than did the HAG, and less

Contented	Interests wide	Stern
Courageous	Outgoing	Warm
Dignified	Praising	

Turning again to the self concept, of the 132 adjectives marked differently by the LAG as compared to the HAG, 104 of them were marked by the LAG on the occupational persona list in the direction either opposite to or less negative than they were on the self concept list, and the occupational stereotype was much more like the occupational persona on those 104 adjectives than it was like the self concept. If it can be assumed that all of the subjects responded to the stimulus for occupational persona in the same way that the pilot group did, i.e., conceptualizing it as the ideal self, then this seems to indicate that for the LAG the ideal self is more like the occupational stereotype than the self concept.

Present Age of Sample

A comparison was done of the present mean ages of the two groups. Mean age of the HAG was 20.58 and of the LAG 19.61. This difference was significant at the .05 level.

Conclusions

A synthesis of the findings of the study leads to the following conclusions.

1. While by definition the HAG and the LAG differ from each other in the extent to which their self concepts are like their occupational personas and occupational stereotypes, they differ very little in terms of ages for considering and making a commitment to engineering as a vocation, in terms of influences affecting their decisions to enter engineering, in terms of interest patterns and personality characteristics, in terms of satisfaction with the course of study and commitment to the vocation, in terms of factors contributing to anticipated job satisfaction, in terms of the extent of understanding of occupational role expectations. In addition, comparison of the various measured characteristics with what has been learned about the unique characteristics of engineers by other investigators shows that neither group is more

like engineers than the other. This refutes the theoretical assumption that the HAG is more like engineers than the LAG.

2. The differences that were distinguished indicate that those in the LAG tend to have more complex personality structures than those in the HAG. The "typical" LAG is significantly more introspective and has a higher drive for autonomy. He has a broader information base as measured by the Information sub-test of the College Qualification Test. His over-all academic performance is significantly better, but his greatest superiority is in subject areas outside of engineering. His pattern of high school interests is indicative of broader interests and interests of a more aesthetic nature.
3. The greater importance of extrinsic factors for the HAG as compared to the LAG in choosing engineering suggests that the "typical" HAG, in focusing on the immediate and tangible, tends to have a less complicated view of himself and the world with less concern for deeper meanings. This also suggests a definite difference in over-all value structures for the two groups, although this was not investigated.
4. While not specifically part of the experimental design, the supplementary analysis in relation to the Adjective Check List leads to the

conclusion that the greatest differences between the HAG and the LAG are defined in terms of their self concepts. It is clear that the LAG views himself much more negatively than the HAG. Because the occupational personas and occupational stereotypes of the two groups are quite similar, it is possible to conjecture that the HAG chose engineering to implement a self concept, and the LAG chose engineering to implement an ideal self concept. This tends to substantiate the "transforming" aspect of the theory, though this was not one of the experimental objectives.

Discussion

As indicated in the conclusions given above, the two groups being studied had some interesting similarities and some interesting differences. As a whole each group had more characteristics like engineers than they had different from each other. Engineering as a vocation is realistic in terms of aptitude, performance, and interests for both the HAG and the LAG. It cannot be concluded from anything uncovered in this study that the "typical" LAG, in an effort to be transformed, reaches beyond his capabilities and outside his interests for a vocation that will transform him.

If the differences between the HAG and the LAG are considered, a pattern begins to show itself. The LAG was found to be more intraspective with a greater need for autonomy, to have interests more like psychologists than

does the HAG, to have engaged to a greater extent in more cultural type activities in high school, to have a broader knowledge in scientific and social science areas, and to have performed better academically. These differences seem to suggest that typically the LAG was composed of more sensitive people with broader interests and probably more open minds. It seems quite reasonable to assume, also, that the "typical" LAG to a greater extent than the "typical" HAG has more vocational options both because of abilities and because of the broader interest pattern.

If this is indeed the case, that the LAG has more vocational options, why the choice of engineering and the substantial commitment to it? The clue to an answer for this question appears in the analysis of the Adjective Check List. It is only a clue, since the study was not designed to explore this aspect of the subject in depth, but it does seem to indicate a direction. The reference here is to the differences in the self concepts of the LAG and the HAG. It is extremely clear that as a group the LAG views itself in negative terms to a far greater extent than the HAG, even to the point of deprecating itself with such descriptions as confused, defensive, impatient, impulsive, nervous, peculiar, withdrawn, and worrying, among others. Now the occupational personas--which might well represent very accurately the ideal self concept--for the HAG and the LAG were virtually identical. These two groups want others to see them in the same way. They are not

different in terms of aspiration, to the extent that this is indicated by responses to the Adjective Check List. Finally, the occupational stereotype of the HAG and the LAG are much more similar than their self concepts, and in the case of the LAG much more similar to the occupational persona than to the self concept. Therefore, it may be surmised that the "typical" LAG chose engineering believing that through the academic discipline required, or the potential association with men in the field, or through patterning himself after engineers in terms of professional behavior, he could become what he really wanted to be as a person. He was willing to put forth all the effort and make all the sacrifices necessary to reach his goal. The vocation was an instrument, not an end in itself.

There might be objections to this view since the LAG stereotype of the engineer was substantially more negative than the HAG stereotype. Two responses suggest themselves: one is the sensitive, pessimistic nature of the LAG which would lead him to see the "bad" as well as the "good," and the other is to call attention to the fact that there is an obvious difference in degree between the negativism expressed in the self concepts of the LAG and the negativism of the stereotype. This tends to reinforce the idea that the LAG is <u>seeking</u> transformation and that he is going to be questioning enough to see if he can realistically expect it in the context of engineering as a vocation.

All of this lends credence to Galinsky and Fast's observation and to Stefflre's proposition concerning vocational choice as a means some might use in seeking to become the kind of persons they really want to be. However, the idea of "magical transformation" expressed by the above investigators needs to be altered. It is very apparent that if indeed the "typical" LAG is seeking transformation, it is not something magic that he is looking for, but he is engaged in a very realistic search in an area to which he is well suited in terms of abilities, interests, and performance.

The foregoing also suggests that at least for this group the investigation was designed to look for differences in the wrong places. The kinds of differences sought here on the basis of the assumption that the LAG would not be as similar to engineers as the HAG are appropriately sought when it is suspected that the kind of transformation desired is not in the personality itself, but rather in the public view. That is to say, it is conceivable that there would be those choosing an occupation in the basic sense of the concept of the occupational persona in that they would want others to consider them to have the attributes and characteristics of people in the occupation without in fact their putting forth the effort or even having the desire to become that kind of person. In contrast to the person seeking transformation, this type of individual, in the context of engineering, might wish to appear resourceful, knowledgeable, strong, masculine, competent without wanting to go through

the necessary disciplinary processes to develop those qualities. Or, on the other hand, he might wish to feel that those characteristics were his while believing that they could never really be part of him. It is quite possible, of course, that among the LAG of this study there were some individuals functioning in this way. The hypotheses were set up for their benefit, but they evidently were in the minority, if present at all. On the basis of the observation that virtually all of the 72 experimental subjects were committed to engineering as a vocation, one might suspect that a group of freshmen engineering students would be likely to contain a fair number of individuals seeking to appear as something they are not and do not intend to be.

There is yet another theoretical question to be considered. Stefflre (1966) in his original proposition includes the real self as a parameter along with occupational persona, occupational stereotype, and self concept. On the face of it this might prove to be the crucial variable in determining which of the three tracks an individual is on--implementing a self concept, implementing an ideal self concept, or implementing a need to be seen by others in a certain way. It is entirely possible that the latter person, who may be considered as attempting to "hide" himself in the occupation, could hide just as well from the investigator by the way he responds to the measure of self concept being used. Certainly in this study, the criterion for differentiation into groups being arbitrary, there were

those in the HAG whose characteristics were much less like those of engineers than were the characteristics of many who were in the LAG. Determining the properties of the "real" self is, of course, a monumental task.

One thing seems patently obvious from the implications of this study and the study reported by Pallone and Hosinski (1967). Super's rather limited view of vocational development as the implementation of a self concept is open to serious question. In this study there were those equally committed to engineering as a vocation whose self concepts differed drastically from each other and from their concepts of the characteristics of engineers. Clearly, there needs to be much more research, but the indications are strong that at least the ideal self concept must be considered as an important factor in the process of vocational choice.

