A STUDY OF THE EXPECTATIONS OF ENGINEERING FRESHMEN AND THE PERCEPTIONS OF ENGINEERING UPPERCLASSMEN AT MICHIGAN STATE UNIVERSITY

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ABSTRACT

A STUDY OF THE EXPECTATIONS OF ENGINEERING FRESHMEN AND THE PERCEPTIONS OF ENGINEERING UPPERCLASSMEN AT MICHIGAN STATE UNIVERSITY

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In this age of great technological demand, engineering educators must prepare the quality graduates who will be able to contribute to the solution of society's most critical problems. They must provide a program which is both topical and relevant for faculty, students, and society at large. To be most effective, it is important an engineering college keep abreast of student attitudes, expectations and perceptions. A study of the expectations of entering engineering freshmen and the perceptions of engineering upperclassmen can provide some valuable information about an engineering student body, their needs and attitudes towards their academic programs.

It was the purpose of this study to compare the expectations of entering engineering students with the perceptions of upperclass engineering students in relation to their academic programs. This was accomplished through a study of freshmen expectations, upperclass perceptions, and

a use of the resultant data for comparative purposes. The data generated by upperclassmen was used as the realistic standard of measure for determining the academic environment of engineering students at Michigan State University. A comparison with freshmen data identified the extent to which freshmen expectations were impractical or unrealistic.

The population of this study was defined as all male and female students enrolled in the College of Engineering at Michigan State University during Fall quarter 1973. The sample was comprised of two groups--freshmen and upperclassmen.

The freshmen were defined as those members of the population who were attending college for the first time in Fall 1973. All had been classified by the University as "engineering--no major," even though many did have a major in mind when they came on campus.

The upperclassmen were defined as those students who had previously enrolled for courses at Michigan State and had accumulated enough credits to be categorized as "juniors" or "seniors." Students representing six engineering majors participated in the study.

A questionnaire was developed to test seven null hypotheses relevant to the students' academic environment in the College of Engineering. Each hypothesis stated "no difference will be found between the expectations of

entering engineering freshmen and the perceptions of engineering upperclassmen" in the following categories:

1. Faculty-Student Relationships
2. Student-Student Relationships
3. Teaching-Learning Environment
4. Personal Attention
5. Difficulty of Material
6. Discussion Opportunities
7. Career Outcomes.

The same questionnaire was administered to both freshmen and upperclassmen with one minor change. All of the questions in the freshman instrument were worded "I expect that . . ." (i.e., faculty members are interested in a student's personal problems). In the upperclass questionnaire, a special section was created to obtain information concerning sex, major, and class. This information was used to gather major/sex differences on responses to the instrument.

Each question was tested using the chi-square statistic. The chi-square method of analysis was chosen since there were two independent population samples with a sufficiently large number of respondents. A computer program was selected to perform the necessary calculations for each of the questions and variables in the questionnaire. A level of significance at the .05 level was used.

Results of computer analyses on each of the seven hypotheses made it possible to reject the null hypotheses in each case. It was found that freshmen were more positive in their responses than were upperclassmen in each of the seven categories. Using the perception scores of upperclass engineering students as the standard measure of reality, it was concluded that the expectations of entering engineering students were impractical and unrealistic.

Four additional computer analyses were performed on the data. The first test computed overall percentages for each response on the thirty-eight questions. On the basis of these results, ten items were removed from further consideration, as no statistical differences were found. Three additional tests were performed to analyze the results by freshmen-upperclass differences, major field of study, and sex. Twenty-four items proved to be significant in the freshmen-upperclass categories, fourteen were significant in the major field analysis, and two were significant when computed by sex.

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THE PROBLEM

Introduction

> The accelerating pace of technological change in all nations and the growing emphasis on industrialization in those slowly emerging from economic chaos are both real and important phenomena of our time. One consequence of both is that the engineering profession will have an increasingly important, increasingly visible, and much broader role to play in all future world societies--or none. As that profession concerned principally with the use of knowledge to deal with (to 'solve' if you will) the constantly changing problems of the real world within which we function, it represents one of man's oldest professional interests. But there will now be many new demands on and new responsibilities assigned to the engineering profession plus new degrees of accountability to be considered. The present cry that engineers demonstrate more concern for the socio-economic impact of their technologies is only one manifestation of this trend.
>
> For engineering educators, these new demands will require that we prepare our students in new ways to meet the challenges of the future.
>
> H. E. Hoelscher [41]

Modern technology is truly on the brink of change and development, and at a period in history when mankind may be facing some of its most serious and pressing crises. The problems of the cities, of effective transportation, of pollution, of food production and distribution, and the productive and efficient utilization of the world's energy supply are some of the critical issues with which engineers

of the present and future must be equipped to deal. Today's engineer has available a variety of methods and tools to assist in these quests. The advent of the computer and other high-powered technological instruments have added new dimensions to the modern problem-solving approach. Each year a tremendous sum of money is spent on research activities. But, despite the tools and the dollars, the problem-solving process in these areas is, at times, painfully slow.

It is important that engineering educators prepare the quality graduates who will be able to contribute to the solution of these sensitive issues. The training and experiences which are given these students will determine, to a large degree, how effectively they will be able to handle these challenges. To this effect, engineering schools around the country are developing new majors and implementing new and unique teaching methods. Programs such as Michigan State University's interdisciplinary Engineering Arts major and the new biomedical engineering option are indicative of innovative efforts at various engineering schools. Computerized instruction, self-paced learning, and modern audio-visual techniques are changing many traditional teaching-learning concepts.

Despite new engineering programs, the optimistic future for technology, and the opportunity for students to interface with the critical challenges of the future, engineering is suffering from a severe decline in enrollments.

Approximately 50,000 engineering graduates were placed in jobs last year, yet projections for engineering graduates in 1976 are expected to be only about 30,000. In addition to low enrollments, attrition (defined as all losses from Engineering for whatever reason) continues to be a major source of concern for engineering schools. Many qualified students are leaving engineering programs each year to pursue another major of interest. In the Michigan State University College of Engineering, the attrition rate is more than thirty percent every year.

While engineering schools have done a respectable job of preparing graduates, developing new courses and implementing new research and teaching programs, only a comparatively modest effort has been made to understand today's engineering student. Current and relevant literature is especially weak in the areas of the perceptions of engineering students toward their academic programs. Even less has been written about entering freshmen engineering students, and their expectations of their academic programs. In the Augustine study it was found that:

> Non-persisters cite a variety of reasons for changing out of engineering. Those most frequently mentioned include:
>
> a) Students had mistaken impressions of the engineering field.
> b) Students were dissatisfied with the content of required courses.
> c) The student's scholastic performance did not meet his self-expectations.[6]

A lack of accurate knowledge about the engineering field and a set of unrealistic and impractical expectations are significant problems to the entering engineering student and an eventual contributor in part, to the high attrition rate.

It has been found that family, friends, high school teachers, and counselors are most instrumental in the student's decision on whether to go to college and to their choice of major. Research done by Stanfel and Watts [87], Sandeen [76], Dole [25], Shill [82], Roberts [74], Soper [85], and Stern [88], point out that besides choice of major and college intentions, it is these same people who help the student gather information, formulate opinions and attitudes, and ultimately develop a set of expectations about the college environment. College catalogs, personal experience, correspondence, hearsay reports, and glorified opinions, aid parents, teachers, counselors, and of course, the student in forming the basis of the information which goes into these various input processes.

Students who choose engineering as a major are oftentimes a distinct group. Gallessich [32], Khan and D'Oyley [48], and Kinloch [50] are among many who have found a high correlation between choice of engineering as a field of study and good high school grades and test scores. Engineering students typically represent the best groups of high school graduating classes. Heckler

et al. [39] found the best predictor of success in engineering to be grades and test scores in high school mathematics and science courses.

Engineering freshmen have been found by researchers such as Hammond [38], DeFiore [24], Bennigson [10], Elton and Rose [27], to be oriented in a materialistic, practical, vocational, conservative and intolerant manner. They are highly motivated toward career training, getting the degree and a job, and making money. Heckler et al. [39] found that 91 percent of engineering freshmen have definite ideas about the career they want before enrolling for their first course.

Yet as pointed up by Augustine [6], engineering students admit that their expectations exceeded reality. Heckler et al. [39] in the previously mentioned study found that of the 91 percent who had definite career ideas, 23 percent changed their minds after one term on campus. As studied by Buckley [15], Quay and Dole [70], Caple [16], Berdie [12], Standing and Parker [86], and Pate [66], idealistic expectations for the new student seem to be the rule, rather than the exception. Pre-college attitudes toward professors, students, the classroom and non-classroom environment are consistently viewed in a positive and idealistic manner.

Yet, different attitudes held by freshmen and seniors show that significant change can and does take

place over a four-year college career. Feldman and Newcomb [29], Sanford [78], Lehmann [52] and others have studied this phenomenon. Seniors become more outer-directed, can think critically better, and are less materialistically and vocationally oriented than freshmen. Seniors also feel that college does more than prepare one for a career.

But, as pointed out by many of those who study college environments, such as Astin [2], Stern [88], and Pace [63], environmental effects, attitudes and perceptions can vary from one university to another and from one major to another on the same campus. It follows that an engineering student at X university is apt to be quite different in interests, background and outlook on life than a liberal arts major from the same campus.

Therefore, it is important, in this age of great technological demand, that engineering educators continue to provide a program which is both relevant and topical for the faculty, students, and society at large. A study of the expectations of entering engineering freshmen and the perceptions of engineering upperclassmen can provide some valuable information about an engineering student body and attitudes toward their academic programs. There is a critical need to assess those areas and ideas of entering engineering students which are being idealized, and what unrealistic expectations about the engineering program they

are bringing with them. There is also a need to obtain information on those views of upperclass engineering students toward their educational program, the faculty, the teaching-learning process and their fellow students.

The College of Engineering at Michigan State University prides itself on its personal contact and services for the student. An ongoing advising program staffed by professionals, small classes, a helpful and knowledgeable faculty, semi-annual open houses, an effective orientation program, and a great deal of communication serve to help make this goal a reality for the college. Yet, a viable program cannot rest on its laurels. To remain effective, it is of great importance the College keep abreast of student attitudes, expectations, and perceptions. These data will provide a means of gauging effectiveness, and perhaps give the impetus for further change and development. This information will be of tremendous importance to the College's efforts in communicating with high schools and community colleges, working with faculty and advisors, and planning the open houses and orientation programs. It will also provide valuable input for curriculum structure, and academic program development. Ultimately, these data will be a step toward filling the void which exists in research about engineering students, their attitudes, expectations, and perceptions of their academic program.

Statement of Problem

Their is evidence to indicate that the expectations of the entering engineering student need to be analyzed and evaluated. There is also a need for a critical examination of the perceptions of engineering upperclassmen towards their academic programs. An analysis and comparison of this information will provide valuable input to engineering educators as they attempt to prepare engineering graduates to meet the challenges of the future more effectively.

Purpose

The primary purpose of this study is to compare the expectations of entering engineering students with the perceptions of upperclass engineering students in relation to their academic programs. This will be accomplished through a study of freshmen expectations, upperclass perceptions, and a use of the resultant data for comparative purposes. The data generated by upperclassmen will be used as the realistic standard of measure for dtermining the academic environment of engineering students at Michigan State University. A comparison with freshmen data will identify the extent to which freshmen expectations are impractical or unrealistic.

Four objectives consistent with the purpose of the study were established to guide the research:

objective 1: To identify the expectations held by entering engineering freshmen toward their academic programs.

objective 2: To identify the perceptions held by engineering upperclass students toward their academic programs.

objective 3: To determine those expectations held by freshmen which are impractical or unrealistic when compared against the environment as perceived by upperclass engineering students.

objective 4: To make recommendations on the basis of this research to faculty, administrators, advisors and other engineering educators to facilitate the planning and implementation of courses, programs, and policies.

Hypotheses

The following group of null hypotheses have been derived on the basis of relevant literature, with due consideration given to the statements of problem and purpose.

Hypothesis 1: No difference will be found between the expectations of entering engineering freshmen and the perceptions of engineering upperclassmen in the categories of Faculty-Student Relationships.

Hypothesis 2: No difference will be found between the expectations of entering engineering freshmen

and the perceptions of engineering upperclassmen in the categories of Student-Student Relationships.

Hypothesis 3: No difference will be found between the expectations of entering engineering freshmen and the perceptions of engineering upperclassmen in the categories of Teaching-Learning Environment.

Hypothesis 4: No difference will be found between the expectations of entering engineering freshmen and the perceptions of engineering upperclassmen in the categories of Personal Attention.

Hypothesis 5: No difference will be found between the expectations of entering engineering freshmen and the perceptions of engineering upperclassmen in the categories of Difficulty of Material.

Hypothesis 6: No difference will be found between the expectations of entering engineering freshmen and the perceptions of engineering upperclassmen in the categories of Discussion Opportunities.

Hypothesis 7: No difference will be found between the expectations of entering engineering freshmen and the perceptions of engineering upperclassmen in the categories of Career Outcomes.

Scope of the Study

The following areas of the students' academic experience have been included in the questionnaires:

a) Faculty-student relationships--This category explores the expectations (or perceptions) that students have concerning their out-of-class relationships with faculty members. Areas include encouragement for out-of-class contact, availability, opportunities for out-of-class discussion of class material, career options, and interest in the student's personal problems.

b) Student-student relationships--This area focuses on the expectations (or perceptions) that students have concerning interactions with their fellow students. Interest will focus on out-of-class contact, cohesiveness, helpfulness with class assignments and interest in personal problems.

c) Teaching-learning environment--This category examines the expectations (or perceptions) that students have concerning the presentation of material, the method of teaching, research opportunities, and the importance of theory, logic, mathematics, and laboratories in an engineering education.

d) Personal attention--This area measures the expectations (or perceptions) that students have concerning the kind and quality of interaction they have in the College. Areas will focus on the ease of getting to know faculty and students,

getting help when they need it, feeling like a person instead of a student number, and having someone available to listen to personal problems.

e) Difficulty of material--This section deals with student expectations (or perceptions) concerning the difficulty of the engineering curriculum and chances for their success in the program. Specific interest will focus on the amount and type of effort needed to succeed, the difficulty of examinations, and the level of competition.

f) Discussion opportunities--This area probes the student's expectations (or perceptions) for classroom interaction. Included will be opportunities to ask questions, challenge the professor and offer new ideas during class time.

g) Career outcomes--This category focuses on the expectations (or perceptions) the student has concerning the practicability of an engineering education, including preparation for job solving problems and generally getting along in the world around us. Also examined will be the student's understanding of what an engineer does on the job.

Limitations of the Study

Certain limitations within the study, as conducted, must also be considered. This research was conducted in

one college within one institution, the Michigan State University College of Engineering. Inferences derived from these results are applicable only to similar populations.

The data for this study were obtained through an instrument developed solely for this project. As is the case with similar surveys of this nature, student responses may not reflect the true intensity or depth of attitudes, perceptions, or expectations. In addition, student participation in this project was purely voluntary, solely dependent upon their willingness to take time to answer the survey form.

Overview of the Study

In Chapter II, literature relevant to this topic will be reviewed. Included will be pertinent material on the student's choice of college attendance, career decisions, academic expectations, and differences between freshmen and senior attitudes toward the academic experience. Where possible, attempts will be made to focus on engineering students in general and Michigan State University engineering students in particular.

The design of the study will be examined in Chapter III. Among the categories will be the methodology, design, and approach to the analysis of the data.

An analysis of the results of the survey data will be presented in Chapter IV. Differences by engineering

major will also be given special attention on the basis of the results obtained from the upperclass questionnaires.

Chapter V will include summary and conclusion remarks, with significant discussion directed towards implications for further research.

CHAPTER II

REVIEW OF THE LITERATURE

The way in which an individual makes decisions to attend college, choose a career, and thereby develops a set of expectations and attitudes, is a complex process influenced by many variables. Through the development of a variety of testing instruments it has been possible to measure expectations, attitudes, and perceptions of various college environments. The use of these same instruments has permitted researchers to measure differences between freshmen and senior viewpoints of their collegiate environment.

Most research of this type has not focused exclusively on academic environments, but on the overall campus climate. Studies of engineering students, in particular, have not dealt with the expectations and perceptions of their academic programs. What little has been done, is oftentimes outdated and not relevant to the engineering student of the mid-1970's. A current examination of these areas is important for planning, program development, and evaluation by engineering educators.

This study has used relevant literature as a basis for the development of this current investigation of the expectations of engineering freshmen and the perceptions of engineering upperclassmen toward their academic environments.

This chapter is devoted to a review of literature instrumental in the development of this study. The material has been divided into the following categories:

a) College attendance and major choice--This section examines the processes and influences that have an impact on going to college, and choosing a major. Data from surveys conducted at Michigan State University are also presented.

b) Characteristics of the engineering major and its students--An overview of research relevant to engineering majors, their attitudes and characteristics is presented in this area. Also examined are some attitudes of entering Michigan State University engineering freshmen.

c) Expectations of entering college students--This category probes the variety of academic expectations the freshman student brings to college. The variables which influence these attitudes will also be investigated. Michigan State University engineering data are evaluated as well.

d) Freshman-Senior differences--This topic covers some of the different views held by freshmen and seniors toward their college environment and the types of changes which occur in students during their four years in college.

e) Use of Environment Scales--This section identifies various environmental scales, their purposes, and usefulness to studies similar to this one.

College Attendance and Choice of Major

A student's arrival on a college campus is the culmination of a variety of variables, some of which have had impact throughout the individual's lifetime. Certainly, a single isolated factor cannot account for this decision. One must realize that this process is the intertwining of many variables over a long period of time.