Finally, though it is highly speculative, the following descriptions are offered of the typical individuals from the HAG and the LAG as suggested by the results of the study.

The typical person in this study whose self concept, occupational persona, and occupational stereotype are very much alike is characterized by a narrowness of interests confined to areas specific to engineering and masculine pursuits in general. His intense masculinity is reflected in his tendency to be assertive and forthright. He exudes great self-confidence and is extremely opinionated. He is stereotypic in his thinking. His relationships to others

are shallow and he is rather insensitive to their feelings. In many ways he resembles an over-grown boy who is an incurable optimist and who casts all of his life experience into an idealistic mold. Because engineering represents so much that he has always aspired to have and be, and because he has so completely convinced himself that he is an engineer, he is quite over-sold on engineering as a vocation.

On the other hand, the typical person in this study whose self concept is very different from his occupational persona and his occupational stereotype is characterized by a shy, sensitive nature and an inclination to pessimism. This pessimism appears rooted in his lack of self-confidence. This is a contradiction in fact, for he tends to be much brighter than the average man, and is able to use his endowment to produce academic success. However, this is not good enough, for no matter how well he performs he feels he could have and should have done better. Life for him is not simple. Because he sees so much in the world around him, he is constantly searching for more answers to more and broader questions. And he turns this questioning inward, for he spends a good deal of time thinking about himself and his identity. This man tends to be very masculine, yet he has learned to appreciate the finer, more delicate things in the world. On the other side of his nature, he is rebellious, fighting against his feelings of inadequacy and seeking to free himself of parental authority.

Engineering is to him a vocation that challenges him to prove himself capable, and that offers him the opportunity to become what he would ideally like to be as a person. His greatest concern is not in what others think of him, but in what he thinks of himself.

Implications for Further Research

One limitation of this study was in the instruments that were used. Additional information that could be gained through the Allport-Vernon-Lindzey Scale of Values and the Rokeach Dogmatism Scale would add to the understanding of the dynamics operating.

The data gathered for this study will be much more meaningful if there could be a longitudinal follow-up to see what the experimental subjects do vocationally, and to see if self concepts, occupational personas, and occupational stereotypes remain stable over time. In case of change, the direction of change would be highly significant.

This study was designed to investigate differences in characteristics in relation to a criterion group. A study should be done that is set up to look carefully at the nature of the self concepts of two equally committed groups differing from each other in a manner similar to those in this study, i.e., self concepts, occupational personas, and occupational stereotypes much alike for the one group; and the same concepts differing for the other. It would be very valuable if a way could be devised to

measure the "real" properties of the self so that this could be fit into the testing of the theoretical system.

The study should also be replicated across occupational groups, in different locations, using different instruments, and at different socio-economic levels. Additional studies should be carried out to test the possibility that ideal self concept may be just as important in vocational development as the self concept.

A P P E N D I X A

ADJECTIVE CHECK LIST BOOKLET

NAME_____ STUDENT NO._____

MSU ADDRESS_____ PHONE NO._____

MAJOR FIELD_____

CLASS: Fresh. Soph. Jr. Sr. GROUP NO._____

You are about to participate in a research project designed to add to the understanding of the process of vocational choice. Your help will be especially valuable if you will follow the directions carefully and respond as candidly as you can.

The analysis of the data collected will be confidential. This cover sheet with your name will only be used in the event that you are asked to make an additional contribution to the study.

Following are three identical lists of descriptive words. Read the directions at the beginning of each list carefully before proceeding. The entire task will take approximately one hour. Complete the three lists in one sitting if at all possible. Please do not discuss your responses with others. Remember! It is of the utmost importance that you respond as genuinely as possible.

And thank you for your assistance....

Each one of us has some idea as to what he is like. If you think a descriptive word is very much like you, circle 3; if somewhat like you, circle 2; if very little like you, circle 1; if not at all like you, circle 0. Be sure you respond to every word. Work as carefully and as rapidly as you can.

1.	absent-minded	0	1	2	3	51.	cowardly	0	1	2	3
2.	active	0	1	2	3	52.	cruel	0	1	2	3
3.	adaptable	0	1	2	3	53.	curious	0	1	2	3
4.	adventurous	0	1	2	3	54.	cynical	0	1	2	3
5.	affected	0	1	2	3	55.	daring	0	1	2	3
6.	affectionate	0	1	2	3	56.	deceitful	0	1	2	3
7.	aggressive	0	1	2	3	57.	defensive	0	1	2	3
8.	alert	0	1	2	3	58.	deliberate	0	1	2	3
9.	aloof	0	1	2	3	59.	demanding	0	1	2	3
10.	ambitious	0	1	2	3	60.	dependable	0	1	2	3
11.	anxious	0	1	2	3	61.	dependent	0	1	2	3
12.	apathetic	0	1	2	3	62.	despondent'	0	1	2	3
13.	appreciative	0	1	2	3	63.	determined	0	1	2	3
14.	argumentative	0	1	2	3	64.	dignified	0	1	2	3
15.	arrogant	0	1	2	3	65.	discreet	0	1	2	3
16.	artistic	0	1	2	3	66.	disorderly	0	1	2	3
17.	assertive	0	1	2	3	67.	dissatisfied	0	1	2	3
18.	attractive	0	1	2	3	68.	distractible	0	1	2	3
19.	autocratic	0	1	2	3	69.	distrustful	0	1	2	3
20.	awkward	0	1	2	3	70.	dominant	0	1	2	3
21.	bitter	0	1	2	3	71.	dreamy	0	1	2	3
22.	blustery	0	1	2	3	72.	dull	0	1	2	3
23.	boastful	0	1	2	3	73.	easy going	0	1	2	3
24.	bossy	0	1	2	3	74.	effeminate	0	1	2	3
25.	calm	0	1	2	3	75.	efficient	0	1	2	3
26.	capable	0	1	2	3	76.	egotistical	0	1	2	3
27.	careless	0	1	2	3	77.	emotional	0	1	2	3
28.	cautious	0	1	2	3	78.	energetic	0	1	2	3
29.	changeable	0	1	2	3	79.	enterprising	0	1	2	3
30.	charming	0	1	2	3	80.	enthusiastic	0	1	2	3
31.	cheerful	0	1	2	3	81.	evasive	0	1	2	3
32.	civilized	0	1	2	3	82.	excitable	0	1	2	3
33.	clear-thinking	0	1	2	3	83.	fair-minded	0	1	2	3
34.	clever	0	1	2	3	84.	fault-finding	0	1	2	3
35.	coarse	0	1	2	3	85.	fearful	0	1	2	3
36.	cold	0	1	2	3	86.	feminine	0	1	2	3
37.	commonplace	0	1	2	3	87.	fickle	0	1	2	3
38.	complaining	0	1	2	3	88.	flirtatious	0	1	2	3
39.	complicated	0	1	2	3	89.	foolish	0	1	2	3
40.	conceited	0	1	2	3	90.	forceful	0	1	2	3
41.	confident	0	1	2	3	91.	foresighted	0	1	2	3
42.	confused	0	1	2	3	92.	forgetful	0	1	2	3
43.	conscientious	0	1	2	3	93.	forgiving	0	1	2	3
44.	conservative	0	1	2	3	94.	formal	0	1	2	3
45.	considerate	0	1	2	3	95.	frank	0	1	2	3
46.	contented	0	1	2	3	96.	friendly	0	1	2	3
47.	conventional	0	1	2	3	97.	frivolous	0	1	2	3
48.	cool	0	1	2	3	98.	fussy	0	1	2	3
49.	cooperative	0	1	2	3	99.	generous	0	1	2	3
50.	courageous	0	1	2	3	100.	gentle	0	1	2	3