One such factor, documented in the literature, is the influence of the Social-Economic-Status (SES) and background of the individual. Researchers such as George and Marshall [35] have identified the SES home level as an important factor in college attendance. Those students labeled as "college-bound" were found to have a high need for achievement and leadership, which the authors attribute to the SES home variable.

Another study by Meyer [56] found the SES level of the high school to have a strong effect on college plans.

It is reported that this factor is an even stronger influence than the quality of the educational program in the high school.

The glamour of a college education is especially attractive to those youth of a lower SES background. As stated by Sanford [78],

> To young people of lower social status, the decision for college may be a more conscious and problematic one. On the borderline of economic ease one expects to find motivational factors most clearly distinguishing those who do and do not enter college. We have seen that for many of these less privileged youngsters, college represents the golden path to social mobility, the chance to increase their share of social and economic rewards.

Probably the most potent influence on college attendance is the multi-variables of parents, peers, high school teachers, and counselors. Studies such as the one by Soper [85] show that family influence is the strongest variable in college attendance; with peer, teacher, and counselor variables ranking behind. He also found that a higher educational level by the parents will increase chances of college attendance by their children. It is interesting to note in this same study that parents preferred to have the school produce more input into their child's decision.

In research done by Juola [45], Sandell and Rossman [77], Kandel and Lesser [46], and Brody and Marin [14] the strong influence by parents, and then peers and high school personnel on college attendance is also confirmed.

Combining SES with parental influence, Rhodes [71] found the mother was the key determinant of college aspirations in low SES youth, with school climate again a weak agent in the formulation of plans. Werts [95], on the other hand, discovered the father as the important influence on college attendance in the semi-professional and professional classes.

Students who were asked why they were going to college provided some interesting insights. Dole [25] found that freshmen and seniors both felt that the importance of the degree toward getting a job was the strongest motivation for a college education. Ranked next in importance for freshmen was, being a success in life; satisfaction with their career interests and preparation for specialization within this particular career. However, seniors, looking back four years, cited factors such as, peers were also going to college; it was important to the family reputation; and the decision had been made for them for as long as they could remember.

Similar findings by Brody and Marin [14] show students identifying two basic reasons for going to college; to improve their self-image and to orient them towards a career.

Juola [44], in a study of entering Michigan State freshmen comments further ". . . the decision to attend college has been a long time expectation (57%). Only nine

per-cent indicate having made this decision after the start of the senior year of high school."

The choice of a major for the student is oftentimes a result of many of the same influencing factors which brought him to college initially. However, the process is more complex and involved than the ones identified in a college attendance decision.

> Intensive studies of individuals indicate that choice of major is the outcome of an interaction of dispositions in the student and forces in his immediate environment such as pressures from his family, his friends, and the college departments. Such studies show that majors are chosen on different bases and in different ways, and they suggest that the basis and manner of choice are related to the student's fate in the major, and later on.

Sanford [78] goes on to suggest that personality traits and college image are also involved in the major choice.

It is interesting to note that Northby [59] found that 86 percent of the freshmen in his study had a major in mind when they first came to campus, and a majority had decided on that major on the average of twenty-six months before enrolling. It appears, therefore, that many of these same influences had at least some impact on the student's initial choice of career study.

There are undoubtedly certain features of an engineering program which appeal to students and affects their selection of engineering as a major. Uppermost among these factors is the vocational orientation and the heavy

curricular emphasis on math and science. Findings by Khan and D'Oyley [48] point out that engineering students test very high nationally on math and science exams. This correlates with Roberts' [74] finding that engineering students have a high positive entering attitude toward mathematics.

A study done by Heckler, Krampen and Handa [39], reiterates that math and its practical application was the most attractive feature to high school students choosing engineering. This was followed in rank order by the practical coursework offered by engineering, and the high earning potential of an engineering career.

Entering freshmen engineers have been measured as being high in intellectual and applied interests [24], and are quite often the best students from high school graduating classes [78]. Kinloch [50] in a similar finding reports the highest reason for engineering attendance is related to challenging intellectual variables. It is interesting to note that in a study by Baird [7], a higher percentage of engineering freshmen predicted they would graduate than of any other major.

Not surprisingly, it was these same factors of high school rank, grade point average, and math abilities which were identified as high correlates of engineering success [33], [48].

It appears, therefore, that individuals choose an engineering career for the appeal of math, science, practicality of the coursework, vocational orientation, and the intellectual challenges of the curriculum. When interfaced with the influential variables of family, friends, counselors, and teachers, an understanding of the factors which motivate a student to select engineering as a major becomes clearer.

Characteristics of the Engineering Major and Engineering Students

Through the use of a variety of assessment techniques, researchers have been able to identify other characteristics which tend to typify engineering students and the program.

A study by Vreeland and Bidwell [92] attempted to pinpoint some of these traits. It was found that engineering students rank high in technical goals, occupational preparation, and structured discipline. On the other hand, these same individuals scored quite low in moral goals and human development types of goals. It was interesting to note that engineering faculty rank higher in interest in the engineering program per se than in interaction with students. They also found more engineering faculty concerned with recruiting competent students than in working with students currently enrolled.

This coincides with research by Beall and Bordin [9] who report that engineers have an overdeveloped interest in material objects and an underinvestment in people.

A study by Elton and Rose [27] helps to identify other personality characteristics of engineering students. According to the authors, engineering students tend to have practical interests; be dependent upon authority; unable to rebel against family, school, church or state; unlikely to protest infringements of rights; inflexible and intolerant.

Sanford [78] found that engineering students, while ranking very high in intellectual areas, are the least liberal-oriented group of students. He goes on to report that engineering is the only field which does rank high in intellectualism and low in liberalism.

Grande and Simons [36] point out the good engineering student has a strong need for achievement, reinforced by a strong motivation to work and study hard. They report the importance of the pre-college peer group in the formation of personal attitudes and values. This is illustrated in the characteristic that engineering students exhibit a greater degree of self-control in such areas as party-going, drinking, and smoking.

In the Juola [45] studies of Michigan State University entering freshmen many of these same variables were in evidence. Entering engineering freshmen ranked high in

job orientation, money motivation, and the desire to improve their socio-economic status. These same individuals ranked quite low in such goal-oriented categories as becoming more cultured, to meet new and interesting people, to enhance social development, to become aware of different philosophies and cultures, and to be of service to mankind.

Juola [44] was also able to pinpoint some background information on these same students which provides additional insight to the Michigan State University engineering freshman. Level of education is lowest for mothers and fathers of entering engineering students. Lowest family income was also reported for engineering student families. Engineering freshmen score lowest in non-classroom experiences such as school politics, typing homework, library work, dating, writing poetry, smoking, visiting an art gallery, and taking vitamins. Not surprisingly they also ranked lowest in accomplishments in the literary, arts, and humanities areas. As might be expected, engineering freshmen rated very high in all areas of science accomplishments.

Academic Expectations of Entering College Students

> In general terms, the freshman in college is a novice in an unfamiliar social organization, and is therefore confronted with the values, norms, and role structures of a new social system and various new subsystems. Such an experience usually involves desocialization (pressures to unlearn certain past values, attitudes, and behavior patterns) as well as socialization (pressures to learn the new culture and

> participate in the new social structure). The uncertainties of this learning period often are compounded by the frustrations involved in moving from a system where one is an established member--the former high school and home community--to a system where one is only a novice. Therefore, regardless of the degree to which the new college environment matches what the entering freshman expected, he faces a variety of expected and unexpected academic, intellectual, and social challenges. He must come to grips with both formal and informal demands, with both a public curriculum and, as Synder (1966b) puts it, an "invisible curriculum." A new set of adult role models is available, often very different from the models provided in his home environment. He may find that they represent a wider variety of psychological and social types than he has known. He may meet challenges to attitudes and values that served adequately enough in high school.[29]

The expectations of the entering college student is a topic which has been covered quite thoroughly in the literature. Most researchers seem to agree that the freshman student is much more optimistic and idealistic about their expected campus environment.

Berdie [12] reports that freshmen anticipate a high degree of intellectual stimulation in college. They envision professors as motivating and exciting. They also expect the coursework to be challenging and rewarding. This conflicts with the survey taken of sophomores on the same campus. Those individuals felt little intellectual stimulation, and saw the faculty as oftentimes dull and uninteresting. They perceived much of the coursework to be tedious and not really as tough as they had expected.

In research by Standing and Parker [86] it was found that freshmen do have an idealistic outlook towards

college. They anticipated a high degree of achievement, understanding, and objectivity in the campus climate. This coincides with the findings by Walsh and McKinnon [93] who found, using the College and University Environment Scales (CUES) that the freshman expectation score was higher than the perception score reported by the student already enrolled.

It is interesting to note that Pate [66] and Buckley [15] found these same unrealistic expectations, besides being held by freshmen, are also similar to those attitudes of new transfer students.

Student expectations are especially high in the areas which involve faculty members. Smithers' [83] research explains that students expect professors to know the subject, be able to teach it, give a structured lecture, and be available for discussion and meetings with students. Coyle [22] similarly reports that students expect strong faculty assistance in developing study habits, help with academic problems, and helping those students afraid to participate in class discussion.

The element of change in student expectations has been researched. It was found that most of these changes take place in the first two years on the college campus. In a study by Caple [16], it was explained that significant change in student impressions of the college begins to take place about five months after being on campus.

Students were less positive in their view of the college after the five month period. They were also less vocationally oriented after this period of time.

Berdie [12] discovered that those freshmen who were most active in campus affairs had their CUES score change the most in a negative direction.

Quay and Dole [70] conclude in their findings that satisfaction with college seems to be related to narrowing the gap between expectations and perceptions.

What factors are influential in the development of these unrealistically positive expectations? Many of the same variables are important as in the cases of college attendance and choice of major.

A study by Sandeen [76] found that attitudes toward college are related to a high concept of self, which is strongly influenced by parents, peers, counselors, and teachers.

Parents, according to Seymour and Richardson [81], hold positive reactions about the role of faculty, opportunities available to students, leadership possibilities and academic excellence. The authors conclude that many of these same feelings are passed on to the entering student.

This is similar to research done by Kelly and Hart [47] who find parents of college students rating the "character-building" role of faculty as important as their

teaching role and much more valuable than their research role. Shill [82] identified the high school teacher as being quite influential in helping the student develop expectations and aspirations. Yet, Guilliams and Dollar [37] and Seymour [80] found that high school counselors and teachers were not accurately tuned into the true campus environment. Their idealistic perceptions existed even in schools which were in close proximity to the college.

Stern [88] reports that parents and teachers sometimes admit to idealizing to their children about college. The most frequent reason given usually relates to trying to motivate the individual to do well in college.

Stanfel and Watts [87] feel that freshmen expectations are the result of being misinformed by parents, counselors, and teachers who have the wrong information to begin with. They suggest that the culprit may, in fact, be the catalog produced by the university. Stern [88] agrees with this opinion. The glorified and ambiguous statements in these publications seem to naturally lend themselves to misinterpretation. In fact Stern categorizes the college catalog as "the publication which is as sincere as a seed catalog."

It is interesting that the people most often responsible for the college catalog and other publications of this type are often as idealistic as the freshmen student. Lynch [53] found a great deal of similarity in viewpoints

between college administrators and the entering student. Both groups tended to idealize most of the actual programs, facilities, quality, and curricula which existed on campus.

A similar study by Stern [88] showed that faculty and upperclassmen are tuned into the realities of the campus environment but administrators and underclassmen were not.

Research findings by Donato and Fox [26] point out that admissions officers view the college in a much more positive light than do any other group on campus. The authors conclude that this group may be most responsible for the misinformation and unrealistic perceptions held by high school counselors.

Entering Academic Expectations of Michigan State University Engineering Freshmen

Since this thesis is in part concerned with entering students in the Michigan State University College of Engineering, it is helpful to get an insight into some of their academic aspirations. The research done by Juola [45] is especially helpful in providing some background data on the Michigan State University entering student.

The goals and aspirations of engineering freshmen include the following points:

a) Forty-two percent of engineering freshmen expect to obtain a B.S. degree, with 36 percent planning on a Masters and 14 percent, a Ph.D. This

indicates that 92 percent of engineering freshmen anticipate at least obtaining a B.S. degree with 50 percent aspiring to a graduate degree of some sort.

b) English was the only subject with which engineering freshmen felt they would need tutoring help. In this category they ranked higher (18 percent) than any other major.

c) Fifty percent felt they would be above average in class rank, while 38 percent anticipated being about average in class rank and 1 percent below average.

d) Sixty-two percent of engineering freshmen felt they would be above average in their academic work, while 37 percent ranked themselves average and only 3 percent below average.

e) High percentages of these same students indicated a desire for more discussion in class than writing, more student-student interaction in class, professors who will spend out-of-class time with students, would like to be known by their first name, have tutoring help available and special honors programs available for high ability students.

Data on Michigan State University engineering freshmen seems to be consistent with previous information

presented, especially in the areas of intellectual and academic aspirations.

Differences Between Freshmen and Seniors

Several researchers have surveyed both freshmen and seniors in an attempt to identify the types of changes which occur in students during their four years in college.

In research done by Davis [23], it was found that most student change occurs when they find an environment which fits their personality.

A study by Frantz [30] pointed out that most student change in college takes place in social areas with the least change affecting traditional beliefs, domestic habits and conformity. Seniors are seen as being more intellectually and culturally oriented, less idealistic, and more tolerant.

Similar findings by Ivey and Wilson [42] show that seniors felt a lower degree of aspiration after four years. They saw the institution as being less concerned with social activities and less vocationally oriented than they had expected as freshmen.

Lehmann's [52] research also indicated significant differences between seniors and freshmen. Seniors surveyed, were less stereotypical and more open to new ideas than freshmen. Seniors were more outer-directed and felt they could critically think better after four years. Money was

less important to seniors than freshmen and job satisfaction was valued more by seniors. After four years they agreed that college did more than prepare one for a job.

Many of these same findings coincide with research done on engineering freshmen-senior differences. Olive [60] found senior engineering students more concerned with people, self-expression, artistic beauty and nature, and their personal status. Freshmen, on the other hand, were interested more in materialistic gains, with more emphasis on vocational preparation and religious activities. Freshmen saw the engineering field as less people-oriented than did the seniors.

Concurrent findings by Hammond [38] show that freshmen engineering students value prestige and money most, with people far down the list. Seniors, however, place more emphasis on people-type values and less on prestige. A study by Webster [94] had similar results. Seniors were more flexible, less compulsive, tolerant, rebellious, and critical of authority than were freshmen. Galessich [32] also found engineering seniors to be more liberal in outlook than entering students.

Bennigson [10] had done research in this area and also obtained parallel results. He found that freshmen see the curriculum as more human oriented than do seniors. They also felt the curriculum to be quite creative, whereas seniors thought an engineering education gave the

student a less broad educational background than other majors.

Use of Environmental Studies

A wide variety of methods and measurement techniques have been developed to describe the environments in colleges and universities. Through the use of these instruments, it has been possible to prove the existence of institutional differences and that these differences are measurable. The use of these scales has provided much of the data concerning freshmen-senior differences presented earlier. Since the survey used in this research is modeled after some of these other instruments, a brief explanation of them seems in order.

The existence of environmental assessment techniques are a relatively new phenomena, with their full development not coming until the late 1950's. Pace [64] was one early pioneer in this area with his College and University Environment Scales (CUES). CUES is designed to measure total college environment and the campus atmosphere as perceived by students. Areas of the environment examined with this technique are faculty, curriculum, student life, campus facilities, rules, and extra-curricular activities.

Pace and Stern [63] have also combined to develop the College Characteristics Index (CCI). Similar to the

CUES, the CCI also attempts to assess campus environments. The CCI measures "press"--the characteristic demand or features of an environment as perceived by those who live in that environment--and its influence on the policies and pressures of the institution that influence student development.

Trow [91] has identified four distinct student sub-cultures that are important to the measurement of environment. These categories are the traditional, the academic, the consumer-vocational, and the non-conformist. Trow suggests that institutional environment can be determined by examining the proportion of its students in each of these four sub-cultures.

Astin and Holland's [4] "Environmental Assessment Technique" is another instrument used to measure environment. Essentially this scale concentrates on examining eight characteristics of the student body and their relation to major fields of study.

Summary

An attempt has been made in this chapter to present a developmental approach to understanding entering college students, their backgrounds, motivation, influences, expectations and the changes which take place between the freshman and senior years in college. Where possible, special emphasis has been given in this chapter to

relating these topics to engineering students in general, and Michigan State University students in particular.

The literature reviewed has explored the college plans of students, and the influences and motivations behind this type of decision. It was reported that parents have the most influential effect on whether or not the student attended college. Ranked next in importance were peers, high school counselors, and teachers. Socio-economic-status was also found to be a variable--the higher the SES, the more likelihood of positive college intention.

Students themselves rated the importance of getting prepared for a career as the most motivating influence on their future college plans. Also important was peer influence and the chance to improve their self-image.

It was found that choice of major was oftentimes dependent on many of these same influential factors. Also important are certain personality traits and image of the college.

Studies with engineering students show that choice of major is often determined by the vocational orientation and the large amount of math and science in the engineering curriculum. It was reported that engineering typically appeals to the student of high intellectual ability with interests in applied areas.

Engineering students were found to be materialistically oriented, practical, dependent upon authority,

unable to rebel against traditional values, inflexible and intolerant. They also rank high in achievement, motivation and self-control.

A study of Michigan State University entering freshmen found many of these same characteristics present in the results.

The literature on the expectations of the entering college student is full of data emphasizing the idealistic attitudes these freshmen bring to college. They anticipate a high degree of intellectual stimulation, strong faculty interest in them, and challenging and rewarding coursework. None of these elements were perceived to a great degree by students who were on campus.

It was found that parents, peers, counselors, and teachers were instrumental in the development of these expectations. Apparently misinformation derived from college publications and university officials helps to contribute to their unrealistic perception of campus climates.

A study of entering Michigan State University freshmen showed that most are intellectually oriented and anticipate stimulation and challenges in their coursework.

Most differences between freshmen and seniors point out a more culturally-oriented, less idealistic and tolerant attitude for seniors. Freshmen on the other hand were money-oriented, idealistic and traditional.

These findings coincide with research done on engineering students by several authors.

A final section of the chapter was devoted to an explanation of instruments used to assess environmental differences. The existence of these various methods and techniques permits researchers to study and measure institutional differences, attitudes, and perceptions of the campus climate.

CHAPTER III

DESIGN OF THE STUDY

In this chapter, an in-depth investigation and description of the population, the sample, and the instrument will be presented. Procedures for collecting and analyzing the data are explained.

The Population and the Sample

The population of this study can be defined as all male and female students enrolled in the College of Engineering at Michigan State University during Fall quarter 1973. The sample was comprised of two groups--freshmen and upperclassmen.

The freshmen were defined as those members of the population who were attending college for the first time in Fall 1973. All had been classified by the University as "engineering--no major," even though many did have a major in mind when they came on campus.

The upperclassmen were defined as those students who had previously enrolled for courses at Michigan State and had accumulated enough credits to be categorized as "juniors" or "seniors." Students representing six

engineering majors participated in the study. Table 3.1 lists the totals of those participating in the study, including a classification by major.

Table 3.1. Description of respondents to the questionnaire.

	Number of Senior-Junior Majors	Number Participating in Study	Degree of Upperclass Majors in Study	Degree of Total in Study
1. Chemical Engineering	72	21	29.1%	4.9%
2. Civil Engineering	210	37	17.6%	8.6%
3. Computer Science	175	35	20.0%	8.1%
4. Electrical Engineering	195	52	26.6%	12.1%
5. Mechanical Engineering	189	43	22.7%	10.0%
6. Metallurgy	28	13	46.4%	3.0%
TOTALS	869	201	23.1%	46.7%
FRESHMEN	346	230	66.5%	53.4%

Note: Figures based on Fall term 1973 enrollment data.

The Instrument

A survey instrument was developed for the sole purposes of this study, in concert with the goals and objectives set forth in Chapter I. They were stated as follows:

objective 1: To identify the expectations held by entering engineering freshmen toward their academic programs;

objective 2: To identify the perceptions held by engineering upperclass students toward their academic programs;

objective 3: To determine those expectations held by freshmen which are impractical or unrealistic when compared against the environment perceived by upperclass engineering students;

objective 4: To make recommendations on the basis of this research to faculty, administrators, advisors and other engineering educators to facilitate the planning and implementation of courses, programs, and policies.

The instrument was designed to be similar in content and style to the CUES and CCI environmental scales. One of the main reasons in developing a separate instrument was to concentrate on the academic environment alone. The other assessment techniques incorporate environmental readings of multi aspects of the campus.

To permit sufficient "try-outs" of the questionnaire, a pre-test was administered to a selected group of engineering students during the Summer quarter 1973. This group consisted of twenty engineering students: first-term freshmen and upperclassmen, male and female. The purpose of the pre-test was to test for clarity, wording, and scope. A personal interview with each pre-test participant was conducted when they completed their

written comments. Minor changes were made to incorporate the reactions and recommendations of this group. Copies of the pre-test are included in Appendix A and B.

The same questionnaire was administered to both freshmen and upperclassmen with only one minor change. All of the questions in the freshman instrument were worded "I expect that . . ." (i.e., . . . faculty members are interested in a student's personal problems).

A cover letter was stapled to each questionnaire explaining the purpose of the study and requesting the student's participation. Copies of each cover letter and the questionnaires are included in Appendix C and D.

In the upperclass questionnaire, a special section was created to obtain information concerning sex, major, and class. This information was used to gather major/sex differences on responses to the instrument.

Seven areas basic to the individual's academic experience were included in the questionnaire. The source and the rationale for each of these questions were based on the hypotheses created for this study.

Category A. Faculty-Student Relationships.

The hypotheses for this category may be stated as follows:

Null hypothesis: No difference will be found between the attitudes and expectations of entering engineering freshmen and the attitudes and

perceptions of engineering upperclassmen in the categories of Faculty-Student Relationships.

Alternate hypothesis: The attitudes and expectations of entering engineering freshmen will exceed the attitudes and perceptions reported by engineering upperclassmen in the categories of Faculty-Student Relationships.

This category focuses on the expectations (or perceptions) that students have concerning their out-of-class relationships with faculty members. Questions covered the encouragement for out-of-class contact, availability, opportunities for out-of-class discussion of class material, career options, and interest in the student's personal problems.

Category B. Student-Student Relationships.

The hypotheses for this category may be stated as follows:

Null hypothesis: No difference will be found between the attitudes and expectations of entering engineering freshmen and the attitudes and perceptions of engineering upperclassmen in the categories of Student-Student Relationships.

Alternate hypothesis: The attitudes and expectations of entering engineering freshmen will exceed the attitudes and perceptions reported by

engineering upperclassmen in the categories of Student-Student Relationships.

Explored in this section were the expectations (or perceptions) that students have concerning interactions with their fellow students. Questions focused on out-of-class contact, cohesiveness, helpfulness with class assignments and interest in personal problems.

Category C. Teaching-Learning Environment.

The hypotheses for this category may be stated as follows:

Null hypothesis: No difference will be found between the attitudes and expectations of entering engineering freshmen and the attitudes and perceptions of engineering upperclassmen in the categories of Teaching-Learning Environment.

Alternate hypothesis: The attitudes and expectations of entering engineering freshmen will exceed the attitudes and perceptions reported by engineering upperclassmen in the categories of Teaching-Learning Environment.

Questions in this area examined the expectations (or perceptions) that students have concerning the presentation of material, the method of teaching, research opportunities, and the importance

of theory, logic, mathematics, and laboratories in an engineering education.

Category D. Personal Attention.

The hypotheses for this category may be stated as follows:

Null hypothesis: No difference will be found between the attitudes and expectations of entering engineering freshmen and the attitudes and perceptions of engineering upperclassmen in the categories of Personal Attention.

Alternate hypothesis: The attitudes and expectations of entering engineering freshmen will exceed the attitudes and perceptions reported by engineering upperclassmen in the categories of Personal Attention.

Explored in this section were the expectations (or perceptions) that students have concerning the kind and quality of interaction they have in the College. Questions focused on the ease of getting to know faculty and students, getting help when they need it, feeling like a person instead of a student number, and having someone available to listen to personal problems.

Category E. Difficulty of Material.

The hypotheses for this category may be stated as follows:

Null hypothesis: No difference will be found between the attitudes and expectations of entering engineering freshmen and the attitudes and perceptions of engineering upperclassmen in the categories of Difficulty of Material.

Alternate hypothesis: The attitudes and expectations of entering engineering freshmen will exceed the attitudes and perceptions reported by engineering upperclassmen in the categories of Difficulty of Material.

This area dealt with student expectations (or perceptions) concerning the difficulty of the engineering curriculum and chances for their success in the program. Specific questions examined the amount and type of effort needed to succeed, the difficulty of examinations, and the level of competition.

Category F. Discussion Opportunities.

The hypothesis for this category may be stated as follows:

Null hypothesis: No difference will be found between the attitudes and expectations of entering engineering freshmen and the attitudes and perceptions of engineering upperclassmen in the categories of Discussion Opportunities.

Alternate hypothesis: The attitudes and expectations of entering engineering freshmen will exceed

the attitudes and perceptions reported by engineering upperclassmen in the categories of Discussion Opportunities.

This section probed the student's expectations (or perceptions) for classroom interaction. Questions included the opportunities to ask questions, challenge the professor and offer new ideas during class time.

Category G. Career Outcomes.

The hypothesis for this category may be stated as follows:

Null hypothesis: No difference will be found between the attitudes and expectations of entering engineering freshmen and the attitudes and perceptions of engineering upperclassmen in the categories of Career Outcomes.

Alternate hypothesis: The attitudes and expectations of entering engineering freshmen will exceed the attitudes and perceptions reported by engineering upperclassmen in the categories of Career Outcomes.

Questions in this category explored the expectations (or perceptions) the student has concerning the practicability of an engineering education, including preparation for job-solving problems and generally getting along in the world. One question

also examined the student's understanding of what an engineer does on the job.

Data Collection Procedures

The instrument was administered to freshmen on two different occasions, both before the start of Fall classes. One group was surveyed during the engineering presentation as part of the Late Summer Orientation Program. Prior to making out their Fall schedules, each of the approximately sixty freshmen students present were asked to fill out one of the instruments. The remainder of the freshmen questionnaires were distributed and collected during the engineering presentation for new freshmen as part of the Welcome Week program.

Upperclass questionnaires were administered during Fall quarter. Academic advisors helped to distribute and collect these surveys. When students stopped by their office, they were given the option of filling out one of the questionnaires. These instruments were also distributed in selected Senior courses. Attempts were made to try and get an even distribution by each engineering major. The numbers and percentages of students participating in each major was presented in Table 3.1.

Analyzing the Data

Responses to each question were labeled as: "Strongly-Agree," "Agree," "Disagree," and "Strongly-Disagree." No neutral option was given in order to try to force responses in a particular direction.

Answers were then coded as being 1 (Strongly-Agree), 2 (Agree), 3 (Disagree) or 4 (Strongly-Disagree) for the purposes of computer analysis.

Each question was tested using the chi-square statistic. The chi-square method of analysis was chosen since there are two independent population samples, with a sufficiently large number of respondents. A computer program was selected to perform the necessary calculations for each of the questions and variables in the questionnaire. A level of significance at the .05 level was used. In the major field of study analyses, some of the cell contributions to the Chi-Square test statistic contain less than five observations. The effect of this low number has been of concern to some statisticians, yet others such as Cochran [20] and Snedecor [84] feel differently. These men have researched this question and concluded that cell size is not a problem if either a) the frequency of cells containing less than five observations are fewer than 80 percent of the total number of cells; or b) the degrees of freedom are greater than five. All conclusions in the major field analyses of this study satisfy both conditions.

Summary

A questionnaire was designed and administered to two groups of Michigan State University engineering students: entering freshmen, and upperclassmen of both sexes and six majors within the College. The instrument was developed to be consistent with the objectives of the study set forth in Chapter I.

Freshmen questions were worded "I expect that . . ." while upperclass items were phrased "I think that . . ." in relation to seven areas of their academic experience. The seven designated categories included a) Faculty-Student Relationships; b) Student-Student Relationships; c) Teaching-Learning Environment; d) Personal Attention; e) Difficulty of Material; f) Discussion Opportunities; and g) Career Outcomes. Hypotheses were established for each of these seven areas consistent with the objectives of the study.

The surveys were given to two groups of freshmen on two different occasions prior to the start of Fall Term classes. Upperclassmen were administered the questionnaire throughout a period of weeks during Fall Term.

Responses to each item were analyzed through the use of the chi-square statistic, with a computer program doing the necessary calculations. A level of significance at the .05 level was used.

In Chapter IV the data will be presented and analyzed. Data obtained for each engineering major, and a classification by sex of the respondent will also be examined.

CHAPTER IV

ANALYSIS OF RESULTS

In the preceding chapter an outline of the objectives, the problem, and hypotheses for this study was presented. The approach and statistical design for the data analysis was also identified. A classification of respondents in the sample was presented in Table 3.1.

Five computer analyses were performed on the data. The first test computed overall percentages for each response on the thirty-eight questions. On the basis of these results, ten items were removed from further consideration, as no statistical differences were found. Three additional tests were performed to analyze the results by freshmen-upperclass differences, major field of study, and sex. Twenty-four items proved to be significant in the freshmen-upperclass categories; fourteen were significant in the major field analysis; and two were significant when computed by sex.

A final analysis was performed to test for interaction effects, among groups, in each of the seven categories of study. The presence of interaction effects would qualify some conclusions of this study. The results of

this examination and the appropriate F test are given in Table 4.1 and Figure 4.1.

The conservative F test was used to prove that no interaction effects were present. In Figure 4.1 a graph of the mean scores for each category shows interaction occurring in unit five. Further investigation found that two of the questions in this unit were not consistent in their wording with the other thirty-six in the survey. A positive response on these items, in actuality, had negative connotations. A reanalysis of the data for unit five was performed. The coding of the responses for the two questions was changed to reflect the different direction of the question. A "strongly-agree" response was coded as "strongly-disagree," an "agree" response was coded as "disagree" and vice versa. The results in Figure 4.2 verify that these items did cause the interaction effect to appear in category five. The new mean scores are consistent with those in other categories.

Using this revised analysis, it is possible to conclude there were no interaction effects throughout the seven units of study.

In this chapter each of the seven basic hypotheses will be restated, and the statistical test results will be reported. A further classification will evaluate the data in terms of class, major and sex differences.

Table 4.1. Repeated-measures ANOVA test for interaction effects.

Source	D.F.	Sum of Squares	Mean Squares	F	Adjusted Degrees of Freedom	
					Conservative	Estimated
Groups	1	51.74	51.74	91.961		
Subjects-Groups	429	241.38	.5626			
Repeated Measures	6	85.31	14.22	88.955	(1.0; 429.0)	(5.24; 2246.44)
R.M.-Groups	6	18.41	3.07	19.195	(1.0; 429.0)	(5.24, 2246.44)
R.M.-Subjects-Groups	2574	411.42	.1598			
TOTAL	3016	808.25				

Note: $F_{1,429,} = 5.15$

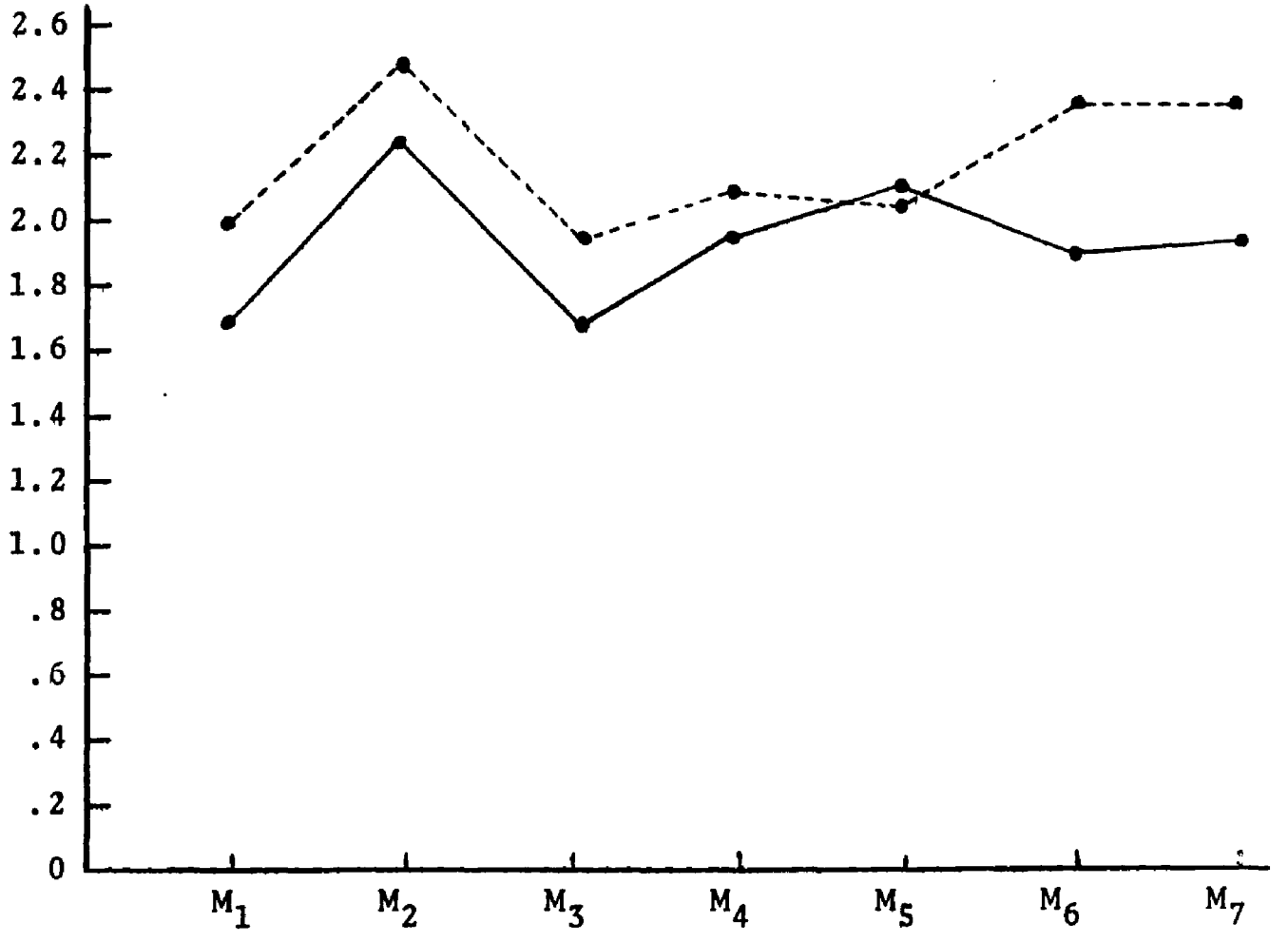

Figure 4.1. Mean scores for the seven categories of study.