101.	gloomy	0	1	2	3	151.	mild	0	1	2	3
102.	good looking	0	1	2	3	152.	mischievous	0	1	2	3
103.	good natured	0	1	2	3	153.	moderate	0	1	2	3
104.	greedy	0	1	2	3	154.	modest	0	1	2	3
105.	handsome	0	1	2	3	155.	moody	0	1	2	3
106.	hard-headed	0	1	2	3	156.	nagging	0	1	2	3
107.	hard-hearted	0	1	2	3	157.	natural	0	1	2	3
108.	hasty	0	1	2	3	158.	nervous	0	1	2	3
109.	headstrong	0	1	2	3	159.	noisy	0	1	2	3
110.	healthy	0	1	2	3	160.	obliging	0	1	2	3
111.	helpful	0	1	2	3	161.	obnoxious	0	1	2	3
112.	high-strung	0	1	2	3	162.	opinionated	0	1	2	3
113.	honest	0	1	2	3	163.	opportunistic	0	1	2	3
114.	hostile	0	1	2	3	164.	optimistic	0	1	2	3
115.	humorous	0	1	2	3	165.	organized	0	1	2	3
116.	hurried	0	1	2	3	166.	original	0	1	2	3
117.	idealistic	0	1	2	3	167.	outgoing	0	1	2	3
118.	imaginative	0	1	2	3	168.	outspoken	0	1	2	3
119.	immature	0	1	2	3	169.	painstaking	0	1	2	3
120.	impatient	0	1	2	3	170.	patient	0	1	2	3
121.	impulsive	0	1	2	3	171.	peaceable	0	1	2	3
122.	independent	0	1	2	3	172.	peculiar	0	1	2	3
123.	indifferent	0	1	2	3	173.	persevering	0	1	2	3
124.	individualistic	0	1	2	3	174.	persistent	0	1	2	3
125.	industrious	0	1	2	3	175.	pessimistic	0	1	2	3
126.	infantile	0	1	2	3	176.	planful	0	1	2	3
127.	informal	0	1	2	3	177.	pleasant	0	1	2	3
128.	ingenious	0	1	2	3	178.	pleasure-seeking	0	1	2	3
129.	inhibited	0	1	2	3	179.	poised	0	1	2	3
130.	initiative	0	1	2	3	180.	polished	0	1	2	3
131.	insightful	0	1	2	3	181.	practical	0	1	2	3
132.	intelligent	0	1	2	3	182.	praising	0	1	2	3
133.	interests narrow	0	1	2	3	183.	precise	0	1	2	3
134.	interests wide	0	1	2	3	184.	prejudiced	0	1	2	3
135.	intollerant	0	1	2	3	185.	preoccupied	0	1	2	3
136.	inventive	0	1	2	3	186.	progressive	0	1	2	3
137.	irresponsible	0	1	2	3	187.	prudish	0	1	2	3
138.	irritable	0	1	2	3	188.	quarrelsome	0	1	2	3
139.	jolly	0	1	2	3	189.	queer	0	1	2	3
140.	kind	0	1	2	3	190.	quick	0	1	2	3
141.	lazy	0	1	2	3	191.	quiet	0	1	2	3
142.	leisurely	0	1	2	3	192.	quitting	0	1	2	3
143.	logical	0	1	2	3	193.	rational	0	1	2	3
144.	loud	0	1	2	3	194.	rattlebrained	0	1	2	3
145.	loyal	0	1	2	3	195.	realistic	0	1	2	3
146.	mannerly	0	1	2	3	196.	reasonable	0	1	2	3
147.	masculine	0	1	2	3	197.	rebellious	0	1	2	3
148.	mature	0	1	2	3	198.	reckless	0	1	2	3
149.	meek	0	1	2	3	199.	reflective	0	1	2	3
150.	methodical	0	1	2	3	200.	relaxed	0	1	2	3

201.	reliable	0	1	2	3	251.	strong	0	1	2	3
202.	resentful	0	1	2	3	252.	stubborn	0	1	2	3
203.	reserved	0	1	2	3	253.	submissive	0	1	2	3
204.	resourceful	0	1	2	3	254.	suggestible	0	1	2	3
205.	responsible	0	1	2	3	255.	sulky	0	1	2	3
206.	restless	0	1	2	3	256.	superstitious	0	1	2	3
207.	retiring	0	1	2	3	257.	suspicious	0	1	2	3
208.	rigid	0	1	2	3	258.	sympathetic	0	1	2	3
209.	robust	0	1	2	3	259.	tactful	0	1	2	3
210.	rude	0	1	2	3	260.	tactless	0	1	2	3
211.	sarcastic	0	1	2	3	261.	talkative	0	1	2	3
212.	self-centered	0	1	2	3	262.	temperamental	0	1	2	3
213.	self-confident	0	1	2	3	263.	tense	0	1	2	3
214.	self-controlled	0	1	2	3	264.	thankless	0	1	2	3
215.	self-denying	0	1	2	3	265.	thorough	0	1	2	3
216.	self-pitying	0	1	2	3	266.	thoughtful	0	1	2	3
217.	self-punishing	0	1	2	3	267.	thrifty	0	1	2	3
218.	self-seeking	0	1	2	3	268.	timid	0	1	2	3
219.	selfish	0	1	2	3	269.	tolerant	0	1	2	3
220.	sensitive	0	1	2	3	270.	touchy	0	1	2	3
221.	sentimental	0	1	2	3	271.	tough	0	1	2	3
222.	serious	0	1	2	3	272.	trusting	0	1	2	3
223.	severe	0	1	2	3	273.	unaffected	0	1	2	3
224.	sexy	0	1	2	3	274.	unambitious	0	1	2	3
225.	shallow	0	1	2	3	275.	unassuming	0	1	2	3
226.	sharp-witted	0	1	2	3	276.	unconventional	0	1	2	3
227.	shiftless	0	1	2	3	277.	undependable	0	1	2	3
228.	show-off	0	1	2	3	278.	understanding	0	1	2	3
229.	shrewd	0	1	2	3	279.	unemotional	0	1	2	3
230.	shy	0	1	2	3	280.	unexcitable	0	1	2	3
231.	silent	0	1	2	3	281.	unfriendly	0	1	2	3
232.	simple	0	1	2	3	282.	uninhibited	0	1	2	3
233.	sincere	0	1	2	3	283.	unintelligent	0	1	2	3
234.	slipshod	0	1	2	3	284.	unkind	0	1	2	3
235.	slow	0	1	2	3	285.	unrealistic	0	1	2	3
236.	sly	0	1	2	3	286.	unscrupulous	0	1	2	3
237.	smug	0	1	2	3	287.	unselfish	0	1	2	3
238.	snobbish	0	1	2	3	288.	unstable	0	1	2	3
239.	sociable	0	1	2	3	289.	vindictive	0	1	2	3
240.	soft-hearted	0	1	2	3	290.	versatile	0	1	2	3
241.	sophisticated	0	1	2	3	291.	warm	0	1	2	3
242.	spendthrift	0	1	2	3	292.	wary	0	1	2	3
243.	spineless	0	1	2	3	293.	weak	0	1	2	3
244.	spontaneous	0	1	2	3	294.	whiny	0	1	2	3
245.	spunky	0	1	2	3	295.	wholesome	0	1	2	3
246.	stable	0	1	2	3	296.	wise	0	1	2	3
247.	steady	0	1	2	3	297.	withdrawn	0	1	2	3
248.	stern	0	1	2	3	298.	witty	0	1	2	3
249.	stingy	0	1	2	3	299.	worrying	0	1	2	3
250.	stolid	0	1	2	3	300.	zany	0	1	2	3

Undoubtedly you have some ideas about what an engineer practicing his profession is like. Circle 3 for those descriptive words very much like your idea of an engineer; circle 2 for those somewhat like your idea of an engineer; circle 1 for those very little like your idea of an engineer; and circle 0 for those not at all like your idea of an engineer. Be sure you respond to every word. Work as carefully and as rapidly as you can.

1.	absent-minded	0	1	2	3
2.	active	0	1	2	3
3.	adaptable	0	1	2	3
4.	adventurous	0	1	2	3
5.	affected	0	1	2	3
6.	affectionate	0	1	2	3
7.	aggressive	0	1	2	3
8.	alert	0	1	2	3
9.	aloof	0	1	2	3
10.	ambitious	0	1	2	3
11.	anxious	0	1	2	3
12.	apathetic	0	1	2	3
13.	appreciative	0	1	2	3
14.	argumentative	0	1	2	3
15.	arrogant	0	1	2	3
16.	artistic	0	1	2	3
17.	assertive	0	1	2	3
18.	attractive	0	1	2	3
19.	autocratic	0	1	2	3
20.	awkward	0	1	2	3
21.	bitter	0	1	2	3
22.	blustery	0	1	2	3
23.	boastful	0	1	2	3
24.	bossy	0	1	2	3
25.	calm	0	1	2	3
26.	capable	0	1	2	3
27.	careless	0	1	2	3
28.	cautious	0	1	2	3
29.	changeable	0	1	2	3
30.	charming	0	1	2	3
31.	cheerful	0	1	2	3
32.	civilized	0	1	2	3
33.	clear-thinking	0	1	2	3
34.	clever	0	1	2	3
35.	coarse	0	1	2	3
36.	cold	0	1	2	3
37.	commonplace	0	1	2	3
38.	complaining	0	1	2	3
39.	complicated	0	1	2	3
40.	conceited	0	1	2	3
41.	confident	0	1	2	3
42.	confused	0	1	2	3
43.	conscientious	0	1	2	3
44.	conservative	0	1	2	3
45.	considerate	0	1	2	3
46.	contented	0	1	2	3
47.	conventional	0	1	2	3
48.	cool	0	1	2	3
49.	cooperative	0	1	2	3
50.	courageous	0	1	2	3
51.	cowardly	0	1	2	3
52.	cruel	0	1	2	3
53.	curious	0	1	2	3
54.	cynical	0	1	2	3
55.	daring	0	1	2	3
56.	deceitful	0	1	2	3
57.	defensive	0	1	2	3
58.	deliberate	0	1	2	3
59.	demanding	0	1	2	3
60.	dependable	0	1	2	3
61.	dependent	0	1	2	3
62.	despondent	0	1	2	3
63.	determined	0	1	2	3
64.	dignified	0	1	2	3
65.	discreet	0	1	2	3
66.	disorderly	0	1	2	3
67.	dissatisfied	0	1	2	3
68.	distractible	0	1	2	3
69.	distrustful	0	1	2	3
70.	dominant	0	1	2	3
71.	dreamy	0	1	2	3
72.	dull	0	1	2	3
73.	easy going	0	1	2	3
74.	effeminate	0	1	2	3
75.	efficient	0	1	2	3
76.	egotistical	0	1	2	3
77.	emotional	0	1	2	3
78.	energetic	0	1	2	3
79.	enterprising	0	1	2	3
80.	enthusiastic	0	1	2	3
81.	evasive	0	1	2	3
82.	excitable	0	1	2	3
83.	fair-minded	0	1	2	3
84.	fault-finding	0	1	2	3
85.	fearful	0	1	2	3
86.	feminine	0	1	2	3
87.	fickle	0	1	2	3
88.	flirtatious	0	1	2	3
89.	foolish	0	1	2	3
90.	forceful	0	1	2	3
91.	foresighted	0	1	2	3
92.	forgetful	0	1	2	3
93.	forgiving	0	1	2	3
94.	formal	0	1	2	3
95.	frank	0	1	2	3
96.	friendly	0	1	2	3
97.	frivolous	0	1	2	3
98.	fussy	0	1	2	3
99.	generous	0	1	2	3
100.	gentle	0	1	2	3

101.	gloomy	0	1	2	3	151.	mild	0	1	2	3
102.	good looking	0	1	2	3	152.	mischievous	0	1	2	3
103.	good natured	0	1	2	3	153.	moderate	0	1	2	3
104.	greedy	0	1	2	3	154.	modest	0	1	2	3
105.	handsome	0	1	2	3	155.	moody	0	1	2	3
106.	hard-headed	0	1	2	3	156.	nagging	0	1	2	3
107.	hard-hearted	0	1	2	3	157.	natural	0	1	2	3
108.	hasty	0	1	2	3	158.	nervous	0	1	2	3
109.	headstrong	0	1	2	3	159.	noisy	0	1	2	3
110.	healthy	0	1	2	3	160.	obliging	0	1	2	3
111.	helpful	0	1	2	3	161.	obnoxious	0	1	2	3
112.	high-strung	0	1	2	3	162.	opinionated,	0	1	2	3
113.	honest	0	1	2	3	163.	opportunistic	0	1	2	3
114.	hostile	0	1	2	3	164.	optimistic	0	1	2	3
115.	humorous	0	1	2	3	165.	organized	0	1	2	3
116.	hurried	0	1	2	3	166.	original	0	1	2	3
117.	idealistic	0	1	2	3	167.	outgoing	0	1	2	3
118.	imaginative	0	1	2	3	168.	outspoken	0	1	2	3
119.	immature	0	1	2	3	169.	painstaking	0	1	2	3
120.	impatient	0	1	2	3	170.	patient	0	1	2	3
121.	impulsive	0	1	2	3	171.	peaceable	0	1	2	3
122.	independent	0	1	2	3	172.	peculiar	0	1	2	3
123.	indifferent	0	1	2	3	173.	persevering	0	1	2	3
124.	individualistic	0	1	2	3	174.	persistent	0	1	2	3
125.	industrious	0	1	2	3	175.	pessimistic	0	1	2	3
126.	infantile	0	1	2	3	176.	planful	0	1	2	3
127.	informal	0	1	2	3	177.	pleasant	0	1	2	3
128.	ingenious	0	1	2	3	178.	pleasure-seeking	0	1	2	3
129.	inhibited	0	1	2	3	179.	poised	0	1	2	3
130.	initiative	0	1	2	3	180.	polished	0	1	2	3
131.	insightful	0	1	2	3	181.	practical	0	1	2	3
132.	intelligent	0	1	2	3	182.	praising	0	1	2	3
133.	interests narrow	0	1	2	3	183.	precise	0	1	2	3
134.	interests wide	0	1	2	3	184.	prejudiced	0	1	2	3
135.	intollerant	0	1	2	3	185.	preoccupied	0	1	2	3
136.	inventive	0	1	2	3	186.	progressive	0	1	2	3
137.	irresponsible	0	1	2	3	187.	prudish	0	1	2	3
138.	irritable	0	1	2	3	188.	quarrelsome	0	1	2	3
139.	jolly	0	1	2	3	189.	queer	0	1	2	3
140.	kind	0	1	2	3	190.	quick	0	1	2	3
141.	lazy	0	1	2	3	191.	quiet	0	1	2	3
142.	leisurely	0	1	2	3	192.	quitting	0	1	2	3
143.	logical	0	1	2	3	193.	rational	0	1	2	3
144.	loud	0	1	2	3	194.	rattlebrained	0	1	2	3
145.	loyal	0	1	2	3	195.	realistic	0	1	2	3
146.	mannerly	0	1	2	3	196.	reasonable	0	1	2	3
147.	masculine	0	1	2	3	197.	rebellious	0	1	2	3
148.	mature	0	1	2	3	198.	reckless	0	1	2	3
149.	meek	0	1	2	3	199.	reflective	0	1	2	3
150.	methodical	0	1	2	3	200.	relaxed	0	1	2	3