Key: ●——————● = Freshmen

●---------● = Upperclassmen

M_1 = Faculty-Student Relationships

M_2 = Student-Student Relationships

M_3 = Teaching-Learning Environment

M_4 = Personal Attention

M_5 = Difficulty of Material

M_6 = Discussion Opportunities

M_7 = Career Outcomes

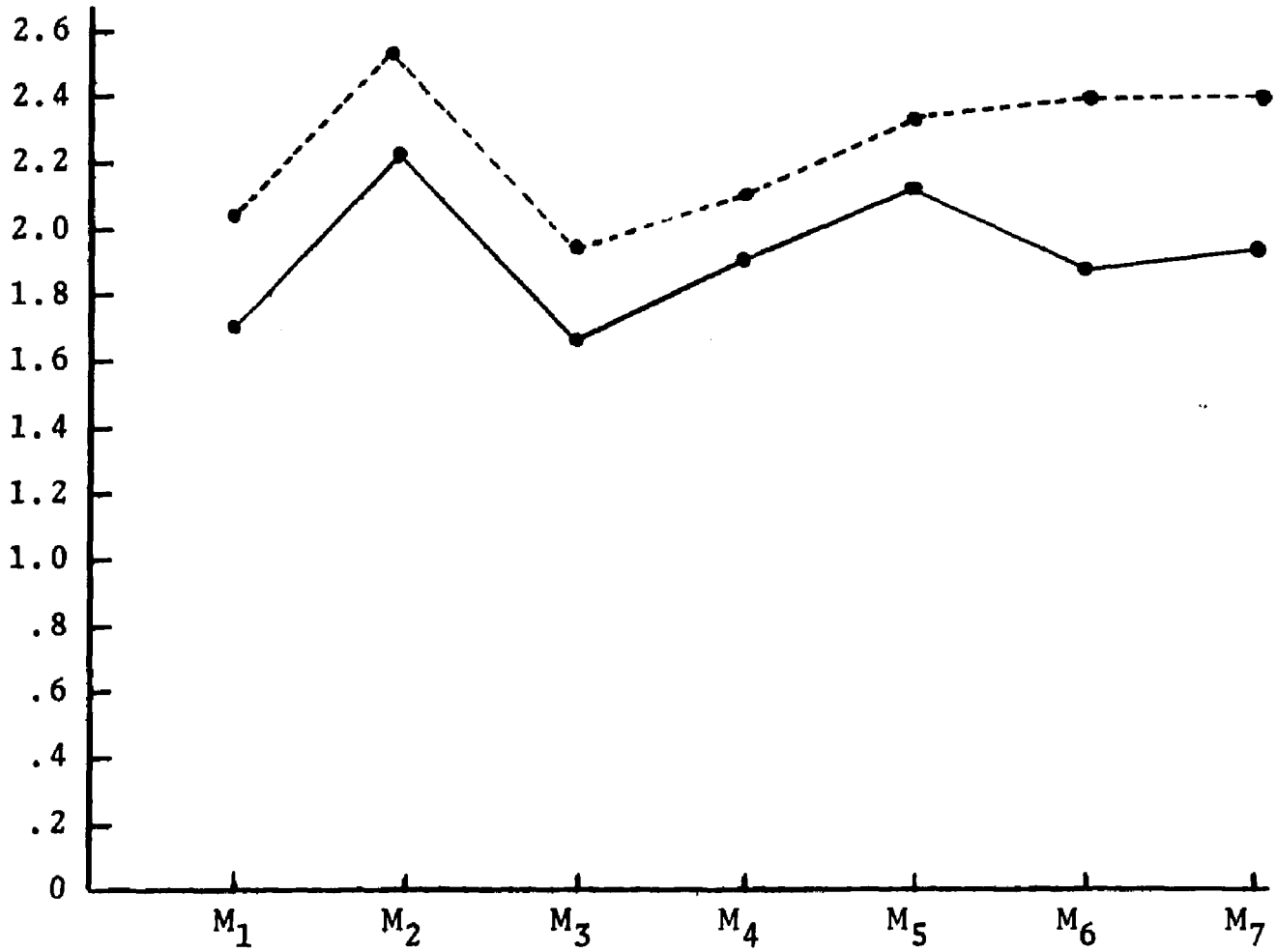

Figure 4.2. Mean scores for seven categories of study with revised mean for measure five.

Key: ●——● = Freshmen

●----------● = Upperclassmen

M_1 = Faculty-Student Relationships

M_2 = Student-Student Relationships

M_3 = Teaching-Learning Environment

M_4 = Personal Attention

M_5 = Difficulty of Material

M_6 = Discussion Opportunities

M_7 = Career Outcomes

Report of Findings

Category A. Faculty-Student Relationships

The hypotheses established for this category were:

Null hypothesis: No difference will be found between the expectations of entering engineering freshmen and perceptions of engineering upperclassmen in the categories of Faculty-Student Relationships.

Alternate hypothesis: The expectations of entering engineering freshmen will exceed the perceptions reported by engineering upperclassmen in the categories of Faculty-Student Relationships.

This category explored the expectations (or perceptions) that students have concerning their out-of-class relationships with faculty members. Areas included encouragement for out-of-class contact, availability, opportunities for out-of-class discussion of class material, career options, and interest in the student's personal problems.

The mean for freshmen was 1.748, while upperclassmen scored 2.026 Although both groups reported positive responses, the intensity of the freshmen responses was stronger. Therefore, the null hypothesis was rejected. The expectations of entering engineering freshmen exceeded

the preceptions of engineering upperclassmen in the categories of Faculty-Student Relationships.

Computer analysis of the five questions in this unit found statistically significant differences for three items.

Question A1a

This item was phrased "I (expect or think) that faculty members in the College of Engineering enjoy talking with students on an informal basis outside of class time." With the first computer analysis, it was determined that this question was not statistically significant, and therefore additional investigation was unnecessary. It was found that 93.88 percent of all respondents either strongly agreed or agreed with this statement.

It can be surmised that freshmen engineering students expect faculty to spend time talking informally with students outside of class. It also appears that engineering upperclassmen, of all majors and both sexes, perceive this activity actually taking place. It therefore seems that freshmen expectations in this area are not idealistic.

Question A1b

This statement read "I (expect or think) that faculty members in the College of Engineering encourage students to come to them for help if they are having

difficulty with course material." The first computer analysis indicated that this question was not significant, so further evaluation of the data was not done. The results showed that 96.26 percent of all respondents either strongly agreed or agreed with this item.

It seems that entering engineering students expect faculty members to offer their assistance and encouragement for students having difficulty with the course material. Engineering upperclassmen, of all majors and both sexes, perceive this to be a reality. It can be concluded that freshmen expectations in this area are not idealistic.

Question A1c

This item stated "I (expect or think) that faculty members in the College of Engineering are interested in a student's personal problems." The results confirmed this question to be statistically significant at the .05 level for freshmen-upperclass differences.

As is evidenced by Table 4.2, entering freshmen engineering students are quite positive in their expectations in this area. A big difference in the responses can be seen in the "strongly-agree" cell where the cell-chi square number indicates a large contribution of responses to this question. Upperclassmen are more responsive in the "disagree" category, which, again, emphasizes a more positive direction taken by the freshmen respondents.

Table 4.2. A comparison of the responses of freshmen and upperclass engineering students on the question "faculty members in the College of Engineering are interested in a student's personal problems."*

		Strongly Agree	Agree	Disagree	Strongly Disagree
Freshmen	Frequency	27	101	88	12
	Cell Chi Square	5.16	1.15	3.25	.10
Upper-classmen	Frequency	5	65	107	12
	Cell Chi Square	6.23	1.39	3.92	.12

*Significant at the .05 level.

Note: degrees of Freedom = 3
Chi Square value = 21.323

It can be concluded that freshmen expect more faculty interest in their personal problems than the upper-classmen, in fact, perceive. Therefore, it appears that this is one area in which the entering engineering student has some overly optimistic expectations when he comes to college.

This question also proved to be statistically significant when analyzed by engineering major of the upperclassmen. The results, as illustrated in Table 4.3, show that Chemical Engineering students are more positive in their "strongly-agree" responses than any of the other

Table 4.3. A comparison of the responses of students in six engineering majors on the question "faculty members in the College of Engineering are interested in a student's personal problems."*

		Strongly Agree	Agree	Disagree	Strongly Disagree
Chemical Engr.	Frequency	3	7	9	1
	Cell Chi Square	11.54	0.00	.48	.06
Civil Engr.	Frequency	0	14	19	1
	Cell Chi Square	.90	.46	0.00	.62
Computer Science	Frequency	0	13	16	6
	Cell Chi Square	.93	.08	.73	6.42
Electrical Engr.	Frequency	1	12	33	4
	Cell Chi Square	.08	1.57	.78	.21
Mechanical Engr.	Frequency	1	11	26	0
	Cell Chi Square	0.00	.33	.94	2.41
Metallurgy	Frequency	0	8	4	0
	Cell Chi Square	.32	3.63	1.15	.76

*Significant at the .05 level.

Note: degrees of Freedom = 15
Chi Square value = 34.395

majors. Metallurgy upperclassmen are somewhat more positive in their "agree" responses than other fields.

Respondents from Computer Science indicate more "strongly-disagree" comments than any of the other majors.

It can be surmised that Chemical Engineering and Metallurgy students perceive more faculty interest in their personal problems while Computer Science respondents perceive much less interest.

A computer analysis of this question by sex classification was not statistically significant. Therefore, there is no difference between males and females in their perception of a faculty member's interest in a student's personal problems.

Question Ald

This question asked "I (expect or think) that faculty members in the College of Engineering are interested in discussing career opportunities with students." The analysis proved this item to be statistically significant for freshmen-upperclassmen differences.

Table 4.4 illustrates that freshmen engineering students are more positive in their expectations than is warranted according to upperclass perceptions. The biggest difference between the two groups is in the "strongly-agree" cell, where freshmen are much heavier in their responses. To lesser degrees, this point is also in

evidence in the "agree" and "disagree" cells where upperclassmen were more responsive in a negative direction.

Table 4.4. A comparison of the responses of freshmen and upperclass engineering students on the question "faculty members in the College of Engineering are interested in discussing career opportunities with students."*

		Strongly Agree	Agree	Disagree	Strongly Disagree
Freshmen	Frequency	110	113	7	0
	Cell Chi Square	12.33	3.58	3.94	1.62
Upperclassmen	Frequency	36	137	20	3
	Cell Chi Square	14.47	4.20	4.62	1.90

*Significant at the .05 level.

Note: degrees of Freedom = 3
Chi Square value = 46.654

Therefore, freshmen students expect more faculty interest in discussing career opportunities than the upperclassmen perceive as actually occurring. This seems to be another expectation held by the entering engineering student which is not accurate.

Further analysis of this item found it to be statistically significant when classified and examined by engineering major. The data in Table 4.5 attest to this point. Chemical engineers were the most positive in their

Table 4.5. A comparison of the responses of students in six engineering majors on the question "faculty members in the College of Engineering are interested in discussing career opportunities with students."*

		Strongly Agree	Agree	Disagree	Strongly Disagree
Chemical Engr.	Frequency	10	10	0	0
	Cell Chi Square	10.90	1.13	2.04	.31
Civil Engr.	Frequency	12	21	4	0
	Cell Chi Square	3.99	.91	.01	.57
Computer Science	Frequency	4	27	3	0
	Cell Chi Square	.81	.44	.06	.52
Electrical Engr.	Frequency	3	34	9	3
	Cell Chi Square	4.00	0.00	3.20	6.75
Mechanical Engr.	Frequency	5	35	3	0
	Cell Chi Square	1.06	.81	.44	.66
Metallurgy	Frequency	2	10	1	0
	Cell Chi Square	.06	.09	.08	.20

*Significant at the .05 level.

Note: degrees of Freedom = 15
Chi Square value = 39.045

comments as can be seen in the "strongly-agree" cell. Other favorable responses came from Electrical Engineers and Civil Engineers, although neither were as strong as the Chemical Engineer group. The most negative comments were from the Electrical Engineers, where results in the "disagree" and "strongly-disagree" cells are fairly heavy.

Therefore, Chemical Engineers perceive strong faculty interest in discussing career opportunities with the Civil Engineers not quite as strong. Electrical Engineers indicated both positive and negative responses to this item.

No statistical significance was found for this question when analyzed by sex differences. Therefore, no differences exist between men and women in their perceptions of faculty interest in discussing career opportunities.

Question A1e

Students in this question were asked "I (expect or think) that faculty members in the College of Engineering are available when they are needed." Analysis of the results found statistical significance on freshmen-upperclass differences.

In Table 4.6 the greatest discrepancy in the data is in the "strongly-agree" cell. Freshmen are again more

positive with their replies. Upperclassmen are more responsive in the "strongly-disagree" category.

Table 4.6. A comparison of the responses of freshmen and upperclass engineering students on the question "faculty members in the College of Engineering are available when they are needed."*

		Strongly Agree	Agree	Disagree	Strongly Disagree
Freshmen	Frequency	86	120	22	0
	Cell Chi Square	13.59	1.82	2.41	3.76
Upper-classmen	Frequency	22	133	35	7
	Cell Chi Square	15.73	2.11	2.79	4.35

*Significant at the .05 level.

Note: degrees of Freedom = 3
Chi Square value = 46.545

Freshmen engineers expect faculty members to be available more so than upperclass students perceive that they are. Again, this is another unrealistic expectation of college life which freshmen engineers bring with them to college.

This question was also significant statistically when analyzed by each engineering major. A modest number of Chemical Engineers "strongly-agreed" with the statement, while a significant group from Electrical Engineering

"disagreed" or "strongly-disagreed." These results are presented in Table 4.7. It appears Chemical Engineers find faculty more accessible, while Electrical Engineering students feel they are not as available when needed as they could be.

An analysis by sex found no significant difference in the responses of men and women to this item.

Category B. Student-Student Relationships

The hypotheses established for this category were:

Null hypothesis: No difference will be found between the expectations of entering engineering freshmen and the perceptions of engineering upperclassmen in the categories of Student-Student Relationships.

Alternate hypothesis: The expectations of entering engineering freshmen will exceed the perceptions reported by engineering upperclassmen in the categories of Student-Student Relationships.

Explored in this section were the expectations (or perceptions) that students have concerning interactions with their fellow students. Questions focused on out-of-class contact, cohesiveness, helpfulness with class assignments and interest in personal problems.

Table 4.7. A comparison of the responses of students in six engineering majors on the question "faculty members in the College of Engineering are available when they are needed."*

		Strongly Agree	Agree	Disagree	Strongly Disagree
Chemical Engr.	Frequency	5	14	2	0
	Cell Chi Square	3.01	0	.80	.75
Civil Engr.	Frequency	3	24	8	1
	Cell Chi Square	.26	0	.40	.06
Computer Science	Frequency	5	24	4	2
	Cell Chi Square	.30	.01	.79	.46
Electrical Engr.	Frequency	3	28	16	4
	Cell Chi Square	1.28	1.20	5.31	2.64
Mechanical Engr.	Frequency	6	30	5	0
	Cell Chi Square	.44	.19	.72	1.46
Metallurgy	Frequency	0	13	0	0
	Cell Chi Square	1.45	2.03	2.31	.46

*Significant at the .05 level.

Note: degrees of Freedom = 15
Chi Square value = 26.342

The mean for freshmen was 2.250 while upperclassmen scored 2.500. The freshmen score can be interpreted as basic agreement with these items, while the upperclass responses average as a neutral score. The null hypothesis was rejected since the expectations of entering engineering freshmen exceeded the perceptions of engineering upperclassmen in the categories of Student-Student Relationships.

Computer analysis of the five questions in this unit found statistically significant differences for three items.

Question B1a

This statement read "I (expect or think) that fellow students in the College of Engineering are a closely knit group." The results confirmed this question to be statistically significant for freshmen-upperclassmen differences.

As is evidenced by Table 4.8, the upperclass engineering student is slightly more negative in response than are freshmen. This can be seen in the "strongly-disagree" cell where upperclass comments are heavier.

This indicates that freshmen are expecting that students in the College of Engineering are a more closely-knit group than is perceived by the upperclass students. This appears to be another idealistic expectation which the entering engineering student holds about his future academic environment.

Table 4.8. A comparison of the responses of freshmen and upperclass engineering students on the question "fellow students in the College of Engineering are a closely-knit group."*

		Strongly Agree	Agree	Disagree	Strongly Disagree
Freshmen	Frequency	23	124	74	6
	Cell Chi Square	.33	1.64	1.25	2.86
Upper-classmen	Frequency	15	82	83	16
	Cell Chi Square	.39	1.90	1.45	3.31

*Significant at the .05 level.

Note: degrees of Freedom = 3
Chi Square value = 13.107

An examination of Table 4.9 shows a statistically significant difference in responses by major field of study. Chemical Engineers perceive more closeness among students than do the students from any of the other majors. Computer Science respondents saw less closeness among students than did any of the other majors.

No statistically significant differences were found between male and female upperclassmen in their perceptions of closeness of the student body.

Question B1b

This item was phrased "I (expect or think) that fellow students in the College of Engineering go out of

Table 4.9. A comparison of the responses of students in six engineering majors on the question "fellow students in the College of Engineering are a closely-knit group."*

		Strongly Agree	Agree	Disagree	Strongly Disagree
Chemical Engr.	Frequency	6	10	4	0
	Cell Chi Square	13.05	.32	2.36	1.63
Civil Engr.	Frequency	2	17	15	1
	Cell Chi Square	.17	.38	0	1.21
Computer Science	Frequency	1	14	13	6
	Cell Chi Square	.99	0	.14	3.75
Electrical Engr.	Frequency	4	15	25	7
	Cell Chi Square	0	1.88	.54	1.93
Mechanical Engr.	Frequency	2	20	19	2
	Cell Chi Square	.51	.22	.03	.65
Metallurgy	Frequency	0	6	7	0
	Cell Chi Square	.99	.06	.41	1.06

*Significant at the .05 level.