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201.	reliable	0	1	2	3	251.	strong	0	1	2	3
202.	resentful	0	1	2	3	252.	stubborn	0	1	2	3
203.	reserved	0	1	2	3	253.	submissive	0	1	2	3
204.	resourceful	0	1	2	3	254.	suggestible	0	1	2	3
205.	responsible	0	1	2	3	255.	sulky	0	1	2	3
206.	restless	0	1	2	3	256.	superstitious	0	1	2	3
207.	retiring	0	1	2	3	257.	suspicious	0	1	2	3
208.	rigid	0	1	2	3	258.	sympathetic	0	1	2	3
209.	robust	0	1	2	3	259.	tactful	0	1	2	3
210.	rude	0	1	2	3	260.	tactless	0	1	2	3
211.	sarcastic	0	1	2	3	261.	talkative	0	1	2	3
212.	self-centered	0	1	2	3	262.	temperamental	0	1	2	3
213.	self-confident	0	1	2	3	263.	tense	0	1	2	3
214.	self-controlled	0	1	2	3	264.	thankless	0	1	2	3
215.	self-denying	0	1	2	3	265.	thorough	0	1	2	3
216.	self-pitying	0	1	2	3	266.	thoughtful	0	1	2	3
217.	self-punishing	0	1	2	3	267.	thrifty	0	1	2	3
218.	self-seeking	0	1	2	3	268.	timid	0	1	2	3
219.	selfish	0	1	2	3	269.	tolerant	0	1	2	3
220.	sensitive	0	1	2	3	270.	touchy	0	1	2	3
221.	sentimental	0	1	2	3	271.	tough	0	1	2	3
222.	serious	0	1	2	3	272.	trusting	0	1	2	3
223.	severe	0	1	2	3	273.	unaffected	0	1	2	3
224.	sexy	0	1	2	3	274.	unambitious	0	1	2	3
225.	shallow	0	1	2	3	275.	unassuming	0	1	2	3
226.	sharp-witted	0	1	2	3	276.	unconventional	0	1	2	3
227.	shiftless	0	1	2	3	277.	undependable	0	1	2	3
228.	show-off	0	1	2	3	278.	understanding	0	1	2	3
229.	shrewd	0	1	2	3	279.	unemotional	0	1	2	3
230.	shy	0	1	2	3	280.	unexcitable	0	1	2	3
231.	silent	0	1	2	3	281.	unfriendly	0	1	2	3
232.	simple	0	1	2	3	282.	uninhibited	0	1	2	3
233.	sincere	0	1	2	3	283.	unintelligent	0	1	2	3
234.	slipshod	0	1	2	3	284.	unkind	0	1	2	3
235.	slow	0	1	2	3	285.	unrealistic	0	1	2	3
236.	sly	0	1	2	3	286.	unscrupulous	0	1	2	3
237.	smug	0	1	2	3	287.	unselfish	0	1	2	3
238.	snobbish	0	1	2	3	288.	unstable	0	1	2	3
239.	sociable	0	1	2	3	289.	vindictive	0	1	2	3
240.	soft-hearted	0	1	2	3	290.	versatile	0	1	2	3
241.	sophisticated	0	1	2	3	291.	warm	0	1	2	3
242.	spendthrift	0	1	2	3	292.	wary	0	1	2	3
243.	spineless	0	1	2	3	293.	weak	0	1	2	3
244.	spontaneous	0	1	2	3	294.	whiny	0	1	2	3
245.	spunky	0	1	2	3	295.	wholesome	0	1	2	3
246.	stable	0	1	2	3	296.	wise	0	1	2	3
247.	steady	0	1	2	3	297.	withdrawn	0	1	2	3
248.	stern	0	1	2	3	298.	witty	0	1	2	3
249.	stingy	0	1	2	3	299.	worrying	0	1	2	3
250.	stolid	0	1	2	3	300.	zany	0	1	2	3

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Each of us would like others to think of us in certain ways when they view us as workers in our various occupations. If a descriptive word is very much like you want to be thought of by others because of your work, circle 3; if somewhat like you want to be thought of, circle 2; if very little like you want to be thought of, circle 1; if not at all like you want to be thought of, circle 0. Be sure you respond to every word. Work as carefully and as rapidly as you can.

1.	absent-minded	0	1	2	3	51.	cowardly	0	1	2	3
2.	active	0	1	2	3	52.	cruel	0	1	2	3
3.	adaptable	0	1	2	3	53.	curious	0	1	2	3
4.	adventurous	0	1	2	3	54.	cynical	0	1	2	3
5.	affected	0	1	2	3	55.	daring	0	1	2	3
6.	affectionate	0	1	2	3	56.	deceitful	0	1	2	3
7.	aggressive	0	1	2	3	57.	defensive	0	1	2	3
8.	alert	0	1	2	3	58.	deliberate	0	1	2	3
9.	aloof	0	1	2	3	59.	demanding	0	1	2	3
10.	ambitious	0	1	2	3	60.	dependable	0	1	2	3
11.	anxious	0	1	2	3	61.	dependent	0	1	2	3
12.	apathetic	0	1	2	3	62.	despondent	0	1	2	3
13.	appreciative	0	1	2	3	63.	determined	0	1	2	3
14.	argumentative	0	1	2	3	64.	dignified	0	1	2	3
15.	arrogant	0	1	2	3	65.	discreet	0	1	2	3
16.	artistic	0	1	2	3	66.	disorderly	0	1	2	3
17.	assertive	0	1	2	3	67.	dissatisfied	0	1	2	3
18.	attractive	0	1	2	3	68.	distractible	0	1	2	3
19.	autocratic	0	1	2	3	69.	distrustful	0	1	2	3
20.	awkward	0	1	2	3	70.	dominant	0	1	2	3
21.	bitter	0	1	2	3	71.	dreamy	0	1	2	3
22.	blustery	0	1	2	3	72.	dull	0	1	2	3
23.	boastful	0	1	2	3	73.	easy going	0	1	2	3
24.	bossy	0	1	2	3	74.	effeminate	0	1	2	3
25.	calm	0	1	2	3	75.	efficient	0	1	2	3
26.	capable	0	1	2	3	76.	egotistical	0	1	2	3
27.	careless	0	1	2	3	77.	emotional	0	1	2	3
28.	cautious	0	1	2	3	78.	energetic	0	1	2	3
29.	changeable	0	1	2	3	79.	enterprising	0	1	2	3
30.	charming	0	1	2	3	80.	enthusiastic	0	1	2	3
31.	cheerful	0	1	2	3	81.	evasive	0	1	2	3
32.	civilized	0	1	2	3	82.	excitable	0	1	2	3
33.	clear-thinking	0	1	2	3	83.	fair-minded	0	1	2	3
34.	clever	0	1	2	3	84.	fault-finding	0	1	2	3
35.	coarse	0	1	2	3	85.	fearful	0	1	2	3
36.	cold	0	1	2	3	86.	feminine	0	1	2	3
37.	commonplace	0	1	2	3	87.	fickle	0	1	2	3
38.	complaining	0	1	2	3	88.	flirtatious	0	1	2	3
39.	complicated	0	1	2	3	89.	foolish	0	1	2	3
40.	conceited	0	1	2	3	90.	forceful	0	1	2	3
41.	confident	0	1	2	3	91.	foresighted	0	1	2	3
42.	confused	0	1	2	3	92.	forgetful	0	1	2	3
43.	conscientious	0	1	2	3	93.	forgiving	0	1	2	3
44.	conservative	0	1	2	3	94.	formal	0	1	2	3
45.	considerate	0	1	2	3	95.	frank	0	1	2	3
46.	contented	0	1	2	3	96.	friendly	0	1	2	3
47.	conventional	0	1	2	3	97.	frivolous	0	1	2	3
48.	cool	0	1	2	3	98.	fussy	0	1	2	3
49.	cooperative	0	1	2	3	99.	generous	0	1	2	3
50.	courageous	0	1	2	3	100.	gentle	0	1	2	3

101. gloomy	0	1	2	3	151. mild	0	1	2	3
102. good looking	0	1	2	3	152. mischievous	0	1	2	3
103. good natured	0	1	2	3	153. moderate	0	1	2	3
104. greedy	0	1	2	3	154. modest	0	1	2	3
105. handsome	0	1	2	3	155. moody	0	1	2	3
106. hard-headed	0	1	2	3	156. nagging	0	1	2	3
107. hard-hearted	0	1	2	3	157. natural	0	1	2	3
108. hasty	0	1	2	3	158. nervous	0	1	2	3
109. headstrong	0	1	2	3	159. noisy	0	1	2	3
110. healthy	0	1	2	3	160. obliging	0	1	2	3
111. helpful	0	1	2	3	161. obnoxious	0	1	2	3
112. high-strung	0	1	2	3	162. opinionated	0	1	2	3
113. honest	0	1	2	3	163. opportunistic	0	1	2	3
114. hostile	0	1	2	3	164. optimistic	0	1	2	3
115. humorous	0	1	2	3	165. organized	0	1	2	3
116. hurried	0	1	2	3	166. original	0	1	2	3
117. idealistic	0	1	2	3	167. outgoing	0	1	2	3
118. imaginative	0	1	2	3	168. outspoken	0	1	2	3
119. immature	0	1	2	3	169. painstaking	0	1	2	3
120. impatient	0	1	2	3	170. patient	0	1	2	3
121. impulsive	0	1	2	3	171. peaceable	0	1	2	3
122. independent	0	1	2	3	172. peculiar	0	1	2	3
123. indifferent	0	1	2	3	173. persevering	0	1	2	3
124. individualistic	0	1	2	3	174. persistent	0	1	2	3
125. industrious	0	1	2	3	175. pessimistic	0	1	2	3
126. infantile	0	1	2	3	176. planful	0	1	2	3
127. informal	0	1	2	3	177. pleasant	0	1	2	3
128. ingenious	0	1	2	3	178. pleasure-seeking	0	1	2	3
129. inhibited	0	1	2	3	179. poised	0	1	2	3
130. initiative	0	1	2	3	180. polished	0	1	2	3
131. insightful	0	1	2	3	181. practical	0	1	2	3
132. intelligent	0	1	2	3	182. praising	0	1	2	3
133. interests narrow	0	1	2	3	183. precise	0	1	2	3
134. interests wide	0	1	2	3	184. prejudiced	0	1	2	3
135. intollerant	0	1	2	3	185. preoccupied	0	1	2	3
136. inventive	0	1	2	3	186. progressive	0	1	2	3
137. irresponsible	0	1	2	3	187. prudish	0	1	2	3
138. irritable	0	1	2	3	188. quarrelsome	0	1	2	3
139. jolly	0	1	2	3	189. queer	0	1	2	3
140. kind	0	1	2	3	190. quick	0	1	2	3
141. lazy	0	1	2	3	191. quiet	0	1	2	3
142. leisurely	0	1	2	3	192. quitting	0	1	2	3
143. logical	0	1	2	3	193. rational	0	1	2	3
144. loud	0	1	2	3	194. rattlebrained	0	1	2	3
145. loyal	0	1	2	3	195. realistic	0	1	2	3
146. mannerly	0	1	2	3	196. reasonable	0	1	2	3
147. masculine	0	1	2	3	197. rebellious	0	1	2	3
148. mature	0	1	2	3	198. reckless	0	1	2	3
149. meek	0	1	2	3	199. reflective	0	1	2	3
150. methodical	0	1	2	3	200. relaxed	0	1	2	3