Note: degrees of Freedom = 15
Chi Square value = 32.281

their way to help other students with class assignments." This question was found to be not significant in class, major, or sex differences. Sixty-five percent, evenly divided between freshmen and upperclassmen, "agreed" or "strongly agreed" with the statement.

It can be concluded that entering engineering students expect students to help one another with class assignments. This appears to be an accurate expectation based on the perceptions of upperclass engineering students.

Question B1c

This statement read "I (expect or think) that fellow students in the College of Engineering are interested in one another's personal problems." This item was not statistically significant for class, major, or sex differences. Approximately even groups of freshmen and upperclassmen agreed or disagreed with the question with no clear-cut pattern established. Therefore, specific conclusions regarding the expectations of entering engineering students are not possible with this information.

Question B1d

This question asked "I (expect or think) that fellow students in the College of Engineering participate in many social activities together." On the basis of the computer

analysis, the data was determined to be statistically significant for the examination of freshmen-upperclassmen differences.

The results as reported in Table 4.10 indicate that freshmen are more positive and less negative in their responses. The entering student comments are strongly in the "agree" cell while upperclass responses are heavier in the "disagree" and "strongly-disagree" cells. This shows that freshmen expect more student interaction in social activities than the upperclassmen perceive as actually taking place. It appears that this is another unrealistic expectation held by the new engineering student.

Table 4.10. A comparison of the responses of freshmen and upperclass engineering students on the question "fellow students in the College of Engineering participate in many social activities together."*

		Strongly Agree	Agree	Disagree	Strongly Disagree
Freshmen	Frequency	14	121	83	6
	Cell Chi Square	3.50	6.20	4.63	4.46
Upper-classmen	Frequency	2	60	114	20
	Cell Chi Square	4.00	7.09	5.30	5.10

*Significant at the .05 level.

Note: degrees of Freedom = 3
Chi Square value = 40.287

Table 4.11 presents the statistically significant results of the analysis by major field of study. It can be seen that Chemical Engineers are the most positive in their responses as evidenced by the figures in the "agree" cell. Electrical Engineers and Civil Engineers are also moderately positive in their agreement with the statement. Oddly enough, it is the Electrical Engineers who are the most negative on this item as their score in the "strongly-disagree" cell indicates.

It can be concluded that Chemical Engineers and Civil Engineers perceive fellow students participating in many social activities together, while the Electrical Engineering students are divided on this question.

An analysis by sex found no statistical significance in the difference between men and women in their perceptions on this item.

Question B1e

This item was phrased "I (expect or think) that fellow students in the College of Engineering have a definite voice in determining policies and programs which affect other students." There was found to be statistically significant differences between the freshmen and upperclass groups of students.

Table 4.12 shows the results which indicate a much more positive attitude on the part of the new engineering

Table 4.11. A comparison of the responses of students in six engineering majors on the question "fellow students in the College of Engineering participate in many social activities together."*

		Strongly Agree	Agree	Disagree	Strongly Disagree
Chemical Engr.	Frequency	2	12	7	0
	Cell Chi Square	14.88	4.83	2.23	2.14
Civil Engr.	Frequency	0	17	18	1
	Cell Chi Square	.37	3.24	.41	1.95
Computer Science	Frequency	0	8	21	5
	Cell Chi Square	.35	.56	.08	.68
Electrical Engr.	Frequency	0	6	35	10
	Cell Chi Square	.52	5.92	.96	4.42
Mechanical Engr.	Frequency	0	15	23	3
	Cell Chi Square	.42	.48	.03	.33
Metallurgy	Frequency	0	2	10	1
	Cell Chi Square	.13	.98	.79	.08

*Significant at the .05 level.

Note: degrees of Freedom = 15
Chi Square value = 46.768

Table 4.12. A comparison of the responses of freshmen and upperclass engineering students on the question "fellow students in the College of Engineering have a definite voice in determining policies and programs which affect other students."*

		Strongly Agree	Agree	Disagree	Strongly Disagree
Freshmen	Frequency	37	138	45	6
	Cell Chi Square	14.09	8.10	14.98	7.97
Upper-classmen	Frequency	0	61	101	27
	Cell Chi Square	16.85	9.69	17.91	9.54

*Significant at the .05 level.

Note: degrees of Freedom = 3
Chi Square value = 99.126

student in all four cells. The freshmen scores are high in the positive categories of "strongly-agree" and "agree" while the upperclass figures are higher in the "disagree" and "strongly-disagree" cells.

It can be concluded that freshmen expect to have a definite voice in determining college policies and programs. Yet, the upperclass engineering students perceive very little of this activity occurring. Freshmen, therefore, have inaccurate perceptions concerning the area of student influence on college programs when they come to the campus.

No statistical significance was found when tests were used to examine differences by upperclass major or

sex. This indicates fairly uniform perceptions, regardless of field of study, for males and females.

Category C. Teaching-Learning Environment

The following hypotheses were established for this category:

> Null hypothesis: No difference will be found between the expectations of entering engineering freshmen and the perceptions of engineering upperclassmen in the categories of Teaching-Learning Environment.
>
> Alternate hypothesis: The expectations of entering engineering freshmen will exceed the perceptions reported by engineering upperclassmen in the categories of Teaching-Learning Environment.

Questions in this area examined the expectations (or perceptions) that students have concerning the presentation of material, the method of teaching, research opportunities, and the importance of theory, logic, mathematics, and laboratories in an engineering education.

The mean for freshmen was 1.710 while upperclassmen scored 1.964. Although both groups gave positive responses, the intensity of the freshmen responses was stronger. Therefore, the null hypothesis was rejected. The expectations of entering engineering freshmen exceeded the

perceptions of engineering upperclassmen in the categories of Teaching-Learning Environment.

Computer analysis of the seven questions in this unit found statistically significant differences for four items.

Question C1a

This statement read "I (expect or think) that success in my engineering courses is dependent on a good grasp of the principles and theories from sciences and mathematics." After the initial computer analysis, this question was determined to be not significant by class, major, or sex. The results show that 96.27 percent of the sample "strongly-agreed" or "agreed" with this item.

It seems that the entering engineering student does have a realistic expectation of the importance of math and science to engineering success as evidenced by the perceptions of engineering upperclassmen.

Question C1b

This question was phrased "I (expect or think) that lectures are very important in the learning process." This item was found to not be statistically significant based on the results of the first computer computations. It was found that 89.74 percent of the participants "strongly-agreed" or "agreed" with this question.

Freshmen expectations about the importance of lectures seem to be accurate and in line with the environment as perceived by the upperclassmen

Question C1c

This item was stated "I (expect or think) that a clear, defined logic is important in engineering problem solving." On the basis of a primary computer analysis, this question was deemed not significant statistically. It was found that 97.67 percent of the sample "strongly-agreed" or "agreed" with the statement.

It appears that the expectations which freshmen bring to college with them are accurate in relation to the importance of logic in engineering problem solving.

Question C1d

This statement was worded "I (expect or think) that most classes stress the theoretical rather than the practical." This question was found to be not significant statistically when analyzed for freshmen-upperclassmen differences. A strong majority of each group responded "strongly-agree" or "agree." This indicates that freshmen expect a theoretical approach in their engineering classes. According to the perceptions of the upperclass engineering students this is a realistic expectation.

This item did prove to be statistically significant when a comparison of major differences was performed. As is evidenced in Table 4.13, the Electrical Engineering students gave the most positive responses as indicated in the "strongly-agree" cell. Moderately positive perceptions were also given by the Civil Engineering group. The most negative comments were recorded by Mechanical Engineers as can be seen in the "disagree" and "strongly-disagree" cells.

It can be concluded that Electrical Engineers and Civil Engineers see more theory in the engineering curriculum. On the other hand, Mechanical Engineers perceive a more practical approach being taken in their class.

A test for differences by sex on this question was found to be not significant. Therefore, men and women see no difference in the theoretical versus practical approach of the coursework.

Question C1e

This item asked "I (expect or think) that mathematics is the most important element for success in my engineering courses." The analysis found this question to be statistically significant when tests for freshmen-upperclassmen differences were performed.

Table 4.14 illustrates that entering engineering students are more positive in their responses than are the

Table 4.13. A comparison of the responses of students in six engineering majors on the question "most classes stress the theoretical rather than the practical."*

		Strongly Agree	Agree	Disagree	Strongly Disagree
Chemical Engr.	Frequency	2	8	9	1
	Cell Chi Square	1.71	.26	3.20	.47
Civil Engr.	Frequency	3	18	13	1
	Cell Chi Square	3.62	.09	2.06	.01
Computer Science	Frequency	8	15	11	0
	Cell Chi Square	.01	.10	.74	.87
Electrical Engr.	Frequency	23	22	7	0
	Cell Chi Square	8.27	.35	2.77	1.33
Mechanical Engr.	Frequency	12	22	5	3
	Cell Chi Square	.29	.17	2.88	3.47
Metallurgy	Frequency	0	9	4	0
	Cell Chi Square	3.18	1.23	.17	.33

*Significant at the .05 level.

Note: degrees of Freedom = 15
Chi Square value = 37.597

seniors and juniors. The "disagree" cell is evidence of this fact, as the upperclass score is much higher. The freshmen responses are moderately stronger in the "strongly-agree" cell.

Table 4.14. A comparison of the responses of freshmen and upperclass engineering students on the question "mathematics is the most important element for success in my engineering courses."*

		Strongly Agree	Agree	Disagree	Strongly Disagree
Freshmen	Frequency	62	123	38	4
	Cell Chi Square	2.68	1.21	7.40	.88
Upper-classmen	Frequency	33	87	73	8
	Cell Chi Square	3.02	1.37	8.36	.99

*Significant at the .05 level.

Note: degrees of Freedom = 3
Chi Square value = 25.910

Therefore, new freshmen students expect mathematics to be very important to engineering success, while the upperclass students perceive its role as being more subdued. This is an area where freshmen are overly ideal in their expectations.

This question was found to be statistically significant when analyzed by engineering majors. It is reported in Table 4.15 that Electrical Engineers indicate more positive

Table 4.15. A comparison of the responses of students in six engineering majors on the question "mathematics is the most important element for success in my engineering courses."*

		Strongly Agree	Agree	Disagree	Strongly Disagree
Chemical Engr.	Frequency	2	8	10	1
	Cell Chi Square	.61	.13	.74	.03
Civil Engr.	Frequency	2	13	22	0
	Cell Chi Square	2.73	.57	5.46	1.47
Computer Science	Frequency	4	9	18	4
	Cell Chi Square	.53	2.50	2.20	4.88
Electrical Engr.	Frequency	18	28	5	1
	Cell Chi Square	10.49	1.34	10.21	.55
Mechanical Engr.	Frequency	7	23	13	0
	Cell Chi Square	0	1.03	.44	1.71
Metallurgy	Frequency	0	6	5	2
	Cell Chi Square	2.13	.02	.02	4.25

*Significant at the .05 level.

Note: degrees of Freedom = 15
Chi Square value = 54.043

responses than any other major. Negative scores were given by students in Civil Engineering and Computer Science. Therefore, Electrical Engineers see math as most important in their coursework while Civil Engineering and Computer Science students perceive it not being so important.

No differences on the test for statistical significance were found between men and women with their perceptions of the importance of mathematics.

Question C1f

This question stated "I (expect or think) that laboratories are an important part of the engineering curriculum." The results confirm this item to be statistically significant in terms of freshmen-upperclass differences.

Table 4.16 presents data which suggests that freshmen are more positive than junior and senior engineering students. Upperclassmen were more negative, as can be seen in the "disagree" and "strongly-disagree" cells while freshmen responses were heavier in the "strongly-agree" cell. It can be concluded that new engineering students expect laboratories to be more important in the curriculum than upperclass students, in fact, perceive them to be. This indicates that freshmen expectations are idealistic in reference to this area when they came to campus.

No statistical significance was found when analysis of the data was done by major field of study or sex. This

Table 4.16. A comparison of the responses of freshmen and upperclass engineering students on the question "laboratories are an important part of the engineering curriculum."*

		Strongly Agree	Agree	Disagree	Strongly Disagree
Freshmen	Frequency	80	133	14	0
	Cell Chi Square	4.66	.71	12.29	5.86
Upper-classmen	Frequency	38	99	51	11
	Cell Chi Square	5.32	.81	14.02	6.69

*Significant at the .05 level.

Note: degrees of Freedom = 3
Chi Square value = 50.371

is evidence that men and women of all engineering majors perceive the same relative importance of laboratories in the engineering curriculum.

Question C1g

This statement read "I (expect or think) that there are adequate opportunities for me to do research and study in an area I am interested in." Computer analysis determined that the freshmen-upperclassmen differences for this question were statistically significant.

Table 4.17 presents the results to this item. New engineering students were quite positive in their expectations as can be seen in the "strongly-agree" cell.

Upperclass students, on the other hand, scored in a negative direction as evidenced by the "disagree" and "strongly-disagree" cells.

Table 4.17. A comparison of the responses of freshmen and upperclass engineering students on the question "there are adequate opportunities for me to do research and study in an area I am interested in."*

		Strongly Agree	Agree	Disagree	Strongly Disagree
Freshmen	Frequency	93	122	14	0
	Cell Chi Square	17.82	.04	15.62	5.97
Upper-classmen	Frequency	18	107	57	11
	Cell Chi Square	21.15	.05	18.53	7.08

*Significant at the .05 level.

Note: degrees of Freedom = 3
Chi Square value = 86.257

Therefore, it can be concluded that freshmen expect to be able to do more research than senior or junior engineering students have actually perceived taking place. This suggests that entering engineering students are too idealistic in their research expectations.

Also shown in Table 4.18 is the analysis by sex in which this question was found to be statistically significant. It appears that males are more positive in their

responses than females. It should be explained that caution must be used when interpreting these results. Significant observations can break down where cell sizes are less than five. A modest conclusion would be that it seems that males perceive more opportunities to do research than do females.

Table 4.18. A comparison of the responses of male and female engineering students on the question "there are adequate opportunities for me to do research and study in an area I am interested in."*

		Strongly Agree	Agree	Disagree	Strongly Disagree
Male	Frequency	14	101	54	11
	Cell Chi Square	.46	.01	.01	.05
Female	Frequency	4	6	3	0
	Cell Chi Square	6.41	.20	.18	.74

*Significant at the .05 level.

Note: degrees of Freedom = 3
Chi Square value = 8.080

No statistical significance was found when an analysis of the data examined differences by major field of study. Therefore, all engineering majors hold similar perceptions in their views on this subject.

Category D.
Personal Attention

The hypotheses established for this category were:

Null hypothesis: No difference will be found between the expectations of entering engineering freshmen and the perceptions of engineering upperclassmen in the categories of Personal Attention.

Alternate hypothesis: The expectations of entering engineering freshmen will exceed the perceptions reported by engineering upperclassmen in the categories of Personal Attention.

Explored in this section were the expectations (or perceptions) that students have concerning the kind and quality of interaction they have in the college. Questions focused on the ease of getting to know faculty and students, getting help when they need it, feeling like a person instead of a student number, and having someone available to listen to personal problems.

The mean reported for freshmen was 1.973 while upperclassmen scored 2.120. Although both groups gave positive responses, the intensity of the freshmen responses was stronger. Therefore, the null hypothesis was rejected since the expectations of entering engineering freshmen exceeded the perceptions of engineering upperclassmen in the categories of Personal Attention.

Computer analysis of the five questions in this unit found statistically significant differences for three items.

Question D1a

This item asked "I (expect or think) that I (will) feel like a person and not a number in the college." The results proved this question to be statistically significant when exploring freshmen-upperclassmen differences.

New freshmen students were more positive in their responses than were upperclass engineering students as can be seen in the "strongly-agree" cell of Table 4.19. It appears that entering engineering students expect a more personable atmosphere in the college. On the basis of upperclass responses, it appears this is an inaccurate expectation on the part of these students.

Table 4.19. A comparison of the responses of freshmen and upperclass engineering students on the question "I feel like a person and not a number in the college."*

		Strongly Agree	Agree	Disagree	Strongly Disagree
Freshmen	Frequency	55	134	30	8
	Cell Chi Square	5.35	.59	1.76	1.37
Upper-classmen	Frequency	21	136	42	2
	Cell Chi Square	6.05	.67	1.98	1.55

*Significant at the .05 level.

Note: degrees of Freedom = 3
Chi Square value = 19.317

Statistical significance was also found when an analysis of the data was done on engineering major differences. Chemical Engineering students were the most positive of all majors, as is seen in the "strongly-agree" cell of Table 4.20. Electrical Engineers, and to a lesser extent, Mechanical Engineers, scored in a negative direction as evidenced by the "disagree" cell. These results suggest that Chemical Engineers do not feel like a student number, while Electrical Engineering and Mechanical Engineering students perceive this attitude in the college.

No differences were found between men and women in terms of this question.

Question D1b

This statement read "I (expect or think) that most of my fellow students and professors (will) know my name." The results confirm this item to be statistically significant in freshmen-upperclassmen student differences.

Table 4.21 presents the figures which show senior and junior engineering students to be more negative in their responses and freshmen score more positively. The negative results are especially evident in the "strongly-disagree" cell while positive freshmen scores can be seen in the "strongly-agree" cell. This suggests that freshmen engineering students' expectation that faculty and students know their name is idealistic based on upperclass perceptions.

Table 4.20. A comparison of the responses of students in six engineering majors on the question "I feel like a person and not a number in the college."*

		Strongly Agree	Agree	Disagree	Strongly Disagree
Chemical Engr.	Frequency	6	14	1	0
	Cell Chi Square	6.60	0	2.62	.21
Civil Engr.	Frequency	2	28	7	0
	Cell Chi Square	.90	.35	.07	.37
Computer Science	Frequency	0	23	11	1
	Cell Chi Square	3.66	.02	1.86	1.22
Electrical Engr.	Frequency	5	26	20	1
	Cell Chi Square	.03	2.40	7.68	.45
Mechanical Engr.	Frequency	6	34	3	0
	Cell Chi Square	.51	.83	3.99	.43
Metallurgy	Frequency	2	11	0	0
	Cell Chi Square	.30	.55	2.72	.13

*Significant at the .05 level.

Note: degrees of Freedom = 15
Chi Square value = 37.883

Table 4.21. A comparison of the responses of freshmen and upperclass engineering students on the question "most of my professors and fellow students know my name."*

		Strongly Agree	Agree	Disagree	Strongly Disagree
Freshmen	Frequency	27	128	69	4
	Cell Chi Square	1.25	.45	1.07	1.59
Upper-classmen	Frequency	14	99	78	10
	Cell Chi Square	1.41	.51	1.21	1.80

*Significant at the .05 level.

Note: degrees of Freedom = 3
Chi Square value = 9.287

This question was also statistically significant when analyzed by engineering major differences. As indicated on the "strongly-agree" cell of Table 4.22, Chemical Engineers were the most favorable in their responses with moderately positive responses from Metallurgy students. Negative feedback was reported by Computer Science students. This indicates that Chemical Engineers and Metallurgy juniors and seniors feel the professors and students know their name, while Computer Science students feel some impersonality.

An analysis by sex differences was not statistically significant which suggests that males and females perceive a similar environment on this question.

Table 4.22. A comparison of the responses of students in six engineering majors on the question "most of my professors and fellow students know my name."*

		Strongly Agree	Agree	Disagree	Strongly Disagree
Chemical Engr.	Frequency	5	13	3	0
	Cell Chi Square	8.55	.68	3.25	1.04
Civil Engr.	Frequency	1	21	14	1
	Cell Chi Square	.97	.42	.01	.38
Computer Science	Frequency	1	8	22	4
	Cell Chi Square	.85	4.95	5.22	2.93
Electrical Engr.	Frequency	3	25	22	2
	Cell Chi Square	.11	.01	.16	.13
Mechanical Engr.	Frequency	3	21	16	3
	Cell Chi Square	.0	.0	.03	.35
Metallurgy	Frequency	1	11	1	0
	Cell Chi Square	.01	3.30	3.24	.65

*Significant at the .05 level.

Note: degrees of Freedom = 15
Chi Square value = 37.258

Question D1c

This question posed "I (expect or think) people (will) take the time to listen to my problems." This item was found to be statistically significant when analyzing freshmen-upperclass student differences.

The "strongly-agree" cell of Table 4.23 points out that freshmen are more positive in their responses. This suggests that new freshmen expect people to take the time to listen to their problems. This appears to be an inaccurate expectation after examining the results of the upperclass data.

Differences by major were also statistically significant as indicated in Table 4.25. Chemical Engineers perceive that people will take time to listen to their probelms as can be seen in the "strongly-agree" cell.

The results in Table 4.24 show that women perceive less attention with personal problems than do males. It should be mentioned that the small sample size of women can be a problem with any attempted interpretation. With cell sizes smaller than five, significant observations can break down. So, a tentative conclusion would be that males feel that people take the time to listen to their problems more than women feel such.

Table 4.23 A comparison of the responses of freshmen and upperclass engineering students on the question "people take the time to listen to my problems."*

		Strongly Agree	Agree	Disagree	Strongly Disagree
Freshmen	Frequency	26	140	59	3
	Cell Chi Square	4.23	.69	.01	.31
Upper-classmen	Frequency	6	136	48	1
	Cell Chi Square	5.06	.82	.01	.37

*Significant at the .05 level.

Note: degrees of Freedom = 3
Chi Square value = 11.511

Table 4.24. A comparison of the responses of male and female engineering students on the question "people take the time to listen to my problems."*

		Strongly Agree	Agree	Disagree	Strongly Disagree
Male	Frequency	6	125	45	0
	Cell Chi Square	.04	.00	.01	.92
Female	Frequency	0	11	3	1
	Cell Chi Square	.47	.01	.16	10.81

*Significant at the .05 level.

Note: degrees of Freedom = 3
Chi Square value = 12.426

Table 4.25. A comparison of the responses of students in six engineering majors on the question "people take the time to listen to my problems."*

		Strongly Agree	Agree	Disagree	Strongly Disagree
Chemical Engr.	Frequency	3	15	3	0
	Cell Chi Square	8.30	.0	.98	.11
Civil Engr.	Frequency	0	26	8	0
	Cell Chi Square	1.07	.13	.03	.18
Computer Science	Frequency	0	23	11	1
	Cell Chi Square	1.10	.15	.55	3.64
Electrical Engr.	Frequency	0	33	16	0
	Cell Chi Square	1.54	.10	1.10	.26
Mechanical Engr.	Frequency	1	29	9	0
	Cell Chi Square	.04	.05	.07	.20
Metallurgy	Frequency	2	10	1	0
	Cell Chi Square	6.20	.06	1.57	.07

*Significant at the .05 level.

Note: degrees of Freedom = 15
Chi Square value = 27.520

Question D1d

This item asked "I (expect or think) that if I need help with a class assignment I (will) know where to get help in the college." This question was determined to not be statistically significant after the initial computer screening of the data. The results showed that 87.21 percent of the sample "strongly-agreed" or "agreed" with the statement.

These results suggest that freshmen accurately expect that they will know where to get class help if they need it.

Question D1e

This question stated "I (expect or think) that if I need general information, I (will) know where to get help in the college." After a preliminary examination of the results, this item was found to not be statistically significant. The data showed that 92.77 percent of the participants "strongly-agreed" or "agreed" with the question.

It appears that the entering engineering student is not over idealistic in his expectation of the availability of assistance in the college.

Category E.
Difficulty of Material

The hypotheses established for this category were:

Null hypothesis: No difference will be found between the expectations of entering engineering freshmen and the perceptions of engineering upperclassmen in the categories of Difficulty of Material.

Alternate hypothesis: The expectations of entering engineering freshmen will exceed the perceptions reported by engineering upperclassmen in the categories of Difficulty of Material.

This area dealt with student expectations (or perceptions) concerning the difficulty of the engineering curriculum and chances for their success in the program. Specific questions examined the amount and type of effort needed to succeed, the difficulty of examinations, and the level of competition.

Initial computer analysis determined the mean for freshmen at 2.122 while upperclassmen scored 2.106. It appeared that there was essentially no difference between the groups in this category. However, further investigation found that two questions ("I (expect or think) that an important ingredient for success is knowing the right people." and "I (expect or think) that an important ingredient for success is learning the ropes.") were inconsistent

with the wording of the other items in the survey. A positive response had negative connotations. A reanalysis of the data for unit five was performed. The coding of the responses was changed to reflect the different direction of the question. A "strongly-agree" response was coded as "strongly-disagree," an "agree" response was coded as "disagree" and vice versa. The new mean score computed for freshmen was 2.145 and 2.310 for upperclassmen. This indicates that freshmen did score in a more positive direction than did upperclassmen on this category. On the basis of these results the null hypothesis was rejected. The expectations of entering engineering freshmen exceeded the perceptions of engineering upperclassmen in the categories of Difficulty of Material.

Computer analysis of the six questions in this unit found statistically significant differences for four items.

Question E1a

This statement read "I (expect or think) that it (is or will be) difficult to pass a course without a great deal of studying." This question proved to be statistically significant when examined for freshmen-upperclassmen differences.

As indicated in the "disagree" cells of Table 4.26, junior and senior engineering students were more negative

Table 4.26. A comparison of the responses of freshmen and upperclass engineering students on the question "it is difficult to pass a course without a great deal of studying."*

		Strongly Agree	Agree	Disagree	Strongly Disagree
Freshmen	Frequency	38	147	39	6
	Cell Chi Square	.12	2.15	4.24	.08
Upper-classmen	Frequency	37	96	62	4
	Cell Chi Square	.14	2.48	4.90	.09

*Significant at the .05 level.

Note: degrees of Freedom = 3
Chi Square value = 14.189

in their responses. Entering students were more positive as evidenced by the results reported in the "agree" cell. It can be concluded that new freshmen expect the necessity of a great deal of studying to pass a course, contrary to the perceptions of engineering upperclass students. Freshmen appear to be too idealistic in their expectations of this situation.

No statistically significant differences were found when computer analysis was done by major field or sex. Male and female upperclass students of all engineering majors have similar perceptions.

Question E1b

This item asked "I (expect or think) that most classes (will) require a lot of preparation and study before going to class." When analyzed for freshmen-upperclass differences, this question was determined to be statistically significant.

The results in Table 4.27 suggest that upperclass engineers are more negative in their perceptions as evidenced in the "disagree" cell. Freshmen also score higher in the "agree" cell. This indicates that freshmen expect to do a lot of preparation for classes, while the junior and senior engineering students seem to think that it is not that necessary. This is evidence that new engineering student expectations are inaccurate concerning the amount of pre-class studying necessary for success.

An examination of the data by engineering majors and sex found no statistical significance indicating that men and women upperclass students perceive a similar environment on this question.

Question E1c

This question stated "I (expect or think) that most examinations (will) require a thorough knowledge of the class material." After an initial analysis of the data it was determined that this item was not statistically significant. The results found that 97.45 percent of

Table 4.27. A comparison of the responses of freshmen and upperclass engineering students on the question "most classes require a lot of preparation and study before going to class."*

		Strongly Agree	Agree	Disagree	Strongly Disagree
Freshmen	Frequency	35	175	16	3
	Cell Chi Square	.19	6.03	22.22	.36
Upper-classmen	Frequency	26	98	76	1
	Cell Chi Square	.22	6.87	25.32	.40

*Significant at the .05 level.

Note: degrees of Freedom = 3
Chi Square value = 61.614

the sample "strongly-agreed" or "agreed" with the statement.

It can be concluded that freshmen students in engineering bring with them accurate perceptions concerning the amount of knowledge needed on examinations. Their expectations seem to coincide with the perceptions of the juniors and seniors.

Question E1d

This statement read "I (expect or think) that an important ingredient for success (will) is knowing the right people." The results of the data indicate this

question to be statistically significant on the basis of freshmen-upperclassmen differences.

It can be seen in Table 4.28 that freshmen are more negative in their responses than are juniors and seniors. The "disagree" cell illustrates the freshmen attitudes while upperclass opinions are shown in the "agree" cell. These results suggest that freshmen engineers feel that success is not dependent upon knowing the right people. Yet, upperclass students perceive that this can be a way to achieve success. Freshmen seem to be idealistic in their expectation as it relates to this situation.

Table 4.28. A comparison of the responses of freshmen and upperclass engineering students on the question "an important ingredient for success is knowing the right people."*

		Strongly Agree	Agree	Disagree	Strongly Disagree
Freshmen	Frequency	20	54	124	28
	Cell Chi Square	1.04	3.44	3.55	.06
Upper-classmen	Frequency	27	76	72	22
	Cell Chi Square	1.19	3.95	4.07	.07

*Significant at the .05 level.

Note: degrees of Freedom = 3
Chi Square value = 17.375

No statistically significant differences were found when the data was analyzed by sex or engineering majors differences. This indicates similar perceptions for engineering men and women of all upperclass majors.

Question E1e

This question asked "I (expect or think) that an important ingredient for success (will be or is) learning the 'ropes.'" The data analysis confirms this item to be statistically significant when testing for freshmen-upperclass differences.

The essential difference is in the "disagree" cell of Table 4.29. Freshmen score in a more negative direction, indicating they expect that learning the ropes will not be important. This is refuted by the results of the junior-senior perceptions. Freshmen expectations appear to be unrealistic in this situation.

Differences between males and females and each engineering major were not statistically significant. This is evidence that the perceptions are fairly uniform among and across these groups on the importance of learning the ropes.

Question E1f

This item was phrased "I (expect or think) the competition for grades (will be or is) intensive." This

Table 4.29. A comparison of the responses of freshmen and upperclass engineering students on the question "an important ingredient for success is learning the 'ropes.'"*

		Strongly Agree	Agree	Disagree	Strongly Disagree
Freshmen	Frequency	25	123	63	9
	Cell Chi Square	.72	1.32	4.60	1.74
Upper-classmen	Frequency	31	135	28	2
	Cell Chi Square	.81	1.49	5.16	1.95

*Significant at the .05 level.

Note: degrees of Freedom = 3
Chi Square value = 17.792

question was found to be not significant with any of the measureable variables. The majority of both freshmen engineers and upperclass students "strongly-agree" or "agree" with the statement.

It can be concluded that entering students and juniors-seniors agree that the competition for grades in engineering courses is intensive. Therefore, freshmen expectations are accurate and realistic.

Category F.
Discussion Opportunities

The hypotheses established for this category were:

Null hypothesis: No difference will be found

between the expectations of entering engineering freshmen and the perceptions of engineering upperclassmen in the categories of Discussion Opportunities.

Alternate hypothesis: The expectations of entering engineering freshmen will exceed the perceptions reported by engineering upperclassmen in the categories of Discussion Opportunities.

This section probed the student's expectations (or perceptions) for classroom interaction. Questions included the opportunities to ask questions, challenge the professor and offer new ideas during class time.

The mean for freshmen was 1.907, while upperclassmen scored 2.395. Although both groups reported in a positive direction, the intensity of the freshmen responses was stronger. Therefore, the null hypothesis was rejected since the expectations of entering engineering freshmen exceeded the perceptions of engineering upperclassmen in the categories of Discussion Opportunities.

Computer analysis of the six questions in this unit found statistically significant differences for four items.

Question F1a

This statement read "I (expect or think) that students are encouraged to speak out, ask questions, and offer alternatives during class." The first computer analysis

of this question found it to be not statistically significant. The results showed that 88.76 percent of the respondents indicated "strongly-agree" or "agree."

Apparently, freshmen expectations are similar to those perceptions held by engineering upperclassmen. Freshmen are not idealistic in relation to their expectations to be able to ask questions and promote new ideas in class.

Question F1b

This question stated "I (expect or think) that professors like to be challenged on their ideas during class." This item was statistically significant when analyzed for freshmen-upperclass differences.

Table 4.30 in the "strongly-agree" cell shows that freshmen are much more positive in their responses. The "disagree" cell shows the negative perceptions recorded by upperclass engineering students. Freshmen expect to be able to challenge professional ideas, while the juniors and seniors do not see this happening in reality. This is an inaccurate expectation on the part of the entering engineering student.

It can be seen in Table 4.31 that there is statistically significant difference by engineering major. Electrical Engineers score most negatively in the "strongly-disagree" cell. Chemical Engineers gave the most positive responses as is indicated in the "agree" cell. It can be

Table 4.30. A comparison of the responses of freshmen and upperclass engineering students on the question "professors like to be challenged on their ideas during class."*

		Strongly Agree	Agree	Disagree	Strongly Disagree
Freshmen	Frequency	47	116	52	10
	Cell Chi Square	13.28	.32	5.89	1.36
Upper-classmen	Frequency	5	90	84	17
	Cell Chi Square	15.24	.36	6.76	1.56

*Significant at the .05 level.

Note: degrees of Freedom = 3
Chi Square value = 44.764

concluded that Electrical Engineers perceive that professors do not like to be challenged in class while Chemical Engineers perceive that they do.

No statistically significant difference was found between men and women, which suggests that both sexes perceive a similar environment in this area.

Question F1c

This item was phrased "I (expect or think) that professors enjoy answering student questions." The initial computer analysis of the data determined this question to be not significant. Results show that 88.81 percent of all respondents "strongly-agreed" or "agreed" with this statement.

Table 4.31. A comparison of the responses of students in six engineering majors on the question "professors like to be challenged on their ideas during class."*

		Strongly Agree	Agree	Disagree	Strongly Disagree
Chemical Engr.	Frequency	0	16	5	0
	Cell Chi Square	.54	4.19	1.78	1.82
Civil Engr.	Frequency	1	16	18	1
	Cell Chi Square	.01	.02	.43	1.44
Computer Science	Frequency	2	14	18	1
	Cell Chi Square	1.37	.27	.60	1.37
Electrical Engr.	Frequency	0	18	21	12
	Cell Chi Square	1.30	1.25	.03	12.98
Mechanical Engr.	Frequency	1	21	15	3
	Cell Chi Square	.00	.38	.27	.06
Metallurgy	Frequency	1	5	7	0
	Cell Chi Square	1.35	.16	.37	1.13

*Significant at the .05 level.

Note: degrees of Freedom = 15
Chi Square value = 33.099

It seems that freshmen expectations are not overly idealistic in this regard. Their ideas are closely integrated with those perceptions of senior and junior engineering students.

Question F1d

This question asked "I (expect or think) that class time is set aside each meeting for questions and/or discussion." This item was determined to be statistically significant when tests for freshmen-upperclass differences were performed.

Evidenced by the data in Table 4.32, freshmen were much heavier in their positive responses as shown in the "strongly-agree" cell. Upperclassmen scores were strongest in the negative cells. This suggests that entering engineering students expect class time to be set aside for questions and discussion. On the basis of the perceptions of juniors and seniors, this is an inaccurate expectation.

Statistical significance was also found when an examination of major differences was done. As illustrated by the "strongly'agree" and "agree" cells of Table 4.33, the Chemical Engineering students scored the most positive on this question. Moderately positive responses were also recorded for Civil Engineers and Electrical Engineers. Strong negative comments were given by Electrical Engineers, as indicated in the "strongly-disagree" cell. Therefore,

Table 4.32. A comparison of the responses of freshmen and upperclass engineering students on the question "class time is set aside each meeting for questions and/or discussion."*

		Strongly Agree	Agree	Disagree	Strongly Disagree
Freshmen	Frequency	59	131	33	2
	Cell Chi Square	17.41	3.43	19.18	5.97
Upper-classmen	Frequency	6	79	98	16
	Cell Chi Square	19.69	3.88	21.69	6.75

*Significant at the .05 level.