201.	reliable	0	1	2	3	251.	strong	0	1	2	3
202.	resentful	0	1	2	3	252.	stubborn	0	1	2	3
203.	reserved	0	1	2	3	253.	submissive	0	1	2	3
204.	resourceful	0	1	2	3	254.	suggestible	0	1	2	3
205.	responsible	0	1	2	3	255.	sulky	0	1	2	3
206.	restless	0	1	2	3	256.	superstitious	0	1	2	3
207.	retiring	0	1	2	3	257.	suspicious	0	1	2	3
208.	rigid	0	1	2	3	258.	sympathetic	0	1	2	3
209.	robust	0	1	2	3	259.	tactful	0	1	2	3
210.	rude	0	1	2	3	260.	tactless	0	1	2	3
211.	sarcastic	0	1	2	3	261.	talkative	0	1	2	3
212.	self-centered	0	1	2	3	262.	temperamental	0	1	2	3
213.	self-confident	0	1	2	3	263.	tense	0	1	2	3
214.	self-controlled	0	1	2	3	264.	thankless	0	1	2	3
215.	self-denying	0	1	2	3	265.	thorough	0	1	2	3
216.	self-pitying	0	1	2	3	266.	thoughtful	0	1	2	3
217.	self-punishing	0	1	2	3	267.	thrifty	0	1	2	3
218.	self-seeking	0	1	2	3	268.	timid	0	1	2	3
219.	selfish	0	1	2	3	269.	tolerant	0	1	2	3
220.	sensitive	0	1	2	3	270.	touchy	0	1	2	3
221.	sentimental	0	1	2	3	271.	tough	0	1	2	3
222.	serious	0	1	2	3	272.	trusting	0	1	2	3
223.	severe	0	1	2	3	273.	unaffected	0	1	2	3
224.	sexy	0	1	2	3	274.	unambitious	0	1	2	3
225.	shallow	0	1	2	3	275.	unassuming	0	1	2	3
226.	sharp-witted	0	1	2	3	276.	unconventional	0	1	2	3
227.	shiftless	0	1	2	3	277.	undependable	0	1	2	3
228.	show-off	0	1	2	3	278.	understanding	0	1	2	3
229.	shrewd	0	1	2	3	279.	unemotional	0	1	2	3
230.	shy	0	1	2	3	280.	unexcitable	0	1	2	3
231.	silent	0	1	2	3	281.	unfriendly	0	1	2	3
232.	simple	0	1	2	3	282.	uninhibited	0	1	2	3
233.	sincere	0	1	2	3	283.	unintelligent	0	1	2	3
234.	slipshod	0	1	2	3	284.	unkind	0	1	2	3
235.	slow	0	1	2	3	285.	unrealistic	0	1	2	3
236.	sly	0	1	2	3	286.	unscrupulous	0	1	2	3
237.	smug	0	1	2	3	287.	unselfish	0	1	2	3
238.	snobbish	0	1	2	3	288.	unstable	0	1	2	3
239.	sociable	0	1	2	3	289.	vindictive	0	1	2	3
240.	soft-hearted	0	1	2	3	290.	versatile	0	1	2	3
241.	sophisticated	0	1	2	3	291.	warm	0	1	2	3
242.	spendthrift	0	1	2	3	292.	wary	0	1	2	3
243.	spineless	0	1	2	3	293.	weak	0	1	2	3
244.	spontaneous	0	1	2	3	294.	whiny	0	1	2	3
245.	spunky	0	1	2	3	295.	wholesome	0	1	2	3
246.	stable	0	1	2	3	296.	wise	0	1	2	3
247.	steady	0	1	2	3	297.	withdrawn	0	1	2	3
248.	stern	0	1	2	3	298.	witty	0	1	2	3
249.	stingy	0	1	2	3	299.	worrying	0	1	2	3
250.	stolid	0	1	2	3	300.	zany	0	1	2	3

A P P E N D I X B

TABLE 1

NUMBER OF RESPONSE AGREEMENTS BETWEEN PAIRS
OF ADJECTIVE LISTS FOR EACH MEMBER OF
THE SAMPLE POPULATION

TABLE 1

NUMBER OF RESPONSE AGREEMENTS BETWEEN PAIRS OF ADJECTIVE LISTS FOR EACH MEMBER OF THE SAMPLE POPULATION

Subject Code No.	SC--OP[1]	SC--OS	OP--OS
040	300	249	249
153**	300	286	286
131**	294	298	294
122**	290	286	288
157	290	234	224
217*	286	272	276
006**	286	278	286
136	285	253	252
032*	268	284	272
015**	272	282	276
162**	280	277	279
053	272	276	274
099**	270	276	276
059**	262	274	266
100**	253	275	256
026**	267	273	272
002**	274	248	258
078**	266	263	251
186**	269	261	264
177**	265	263	256
024**	269	261	270
187*	268	266	286
215**	266	256	258

[1]SC - Self Concept OP - Occupational persona
OS - Occupational stereotype

*Included in the experimental sample, but did not return instruments or instruments were incomplete and unusable.

**Data included in the study -- Part of final experimental sample of 72

TABLE 1 (continued)

Subject Code No.	SC--OP[1]	SC--OS	OP--OS
143**	269	255	268
098**	266	260	274
088**	251	267	260
062*	266	264	282
004**	276	266	272
018**	252	265	251
214**	265	260	273
038**	261	266	281
095	268	212	230
001**	255	264	263
198**	255	260	255
133	265	239	248
197**	262	250	260
037**	261	256	269
190**	260	248	250
012	264	232	238
070**	258	259	275
151**	260	254	266
105	263	229	228
085**	261	256	273
141**	261	252	265
130	261	242	241
225	262	237	247
119**	258	263	263
221**	259	256	271
094	260	242	250
126**	260	251	273
120**	249	260	271
148	257	247	258
102	253	254	267
077	255	248	261
097	250	241	237

TABLE 1 (continued)

Subject Code No.	SC--OP[1]	SC--OS	OP--OS
118	256	239	251
110	253	244	257
154	253	250	277
124	250	249	265
033	248	235	233
029	250	235	253
219	250	243	257
034	240	255	263
181	244	249	263
081	250	242	256
104	247	245	266
147	252	220	234
080	248	248	282
189	245	220	237
145	250	233	265
149	243	245	268
030	248	241	269
158	242	249	275
051	249	246	257
142	237	245	260
171	233	242	245
093	241	230	251
027	237	246	279
045	236	243	243
132	236	234	236
192	241	178	189
003	241	236	275
222	239	238	263
054	243	211	232
106	236	233	247
005	236	236	262
007*	224	236	256

TABLE 1 (continued)