Note: degrees of Freedom = 3
Chi Square value = 98.007

Chemical Engineers and Civil Engineers perceive class time set aside for discussion, while Electrical Engineers do not.

No differences were found between males and females which suggest that they hold similar perceptions towards this situation.

Question Fle

This statement read "I (expect or think) that class discussions are usually stimulating and intense." This question was found to be statistically significant when a comparison of freshmen-upperclass responses was done.

Table 4.33. A comparison of the responses of students in six engineering majors on the question "class time is set aside each meeting for questions and/or discussion."*

		Strongly Agree	Agree	Disagree	Strongly Disagree
Chemical Engr.	Frequency	3	14	4	0
	Cell Chi Square	8.85	3.85	3.89	1.69
Civil Engr.	Frequency	1	8	22	5
	Cell Chi Square	.01	2.77	1.03	1.53
Computer Science	Frequency	0	15	19	1
	Cell Chi Square	1.06	.09	.18	1.17
Electrical Engr.	Frequency	0	13	30	9
	Cell Chi Square	1.57	2.83	.75	5.55
Mechanical Engr.	Frequency	2	22	17	1
	Cell Chi Square	.43	1.70	.66	1.67
Metallurgy	Frequency	0	7	6	0
	Cell Chi Square	.39	.66	.03	1.05

*Significant at the .05 level.

Note: degrees of Freedom = 15
Chi Square value = 43.382

Each of the four cells of Table 4.34 show that the responses of entering engineering students are much stronger in a positive direction than are those of juniors and seniors. This indicates a strong expectation on the part of freshmen for stimulating class discussions. The expectation is overly idealistic as is shown by the responses of the upperclass students.

Table 4.34. A comparison of the responses of freshmen and upperclass engineering students on the question "class discussions are usually stimulating and intense."*

		Strongly Agree	Agree	Disagree	Strongly Disagree
Freshmen	Frequency	47	121	50	2
	Cell Chi Square	17.30	7.82	17.56	6.93
Upper-classmen	Frequency	2	57	120	18
	Cell Chi Square	19.32	8.73	19.61	7.74

*Significant at the .05 level.

Note: degrees of Freedom = 3
Chi Square value = 105.012

Differences by engineering major were also found to be statistically significant. The "agree" cell of Table 4.35 points out the positive attitudes of Chemical Engineers and Mechanical Engineers on this item. Electrical Engineers were found to be the most negative as seen in the

Table 4.35. A comparison of the responses of students in six engineering majors on the question "class discussions are usually stimulating and intense."*

		Strongly Agree	Agree	Disagree	Strongly Disagree
Chemical Engr.	Frequency	0	12	8	1
	Cell Chi Square	.21	5.78	1.80	.44
Civil Engr.	Frequency	0	7	25	4
	Cell Chi Square	.37	1.12	.43	.15
Computer Science	Frequency	0	7	26	2
	Cell Chi Square	.36	.97	1.03	.45
Electrical Engr.	Frequency	1	11	31	8
	Cell Chi Square	.45	.96	.00	2.39
Mechanical Engr.	Frequency	1	19	20	1
	Cell Chi Square	.82	4.29	.99	2.01
Metallurgy	Frequency	0	1	10	2
	Cell Chi Square	.13	2.03	.55	.56

*Significant at the .05 level.

Note: degrees of Freedom = 15
Chi Square value = 28.268

"strongly-disagree" cell. It can be concluded that Chemical Engineers and Mechanical Engineers perceive stimulating class discussion while Electrical Engineers do not.

No statistically significant differences were found on the basis of sex. Men and women apparently hold similar viewpoints on class discussions.

Question F1f

This question was phrased "I (expect or think) that student discussion can make a professor change his mind." When tests for freshmen-upperclass differences were performed, this item was found to be statistically significant.

The "strongly-agree" cell of Table 4.36 shows that entering engineers are more positive. This indicates that freshmen expect that student discussion will make a professor change his mind. The results of the upperclass engineering data do not support this and indicate that freshmen are idealistic in this expectation.

No statistically significant differences were found for major or sex differences. This suggests that males and females of all engineering majors have similar attitudes on this question.

Category G.
Career Objectives

The basic hypotheses established for this category were:

Table 4.36. A comparison of the responses of freshmen and upperclass engineering students on the question "student discussion can make a professor change his mind."*

		Strongly Agree	Agree	Disagree	Strongly Disagree
Freshmen	Frequency	31	112	62	12
	Cell Chi Square	9.69	.03	2.64	.03
Upper-classmen	Frequency	3	98	83	12
	Cell Chi Square	10.69	.03	2.92	.03

*Significant at the .05 level.

Note: degrees of Freedom = 3
Chi Square value = 26.033

Null hypothesis: No difference will be found between the expectations of entering engineering freshmen and the perceptions of engineering upperclassmen in the categories of Career Outcomes.

Alternate hypothesis: The expectations of entering engineering freshmen will exceed the perceptions reported by engineering upperclassmen in the categories of Career Outcomes.

Questions in this category explored the expectations (or perceptions) the student has concerning the practicability of an engineering education, including preparation for job-solving problems and generally getting along in the

world. One question also examined the student's understanding of what an engineer does on the job.

The mean for freshmen was 1.957 while upperclassmen scored 2.392. Although both groups reported in a positive direction, the intensity of the freshmen responses was stronger. Therefore, the null hypothesis was rejected. The expectations of entering engineering freshmen exceeded the perceptions of engineering upperclassmen in all the categories of Career Outcomes.

Computer analysis found statistical significance for all four of the items in this unit.

Question G1a

This question was worded "I (expect or think) that the required engineering courses will adequately prepare me for a job when I graduate." The results confirm this item to be statistically significant when analyzed for freshmen-upperclass differences.

It can be seen in Table 4.37 that freshmen give more positive responses to this question. The "strongly-agree" cell is much heavier than the junior-senior score, while upperclassmen score strongest in the "disagree" cell. Upperclass engineering students are pessimistic about the educational preparation they are receiving. It can be concluded that entering engineering students expect their

Table 4.37. A comparison of the responses of freshmen and upperclass engineering students on the question "the required engineering courses will adequately prepare me for a job when I graduate."*

		Strongly Agree	Agree	Disagree	Strongly Disagree
Freshmen	Frequency	95	119	10	2
	Cell Chi Square	26.98	1.41	15.94	1.24
Upper-classmen	Frequency	9	127	51	6
	Cell Chi Square	31.60	1.65	18.67	1.45

*Significant at the .05 level.

Note: degrees of Freedom = 3
Chi Square value = 98.948

education to be more useful for a job. It appears this expectation is inaccurate.

Statistically significant differences were found by engineering major. As illustrated in the "strongly-disagree" cell of Table 4.38, Electrical Engineers were the most negative in their responses. This indicates that they perceive their education will not adequately prepare them for a job more than any other major group of students.

No statistically significant differences were found for men and women indicating similar perceptions on this question.

Table 4.38. A comparison of the responses of students in six engineering majors on the question "the required engineering courses will adequately prepare me for a job when I graduate."*

		Strongly Agree	Agree	Disagree	Strongly Disagree
Chemical Engr.	Frequency	2	16	1	0
	Cell Chi Square	1.40	.98	3.22	.59
Civil Engr.	Frequency	1	27	7	0
	Cell Chi Square	.24	.68	.55	1.09
Computer Science	Frequency	3	22	10	0
	Cell Chi Square	1.15	.05	.06	1.09
Electrical Engr.	Frequency	2	28	17	5
	Cell Chi Square	.07	1.13	.77	7.08
Mechanical Engr.	Frequency	0	24	15	1
	Cell Chi Square	1.87	.20	1.86	.05
Metallurgy	Frequency	1	10	1	0
	Cell Chi Square	.35	.56	1.49	.37

*Significant at the .05 level.

Note: degrees of Freedom = 15
Chi Square value = 26.894

Question G1b

This statement read "I (expect or think) an engineering program gives the student a well-rounded education." This item was found to be statistically significant when analyzed for freshmen-upperclass differences.

As evidenced by the "strongly-agree" and "disagree" cells of Table 4.39, freshmen were much more positive in their responses, while upperclassmen were more negative. These results suggest that freshmen expect an engineering curriculum to give them a well-balanced educational background. On the basis of junior-senior results, this appears to be an idealistic expectation.

Table 4.39. A comparison of the responses of freshmen and upperclass engineering students on the question "an engineering program gives the student a well-rounded education."*

		Strongly Agree	Agree	Disagree	Strongly Disagree
Freshmen	Frequency	54	141	29	2
	Cell Chi Square	7.96	.05	6.25	1.64
Upperclassmen	Frequency	15	118	57	7
	Cell Chi Square	9.14	.06	7.17	1.88

*Significant at the .05 level.

Note: degrees of Freedom = 3
Chi Square value = 34.152

No statistically significant differences were found when the data was examined for major or sex differences. This indicates that males and females of all engineering majors have similar perceptions in this area.

Question G1c

This item asked "I (expect or think) that an engineering education teaches a student how to get along with other people." Statistical significance was found to exist for this question when tested for freshmen-upperclass differences.

It can be seen in the "agree" and "disagree" cells of Table 4.40 that new engineering students are more positive in their responses than are juniors and seniors. Freshmen expect to learn how to get along with people from their engineering curriculum when they come to college. This expectation is unrealistic based on the data results from engineering upperclassmen.

When analyzed for major and sex differences, this question was not statistically significant. Males and females hold similar perceptions to this situation.

Question G1d

This question stated "I (expect or think) that I know what an engineer does on the job." Based on the results of the data analysis, this item was determined

Table 4.40. A comparison of the responses of freshmen and upperclass engineering students on the question "an engineering education teaches a student how to get along with other people."*

		Strongly Agree	Agree	Disagree	Strongly Disagree
Freshmen	Frequency	21	114	84	7
	Cell Chi Square	1.99	8.09	7.68	.70
Upper-classmen	Frequency	8	50	129	11
	Cell Chi Square	2.27	9.23	8.77	.80

*Significant at the .05 level.

Note: degrees of Freedom = 3
Chi Square value = 39.522

to be statistically significant for freshmen-upperclass differences.

An examination of the "strongly-disagree" and "strongly-agree" cells in Table 4.41 reveals a more positive response by the group of entering engineering freshmen. The results suggest that these new students feel they know what an engineer does on the job. Yet the juniors and seniors indicate that they do not. This means that incoming engineering students probably do not really have a good conception of an engineer on the job.

No statistical significance was found when the data was analyzed by major or sex. This suggests that

engineering upperclass students of both sexes hold similar viewpoints on this question.

Table 4.41. A comparison of the responses of freshmen and upperclass engineering students on the question "I know what an engineer does on the job."*

		Strongly Agree	Agree	Disagree	Strongly Disagree
Freshmen	Frequency	40	126	50	7
	Cell Chi Square	3.13	1.01	1.67	6.32
Upper-classmen	Frequency	17	91	63	26
	Cell Chi Square	3.55	1.14	1.89	7.15

*Significant at the .05 level.

Note: degrees of Freedom = 3
Chi Square value = 25.850

Summary

The analysis of the data and a report of the findings have been presented in this chapter. The expectations of entering engineering freshmen were compared to the perceptions of engineering upperclassmen toward their academic environment. The following seven areas of the academic climate were surveyed: faculty-student relationships, student-student relationships, teaching-learning environment, personal attention, difficulty of material, discussion

opportunities, and career outcomes. In each category, freshmen were found to be more positive in their responses. When compared to the standard of reality as measured by upperclassmen data, the expectations of the entering engineering students were concluded to be impractical and unrealistic. Significant differences were found on twenty-four items. A summary of these differences is listed in Table 4.42.

Findings were also reported for differences by major field of study and sex. Computer analysis found fourteen questions to be significant when tested for differences by major. No engineer major was found to be consistently more positive than the others, although Chemical Engineers did seem to score in a more positive direction on questions regarding personal attention by faculty, fellow students, and the college in general. Only two differences were found when the data was analyzed by sex. Since the number of female respondents was so small, the conclusions were only cautiously offered. The results of these findings are summarized in Table 4.42.

Of the seven hypotheses used in this study, the null hypotheses was rejected in each case. Special mention was made in category five, where a recomputation of the data was done to show a more positive freshman response.

The importance of these findings, and the subsequent conclusions are discussed in Chapter V.

Table 4.42. Summary of statistically significant findings.

Question	Fresh/ Upper Difs.	Major Difs.	Sex Difs.
A. Faculty-Student Relationships			
1. Faculty members in the College of Engineering . . .			
c. are interested in a student's personal problems.	X	X	
d. are interested in discussing career opportunities with students.	X	X	
e. are available when they are needed.	X	X	
B. Student-Student Relationships			
1. Fellow students in the College of Engineering . . .			
a. are a closely-knit group.	X	X	
d. participate in many social activities together	X	X	
e. have a definite voice in determining policies and programs which affect other students.	X		
C. Teaching-Learning Environment			
d. most classes stress the theoretical rather than the practical.		X	
e. mathematics is the most important element for success in my engineering course.	X	X	
f. laboratories are an important part of the engineering curriculum.	X		

Table 4.42. Continued.

Question	Fresh/ Upper Difs.	Major Difs.	Sex Difs.
g. there are adequate opportunities for me to do research and study in an area I am interested in.	X		
D. Personal Attention			
a. I feel like a person and not a number in the college.	X	X	
b. most of my professors and fellow students know my name.	X	X	
c. people take the time to listen to my problems.	X	X	X
E. Difficulty of Material			
a. it is difficult to pass a course without a great deal of studying.	X		
b. most classes require a lot of preparation and study before going to class.	X		
d. an important ingredient for success is knowing the right people.	X		
e. an important ingredient for success is learning the "ropes."	X		
F. Discussion Opportunities			
b. professors like to be challenged on their ideas during class.	X	X	
d. class time is set aside each meeting for questions and/or discussion.	X	X	

Table 4.42. Continued.

Question	Fresh/ Upper Difs.	Major Difs.	Sex Difs.
e. class discussions are usually stimulating and intense.	X	X	
f. student discussion can make a professor change his mind.	X		
G. Career Outcomes			
a. the required engineering courses will adequately prepare me for a job when I graduate.	X	X	
b. an engineering program gives the student a well-rounded education.	X		
c. an engineering education teaches a student how to get along with other people.	X		
d. I know what an engineer does on the job.	X		

CHAPTER V

SUMMARY

There is evidence to indicate that the expectations of the entering engineering student need to be analyzed and evaluated. There is also a need for a critical examination of the perceptions of engineering upperclassmen towards their academic programs. Hence, the primary purpose of this study was to compare the expectations of entering engineering students with the perceptions of upperclass engineering students in relation to their academic programs. This was accomplished through a study of freshmen expectations, upperclass perceptions, and a use of the resultant data for comparative purposes. The data generated by upperclassmen was used as the realistic standard of measure for determining the academic environment of engineering students at Michigan State University. A comparison with freshmen data identified the extent to which freshmen expectations were impractical or unrealistic.

The population of this study was defined as all male and female students enrolled in the College of Engineering at Michigan State University during Fall quarter 1973. The sample was comprised of two groups--freshmen and upperclassmen.

The freshmen were defined as those members of the population who were attending college for the first time in Fall 1973. All had been classified by the University as "engineering--no major," even though many did have a major in mind when they came on campus.

The upperclassmen were defined as those students who had previously enrolled for courses at Michigan State and had accumulated enough credits to be categorized as "juniors" or "seniors." Students representing six engineering majors participated in the study.

A questionnaire was developed to test the following seven hypotheses relevant to the student's academic environment in the College of Engineering:

Hypothesis 1: No difference will be found between the expectations of entering engineering freshmen and the perceptions of engineering upperclassmen in the categories of Faculty-Student Relationships.

Hypothesis 2: No difference will be found between the expectations of entering engineering freshmen and the perceptions of engineering upperclassmen in the categories of Student-Student Relationships.

Hypothesis 3: No difference will be found between the expectations of entering engineering freshmen and the perceptions of engineering upperclassmen in the categories of Teaching-Learning Environment.

Hypothesis 4: No difference will be found between the expectations of entering engineering freshmen and the perceptions of engineering upperclassmen in the categories of Personal Attention.

Hypothesis 5: No difference will be found between the expectations of entering engineering freshmen and the perceptions of engineering upperclassmen in the categories of Difficulty of Material.

Hypothesis 6: No difference will be found between the expectations of entering engineering freshmen and the perceptions of engineering upperclassmen in the categories of Discussion Opportunities.

Hypothesis 7: No difference will be found between the expectations of entering engineering freshmen and the perceptions of engineering upperclassmen in the categories of Career Outcomes.

The same questionnaire was administered to both freshmen and upperclassmen with one minor change. All of the questions in the freshman instrument were worded "I expect that . . ." (i.e., faculty members are interested in a student's personal problems). In the upperclass questionnaire, a special section was created to obtain information concerning sex, major, and class. This information was used to gather major/sex differences on responses to the instrument.

The instrument was administered to freshmen on two different occasions, both before the start of Fall classes. One group was surveyed during the engineering presentation as part of the Late Summer Orientation Program. Prior to making out their Fall schedules, each of the approximately sixty freshmen students present were asked to fill out one of the instruments. The remainder of the freshmen questionnaires were distributed and collected during the engineering presentation for new freshmen as part of the Welcome Week program.

Upperclass questionnaires were administered during Fall quarter. Academic advisors helped to distribute and collect these surveys. When students stopped by their office, they were given the option of filling out one of the questionnaires. These instruments were also distributed in selected Senior courses. Attempts were made to try and get an even distribution by each engineering major.