Subject Code No.	SC--OP[1]	SC--OS	OP--OS
127*	225	234	247
185*	229	227	238
103**	236	220	258
113**	226	233	265
014**	228	219	239
125**	231	220	249
112**	232	212	238
010**	227	223	258
212**	227	234	277
049	234	239	269
035	244	248	268
140**	226	219	241
168**	217	230	277
134**	226	216	236
129**	222	226	256
020**	226	194	202
176**	215	224	273
089**	215	216	243
204**	229	224	263
150**	210	215	241
117*	227	209	206
039**	213	204	251
108**	208	214	232
193**	213	215	258
075**	183	218	227
048**	210	189	201
083**	215	181	174
166**	210	189	207
229**	208	196	244
183**	202	200	214
188**	194	199	273
209**	183	177	174

TABLE 1 (continued)

Subject Code No.	SC--OP[1]	SC--OS	OP--OS
173**	186	189	231
055**	185	182	227
216**	188	180	260
011	246	199	237
019**	178	160	236
137**	165	174	203
210**	162	166	214
180**	147	152	261
174**	186	196	242
101**	173	183	178

Note:

The criteria for inclusion in the group considered to have similar self concepts, occupational personas and occupational stereotypes were:

1. SC--OP agreements equal to or exceeding 249.
2. SC--OS agreements equal to or exceeding 248.
3. Difference between SC--OP and SC--OS agreements not to exceed 26.

The criteria for inclusion in the group considered to have the least similar self concepts, and occupational personas and occupational stereotypes were:

1. SC--OP agreements equal to or less than 236.
2. SC--OS agreements equal to or less than 239.
3. Difference between SC--OP and SC--OS agreements not to exceed 34.

A P P E N D I X C

LETTERS

FROM: Glenn A. Chaffee, doctoral student in Counseling and Guidance
TO: Instructors of MMM 205 & 206
RE: Information concerning research project

The research project in which your classes are being asked to participate is an effort to develop a greater understanding of the problem of vocational development. While this study is being limited to engineering students, it is hoped that the theoretical base will be generalizable to other vocational groups.

With respect to the research task, the students will be asked to make some choices concerning the appropriateness of 300 adjectives when applied to themselves, to engineers practicing in the profession, and to themselves when viewed as workers by others. The three lists will be compared for each student. From the total population of students completing the check lists, approximately 60 will be asked to complete a relatively short questionnaire and to take two well known tests--one an occupational interest inventory and the other a personal preference schedule. The total time involved for those completing just the check list will be approximately one hour, and for those completing the entire series approximately three hours.

I would like to take from 5 to 10 minutes of a class period to present the check list and to answer any questions that might be asked. If this were done on Tuesday, April 4, the date for returning them to the class would be the following Monday. I would be happy to be present that day to pick them up. From the results of the processing of these data, the final group of 60 will be chosen and the method of procedure for collecting the remaining data finalized.

All data will be held in strictest confidence, but the compiled results will be available to any who are interested. I will also be happy to discuss the total research project with any who would like me to do so.

Thank you very much for your help. Your kindness will not only help in the solving of the research problem, but also aid me in completing my doctoral dissertation! Again, many thanks.

Gentlemen:

Thanks to your help, the first part of my research project has gone quite well. The most crucial aspect of the study now remains to be done.

The letter I have included with the packets for your classes outlines the tasks to be completed by the fellows selected for this part of the project. You will note that I am going to arrange a time for discussing the test results and the total study for all who are interested.

Because of the statistical analyses that will be used in interpreting the data, it is <u>extremely important</u> that there be as near a 100% return of the materials as possible. Without this the whole study could very easily go down the drain. Needless to say, anything you could do to get all the data returned will be deeply appreciated!

In the event that a student is absent today, please give the packet to him tomorrow or Friday. I have arranged with Dr. Montgomery to pick-up the completed materials in his office as before.

If you have any questions about any of this, please feel free to call me. And let me say again, thank you very much for your kindness in helping me with this project.

Sincerely,

Glenn Chaffee

Glenn Chaffee

MICHIGAN STATE UNIVERSITY East Lansing, Michigan 48823

Counseling Center - Student Services Building

First of all, let me thank you for the time you have already spent in participating in this research project. Your help has been invaluable. As a result of the findings thus far, we are now able to move on to the most crucial part of the study.

Enclosed with this letter you will find a questionnaire, a Strong Vocational Interest Blank and answer sheet, and an Edwards Personal Preference Schedule and answer sheet. The questionnaire was specially developed for this project, but the Strong and the Edwards are routinely used at the MSU Counseling Center in vocational counseling. The directions for each are clear. Simply follow them as they are stated. Completing all three should take you something less than two hours; however, it is not necessary that you finish the project all at once. Let me remind you, also, that all information is confidential. It is not necessary for you to put your name on any of the materials, but you may if you so desire.

Since I am sure that most of you will be interested in the results of the tests, I will arrange a time for interpreting them for you both as a group and individually if you desire. At that time I will be more than happy to answer any questions you might have about the research project as well as your part in it.

Because of the time pressure as we move toward the end of Spring term, it is extremely important that the materials be returned to your instructor on Monday, May 8th, if at all possible. If it is not possible for you to meet this schedule, please hand them in on Wednesday, May 10th. It will be helpful if you return the materials in the envelope in which you receive them. If you have any questions at all, please feel free to call me either at the Counseling Center -- 5-8270 -- or at my home -- 332-1446.

Again, I want you to know that your help in this project is deeply appreciated. Not only is this a help to me personally, but at this point in the study it appears quite likely that the findings will make an important contribution to our understanding of the process of vocational choice.

Sincerely,

Glenn A. Chaffee
Assistant Instructor, Counseling Center

P.S. The Strong and Edwards materials are on loan from the MSU Testing Center. Please be sure to return the booklets unmarked. Thank you.

TO: MAM 205 & 206 and CHE 202 & 203 instructors
FROM: Glenn A. Chaffee
RE: Meeting for test interpretation

Gentlemen:

Again, thanks to your cooperation, the second phase of the [illegible] study came off very well. Of the 60 tests that [illegible] were turned out, 47 were returned. [illegible]

I am ready now to interpret the tests for the fellows that participated in the last phase of the study and to discuss with anyone that objects to the purpose and preliminary findings of the study. Please announce in your classes that I will meet with all interested people at 5:00 o'clock Thursday afternoon, June 1, in room 146 in the engineering building.

If there are those who are interested but unable to meet at the specified time, please that will be at 5-o'clock or 12-1 and I will arrange a time to meet with them.

[illegible] very much.

Sincerely,

Glenn Chaffee

A P P E N D I X D

THE QUESTIONNAIRE

Code No. _____

A STUDY OF VOCATIONAL DEVELOPMENT

This questionnaire has been developed to obtain information that will help in understanding the process of vocational development. The questions have been designed to get the maximum information in the minimum amount of time. All of your responses will be held in strict confidence. Please do not discuss your answers with anyone since your individual opinions are of the utmost importance. Thank you very much for your assistance.

1. How old were you when you first considered the possibility of a career in engineering? _____ (years)

2. How old were you when you made the definite decision to enter an engineering school? _____ (years)

3. What is your present age? _____(years)

4. What is your father's present occupation? (Be specific; for example: Pipe fitter, civil engineer, etc. If deceased or retired, specify last occupation.) _____

_____

5. Quite possible you were influenced to enter the field of engineering through your observation of someone who was an engineer. This significant person may have been a close relative or someone you observed from a distance. From the following list, choose the one that applies and check it.

_____ Father
_____ Brother
_____ Uncle
_____ Grandfather
_____ Close friend of the family
_____ Neighbor
_____ Someone for whom you worked
_____ Other (Specify) _____
_____ I didn't know any engineers
_____ I knew an engineer, but that had nothing to do with my choice.

6. Influences other than significant people who were engineers might also have been at work in moving you toward choosing engineering as a vocation. From the following list, rank the <u>three</u> greatest influences in order of importance, <u>1</u> being the most important, <u>2</u> the next most important, and <u>3</u> the least important.

_____ Father
_____ Mother
_____ Uncle
_____ Brother

____ Grandparents
____ Friends
____ High school counselor
____ High school teacher
____ Books, magazines, articles you've read concerning the work of engineers
____ Finding scientific and technical courses in high school interesting and challenging
____ Other (Specify) _____

_____

7. In the process of deciding to become an engineer, you developed some ideas concerning the work an engineer does. These ideas came from many sources. From the following list choose the three that were most important for you, and rank them in the order of importance with 1 being the most important:

____ Close relatives who were engineers
____ Close relatives who were not engineers
____ High School teachers
____ High School counselors
____ Family friend
____ Neighbor
____ Books you've read on engineering
____ Working with or around men who were engineers
____ From reading technical magazines or journals like Scientific American
____ From reading Popular Science or similar magazines
____ From seeing engineers portrayed in movies
____ From descriptions of engineering projects in newspapers
____ Other (Specify) _____

8. Certain factors entered into your final choice prior to entering the field of engineering as a student. Indicate the extent to which the following factors were important in your decision:
If one was of very great importance, circle VGI; if of great importance, circle GI; if of moderate importance; circle MI; if of little importance, circle LI.

a.	Engineering provides an opportunity to use my special abilities or aptitudes	VGI	GI	MI	LI
b.	Engineering provides an opportunity to earn a good deal of money	VGI	GI	MI	LI
c.	Engineering permits me to be creative and original	VGI	GI	MI	LI
d.	As a profession, engineering gives social status and prestige	VGI	GI	MI	LI
e.	Engineering enables me to work with things rather than people	VGI	GI	MI	LI
f.	As a successful engineer I could look forward to a stable, secure future	VGI	GI	MI	LI

g. As an engineer I could be relatively free of supervision by others VGI GI MI LI

h. Engineering provides an opportunity to exercise leadership VGI GI MI LI

i. Engineering offers adventure VGI GI MI LI

j. As an engineer I will have an opportunity to be helpful to others VGI GI MI LI

k. By becoming an engineer I can repay my parents for all they have done for me VGI GI MI LI

l. Being an engineer allows me to be a man among men in a traditionally masculine vocation VGI GI MI LI

m. Engineering gives me a chance to identify interesting problems and to work out solutions to them VGI GI MI LI

n. Engineering provides opportunity to work with and understand complicated machinery and/or processes VGI GI MI LI

o. The engineering profession will enable me to enjoy a higher standard of living than my parents were able to enjoy VGI GI MI LI

p. As an engineer I will have opportunity to use mathematical procedures in arriving at the solutions to various problems VGI GI MI LI

9. In which extra-curricular activities did you participate in high school? (Check <u>all</u> appropriate responses.)

_____ Individual sports
_____ Team sports
_____ Science or math clubs
_____ JETS club
_____ Musical organizations
_____ Dramatics
_____ Publications (Newspaper, yearbook, etc.)
_____ Speech and/or debate team
_____ Foreign language clubs
_____ Student government
_____ Other (Specify)
_____ I did not participate in any extra-curricular activities

10. Following is a list of the various kinds of extra-curricular activities one might participate in at MSU. Respond by placing an (X) under the word that best indicates the extent of your participation.

	Regularly	Occasionally	Seldom	Never
a. Attending varsity sports events	____	____	____	____
b. Participating in various intramural sports	____	____	____	____
c. Attending various social events such as Homecoming Dance, Water Carnival, Greek Feast, J Hop, etc.	____	____	____	____
d. Attending the University Theatre productions such as staged by Performing Arts Company and Arena Productions	____	____	____	____
e. Attending or participating in musical events like the Lecture Concert Series, MSU Symphony, Recitals, University Chorus, Glee Club	____	____	____	____
f. Attending art exhibits at Kresge Art Center or other places on campus	____	____	____	____
g. Attending lectures such as Department Coloquia or the Provost Series	____	____	____	____
h. Attending film showings in the World Travel, Film Classics, or Foreign Film programs	____	____	____	____
i. Attending the Career Carnival and/or various engineering exhibits	____	____	____	____

11. By this time in your career you have some feeling about the course of study as you have experienced it. Please check the response that best indicates your present feeling.

_____ I like it very much
_____ I am satisfied
_____ I'm not very happy with it
_____ I don't like it at all

12. Check the expression which best indicates the extent to which you feel committed to engineering as a vocation.

_____ Engineering is <u>definitely</u> my choice as a vocation
_____ I will probably go on to become an engineer
_____ Right now I'm not sure what I'm going to do
_____ Chances are that I will <u>not</u> become an engineer

13. Please read the instructions for the following questions carefully. Keep in mind that there are no "right" or "wrong" answers to these questions.

a. What do you expect to find most satisfying in your job as an engineer? Select from the following list the 3 things you expect to like most. In the spaces provided, place a number 1 next to the one you expect to like most, a number 2 next to your 2nd choice and number 3 next to your 3rd choice. Be sure to make 3 selections.

_____ Enjoyable outdoor work
_____ Chance to be a leader
_____ Being looked upon very highly
_____ Being well paid
_____ Security of steady job
_____ Not having to make decisions
_____ Opportunities to use my abilities fully
_____ Telling other people what to do on job
_____ Helping others
_____ Working with people I like
_____ Interesting job duties
_____ Freedom from too close supervision
_____ Opportunity for advancement
_____ Opportunity for competition

b. If you had complete freedom of choice, which of the following would you choose?
In the spaces provided, place a number 1 next to your first choice, a number 2 next to your 2nd choice, a number 3 next to your 3rd choice. Be sure to make 3 selections.

_____ A job working mostly on your own
_____ A job being with people you like
_____ A job having very good chances for advancement
_____ A job doing healthy outdoor work
_____ A job having good chances to compete with others
_____ A job with very interesting duties
_____ A job where you would be boss
_____ A job using your full abilities
_____ A job in which you would be a leader
_____ A job where you would be looked up to by your fellow workers
_____ A job where you would follow instructions and not decide what to do
_____ A job in which you would be absolutely certain of no lay-off
_____ A job helping other people

c. Which of the following did you consider in deciding to go into engineering? Please select from the following the 3 most important factors. In the spaces provided, place a number 1 next to your 1st choice, a number 2 next to your 2nd choice and a number 3 next to your 3rd choice. Make 3 selections.

_____ Stimulating opportunity for competition with others
_____ Very good possibilities for advancement
_____ Being sure my job will continue
_____ Being able to work independently with little supervision.
_____ Working outdoors in pleasant surroundings

_____ Being the person who orders others to do jobs
_____ Being able to help others
_____ The chance to be a leader
_____ Following instructions, letting others make job decisions
_____ Excellent opportunity to fully use my skills and abilities
_____ Making a great deal of money
_____ Being thought of highly among those I work with
_____ The pleasure of working with people I like
_____ Enjoying job duties which are very interesting

14. Following is a list of tasks or responsibilities that may or may not be part of an engineer's job. If you think that one of the listed items would likely be part of an engineer's function during the first three years of his working in the field, place an (X) under "yes" in the space provided. If you think an item does not represent an appropriate engineering responsibility or represents a task or responsibility more appropriate for an engineer with more than three years experience, place an (X) under "no" in the space provided.

YES	NO	ITEM
X		Member of a research team working with specialists in other disciplines
	X	Serving as a member of the Board of Directors of a company
X		Selling a company's products or services to individual customers
X		Shift supervisor in the start-up of a new production operation
X		Working with a technical draftsman in the design of a new piece of equipment
	X	Preparing and presenting a paper at a national technical meeting
X		Generating design drawings of a process, equipment, or machine part.
X		Conducting laboratory work to solve a problem
X		Reviewing research results with the director of research for a company
	X	Working as a project engineer supervising a small group of engineers in the solving of an industry related problem
X		Serve as a "fact gatherer" for a project group
X		Conducting time and motion studies of a production process
X		Work in various departments of a company on a rotating basis
	X	Serving as coordinator of the design of a production plant by a consulting engineering firm for a company
X		Develop computer programs relating to various operations of the company
X		"De-bug" a particular manufacturing process in order to improve quality and/or cost factors
X		Writing technical reports for company-wide distribution
	X	Serving as manager of a small production plant or as head of a department in a larger corporation.
X		Co-inventing a new process or product
	X	Working with instrument manufacturers in designing and specifying a process optimization system utilizing computer control
X		Do a cost analysis or estimate of a production process

YES	NO	ITEM
	X	Analyzing market and competition in order to determine possibilities for potential new products
X		Assist in the preparation of patent applications
	X	Manager of a department for product development

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