Each question was tested using the chi-square statistic. The chi-square method of analysis was chosen since there were two independent population samples with a sufficiently large number of respondents. A computer program was selected to perform the necessary calculations for each of the questions and variables in the questionnaire. A level of significance at the .05 level was used.

Findings

Results of computer analyses on each of the seven hypotheses made it possible to reject the null hypotheses in each case. It was found that freshmen were more positive in their responses than were upperclassmen in the categories of: faculty-student relationships, student-student relationships, teaching-learning environment, personal attention, difficulty of material, discussion opportunities, and career outcomes. Using the perception scores of upperclass engineering students as the standard measure of reality, it was concluded that the expectations of entering engineering students were impractical and unrealistic.

Four additional computer analyses were performed on the data. The first test computed overall percentages for each response on the thirty-eight questions. On the basis of these results, ten items were removed from further consideration, as no statistical differences were found. Three additional tests were performed to analyze the results by freshmen-upperclass differences, major field of study, and sex. Twenty-four items proved to be significant in the freshmen-upperclass categories, fourteen were significant in the major field analysis, and two were significant when computed by sex.

The following questions were not statistically significant, i.e., no difference existed between the

expectations of entering engineering students and the perceptions of engineering upperclassmen.

Category A. Faculty-Student Relationships.

1. Faculty members in the College of Engineering . . .
   a) enjoy talking with students on an informal basis outside of class time.
   b) encourage students to come to them for help if they are having difficulty with course material.

Category B. Student-Student Relationships

1. Fellow students in the College of Engineering . . .
   b) go out of their way to help other students with class assignments.
   c) are interested in one another's personal problems.

Category C. Teaching-Learning Environment

   a) success in my engineering courses is dependent on a good grasp of the principles and theories from sciences and mathematics.
   b) lectures are very important in the learning process.
   c) a clear, defined logic is important in engineering problem solving.
   d) most classes stress the theoretical rather than the practical.

Category D. Personal Attention

d) if I need help with a class assignment I know where to get help in the college.

e) if I need general information, I know where to go for help in the college.

Category E. Difficulty of Material

c) most examinations require a thorough knowledge of the class material.

f) the competition for grades is intensive.

Category F. Discussion Opportunities

a) students are encouraged to speak out, ask questions, and offer alternatives during class.

c) professors enjoy answering student questions.

In each of the above areas, freshmen expectations are not different from the perceptions of upperclass engineering students toward their academic environment in the College of Engineering. Using the scores of the upperclassmen as the standard measure of reality, it can be concluded that the expectations of entering engineering students are not impractical or unrealistic on each of the above items.

The following questions were determined to be statistically significant on the basis of computer analysis. Differences were found between the expectations of entering engineering freshmen and the perceptions of upperclass engineering students.

Category A. Faculty-Student Relationships

1. Faculty members in the College of Engineering . . .

c) are interested in a student's personal problems

d) are interested in discussing career opportunities with students.

e) are available when they are needed.

Category B. Student-Student Relationships

1. Fellow students in the College of Engineering . . .

a) are a closely-knit group.

d) participate in many social activities together.

e) have a definite voice in determining policies and programs which affect other students.

Category C. Teaching-Learning Environment

e) mathematics is the most important element for success in my engineering course.

f) laboratories are an important part of the engineering curriculum.

g) there are adequate opportunities for me to do research and study in an area I am interested in.

Category D. Personal Attention

a) I feel like a person and not a number in the college.

b) most of my professors and fellow students know my name.

c) people take the time to listen to my problems.

Category E. Difficulty of Material

a) it is difficult to pass a course without a great deal of studying.

b) most classes require a lot of preparation and study before going to class.

d) an important ingredient for success is knowing the right people.

e) an important ingredient for success is learning the "ropes."

Category F. Discussion Opportunities

b) professors like to be challenged on their ideas during class.

d) class time is set aside each meeting for questions and/or discussion.

e) class discussions are usually stimulating and intense.

f) student discussion can make a professor change his mind.

Category G. Career Outcomes

a) the required engineering courses will adequately prepare me for a job when I graduate.

b) an engineering program gives the student a well-rounded education.

c) an engineering education teaches a student how to get along with other people.

d) I know what an engineer does on the job.

For each of the above items, the expectations of entering engineering students were more positive directed. If the scores of the upperclass engineering students are used as the standard measure of reality, it must be concluded that freshmen are unrealistic in their expectations of their future college academic environment.

Discussion and Recommendations

The following discussion and recommendations have evolved from the findings of this study as they relate to the relevant literature presented earlier.

1. It has been found that family, friends, high school teachers and counselors are the most instrumental in the student's decision on whether to attend college and to their choice of major. The results of the present study show entering engineering students hold many impractical or unrealistic expectations when they first arrive on campus. It must be concluded that family, friends, teachers and counselors are influential in the student's formation of these expectations. Therefore, it is recommended the College of Engineering develop new methods and refine old ones to ensure that parents, counselors, teachers, and students

receive accurate information about their future academic environment.

Such methods could include:

a) Continuation of the semi-annual engineering open houses. Through the use of lab demonstrations, faculty discussion, and examination of engineering equipment and facilities, the counselor, teacher, parent and student can gain a better understanding of the engineering field and the academic program at Michigan State. It is important that discussion include a realistic portrayal of faculty-student relationships, student-student relationships, the teaching-learning environment, personal attention, discussion opportunities, difficulty of material, and career outcomes. Based on the positive responses reported by engineering upperclass students in this study, the MSU engineering program will sell itself if steps are taken to provide accurate information.

b) An evaluation of the recruiting literature and informational material sent to high schools and community colleges by the College of Engineering should be undertaken. Since this written material is oftentimes the only communication the college has with a high school or community college, it is important that it be an accurate portrayal of the curriculum and academic climate in the College of Engineering. Unrealistic or impractical expectations

should not be formed on the basis of information distributed by the college.

c) The College of Engineering should consider the feasibility of going to high schools and community colleges on a regular basis to provide current and relevant information about the academic programs in engineering. Through the use of engineering faculty, students, and organizations, in formal or informal settings, an accurate picture could be given to those most instrumental to a student's decision making process.

d) The College of Engineering should continue to encourage parents, teachers, and counselors to visit the campus, talk with engineering educators and examine our facilities. This should help to provide a realistic view of the college and its programs.

2. Prospective engineering students have been found to have certain needs and traits that need to be met in a college environment. The College of Engineering should attempt to provide information to the student which will show how an engineering education could fulfill certain needs. This could be accomplished in the following ways:

a) A continuation of the Summer High School Engineering Institute in order to identify young students with interests in science and mathematics. This program has been especially beneficial in exposing science-oriented

individuals to the opportunities and advantages of directing their talents toward an engineering career.

b) Prospective students should be encouraged to learn about the campus, the engineering field, and MSU in particular. Potential students should try to meet with engineers, MSU representatives, and visit the campus in order to better understand the type of program and climate they will be involved with.

c) The College of Engineering should explore ways to maximize their effectiveness in the Summer orientation and Welcome Week programs directed at new students before the start of classes. These programs provide valuable interaction between the college and the entering student. This time could be used to help students identify needs and career plans and explore opportunities available in the college to help students fulfill them. Interaction with present students and faculty could also prove beneficial in these sessions.

3. It has been found that freshmen expectations are higher than the perceptions of reality as seen by upperclass engineering students. After the freshmen engineering students have arrived on campus, it is important that steps be taken to bring their expectations closer in line with the thoughts of upperclassmen. Efforts should be undertaken to bring these two groups together for discussion, and the exchange of ideas. Through the medium of professional

clubs, seminars, the open house, orientation, welcome week, and other meetings, the freshmen could gain a better awareness of the College of Engineering and their academic programs.

4. The College of Engineering should assess the data on the expectations held by the freshmen who were included in this study, to determine whether any of these are worth considering for incorporation into the academic programs or other college related activities. Just because the perceptions of engineering upperclassmen have been used as the standard measure of reality, it should not be assumed that they also represent quality and perfection in the academic program. Some of the expectations of engineering freshmen may be quite practical, and appropriate, for consideration by engineering educators. They may also give indications of any shortcomings by the college to provide the quality engineering education which is publicized in the catalog and other brochures and literature.

Efforts should also be made to determine if engineering upperclassmen are satisfied with the quality of their education. These students may feel that many of their initial expectations, which they continue to hold as valid, were not met by the college. This would provide a means of gauging effectiveness, and perhaps, serve as an impetus for further programmatic change and development by the college.

5. In this age of great technological demand, engineering educators must continually assess and evaluate the relevancy of their program. An important part of this should be a yearly evaluation of student opinion, their attitudes and perceptions of their academic program. Continuous data of this sort will provide a means for gauging effectiveness and determining if change and development is necessary.

Implications for Further Research

The findings presented in this study suggest questions which bear further attention and investigation.

1. Are the attitudes and expectations of entering engineering transfer students similar to those of engineering freshmen?

2. Do factors such as type of high school, geographical area, socio-economic status of the family, and having parents as engineers influence the formation of a different type of expectation than the findings suggested in this study?

3. Is the high attrition rate in engineering the result of a student's expectations not being fulfilled?

a) If so, what non-engineering majors are likely to appeal to these particular students?

4. What are the perceptions of engineering faculty members and administrators toward the expectations of the entering engineering freshman student?

5. How important an influence is the informational literature and the college catalog in the formation of a student's expectations?

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APPENDICES

APPENDIX A

FRESHMEN PRE-TEST

MICHIGAN STATE UNIVERSITY East Lansing - Michigan

College of Engineering - Office of Student Affairs - Engineering Building

Dear Engineering Freshman:

The College of Engineering is interested in your expectations and attitudes as you begin your college career. The enclosed questionnaire is designed to help us in this purpose.

The information obtained will be helpful to the college, the faculty, and the advising staff when modifying our programs and literature. In addition, this material will comprise the data for the completion of my own dissertation.

Thank you for your co-operation with this project.

Sincerely,

Les L. Leone
Specialist

LLL/plc

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There are no right or wrong answers to the following questions. All of the questions pertain to your expectations and attitudes as you begin your program in the College of Engineering.

Please check the one response for each question which best represents your present feeling.

A. Faculty-student contact

1. I expect that faculty members in the College of Engineering . . .

	Strongly Agree SA	Agree A	Disagree D	Strongly Disagree SD
a) enjoy talking with students on an informal basis outside of class time.	—	—	—	—
b) encourage students to come to them for help if they are having difficulty with course material.	—	—	—	—
c) encourage students to come and talk with them during office hours.	—	—	—	—
d) are interested in a student's personal problems.	—	—	—	—
e) are interested in discussing career opportunities with students.	—	—	—	—
f) are available when they are needed.	—	—	—	—

B. Student-student contact

1. I expect that fellow students in the College of Engineering . . .

a) are a closely-knit group.	—	—	—	—
b) will go out of their way to help other students with class assignments.	—	—	—	—
c) are interested in one another's personal problems.	—	—	—	—
d) will often engage in out-of-class discussion concerning class material.	—	—	—	—
e) participate in many social activities together.	—	—	—	—

B. Student-student contact continued

1. (continued) I expect that fellow students in the college of Engineering . . .

	SA	A	D	SD
f) participate in engineering clubs and organizations.	—	—	—	—
g) have a definite voice in determining policies and programs which affect other students.	—	—	—	—

C. Teaching-learning environment

1. I expect that . . .

a) success in my engineering courses will be dependent on a good grasp of the principles and theories from sciences and mathematics.	—	—	—	—
b) professors will regularly refer to, and use, principles and theories from mathematics and science in their lectures.	—	—	—	—
c) lectures will be very important in the learning process.	—	—	—	—
d) a clear, defined logic will be important in engineering problem solving.	—	—	—	—
e) lectures will be stimulating, challenging, and thorough.	—	—	—	—
f) most classes will stress the theoretical rather than the practical.	—	—	—	—
g) mathematics will be the most important element for success in my engineering course.	—	—	—	—

D. Personal attention

1. I expect that . . .

	SA	A	D	SD
a) it will be easy to get to know faculty and students in the college.	—	—	—	—
b) I will feel like a person and not a number in the college.	—	—	—	—
c) most of my professors and fellow students will know my name.	—	—	—	—
d) people will take the time to listen to my problems.	—	—	—	—
e) people will try to understand my feelings.	—	—	—	—
f) if I need help with a class assignment I will know where to get help in the college.	—	—	—	—
g) if I need general information, I will know where to go for help in the college.	—	—	—	—

E. Difficulty of material

1. I expect that . . .

a) it will be difficult to pass a course without a great deal of studying.	—	—	—	—
b) most classes will require a lot of preparation and study before going to class.	—	—	—	—
c) most examinations will require a thorough knowledge of the class material.	—	—	—	—
d) examinations will be fair and comprehensively cover most material presented in class.	—	—	—	—

E. Difficulty of material continued

1. (continued) I expect that . . .

	SA	A	D	SD
e) the amount of time and effort required to succeed in a class will not be much different from high school.	—	—	—	—
f) an important ingredient for success will be knowing the right people.	—	—	—	—
g) an important ingredient for success will be learning the "ropes."	—	—	—	—
h) the competition for grades will be intensive.	—	—	—	—
i) there will be a lot of homework and preparation required before going to class.	—	—	—	—

F. Discussion opportunities

1. I expect that . . .

a) students are encouraged to speak out, ask questions, and offer alternatives during class.	—	—	—	—
b) professors like to be challenged on their ideas during class.	—	—	—	—
c) professors enjoy answering student questions.	—	—	—	—
d) class time is set aside each meeting for questions and/or discussion.	—	—	—	—
e) class discussions are usually stimulating and intense.	—	—	—	—
f) student discussion can make a professor change his mind.	—	—	—	—

G. Practical benefit

1. I expect that . . .

	SA	A	D	SD
a) the required engineering courses will be of benefit when I am "on the job."	—	—	—	—
b) the engineering curriculum will adequately prepare me for a job when I graduate.	—	—	—	—
c) getting to know the faculty and students will make the program easier for me.	—	—	—	—
d) an engineering education teaches students how to solve problems.	—	—	—	—
e) an engineering program gives the student a well-rounded education.	—	—	—	—
f) an engineering education teaches a student how to get along with other people.	—	—	—	—
g) I know what an engineer does on the job.	—	—	—	—

APPENDIX B

UPPERCLASSMEN PRE-TEST

MICHIGAN STATE UNIVERSITY - East Lansing - Michigan 48824

College of Engineering - Office of Student Affairs -
Engineering Building

Dear Engineering Student:

The College of Engineering is interested in your perceptions and attitudes of your college program. The enclosed questionnaire is designed to help us in this program.

The information obtained will be helpful to the college, the faculty, and the advising staff when modifying our programs and literature. In addition, this material will comprise the data for the completion of my own doctoral dissertation.

Thank you for your co-operation with this project.

Sincerely,

Les L. Leone
Specialist

LLL/plc

Enclosure

There are no right or wrong answers to the following questions. All of the questions pertain to your expectations and attitudes as you begin your program in the College of Engineering.

Please check the one response for each question which best represents your present feeling.

A. Faculty-student contact

1. I think that faculty members in the College of Engineering . . .

	Strongly Agree SA	Agree A	Disagree D	Strongly Disagree SD
a) enjoy talking with students on an informal basis outside of class time.	—	—	—	—
b) encourage students to come to them for help if they are having difficulty with course material.	—	—	—	—
c) encourage students to come and talk with them during office hours.	—	—	—	—
d) are interested in a student's personal problems.	—	—	—	—
e) are interested in discussing career opportunities with students.	—	—	—	—
f) are available when they are needed.	—	—	—	—

B. Student-student contact

1. I think that fellow students in the College of Engineering . . .

a) are a closely-knit group.	—	—	—	—
b) will go out of their way to help other students with class assignments.	—	—	—	—
c) are interested in one another's personal problems.	—	—	—	—
d) will often engage in out-of-class discussion concerning class material.	—	—	—	—
e) participate in many social activities together.	—	—	—	—

B. Student-student contact continued

1. (continued) I think that fellow students in the College of Engineering . . .

	SA	A	D	SD
f) participate in engineering clubs and organizations.	—	—	—	—
g) have a definite voice in determining policies and programs which affect other students.	—	—	—	—

C. Teaching-learning environment

1. I think that . . .

a) success in my engineering courses will be dependent on a good grasp of the principles and theories from sciences and mathematics.	—	—	—	—
b) professors will regularly refer to, and use, principles and theories from mathematics and science in their lectures.	—	—	—	—
c) lectures will be very important in the learning process.	—	—	—	—
d) a clear, defined logic will be important in engineering problem solving	—	—	—	—
e) lectures will be stimulating, challenging, and thorough.	—	—	—	—
f) most classes will stress the theoretical rather than the practical.	—	—	—	—
g) mathematics will be the most important element for success in my engineering course.	—	—	—	—

D. Personal attention.

1. I think that . . .

	SA	A	D	SD
a) it will be easy to get to know faculty and students in the college.	—	—	—	—
b) I will feel like a person and not a number in the college.	—	—	—	—
c) most of my professors and fellow students will know my name.	—	—	—	—
d) people will take the time to listen to my problems.	—	—	—	—
e) people will try to understand my feelings.	—	—	—	—
f) if I need help with a class assignment I will know where to get help in the college.	—	—	—	—
g) if I need general information, I will know where to go for help in the college.	—	—	—	—

E. Difficulty of material

1. I think that . . .

a) it will be difficult to pass a course without a great deal of studying.	—	—	—	—
b) most classes will require a lot of preparation and study before going to class.	—	—	—	—
c) most examinations will require a thorough knowledge of the class material.	—	—	—	—
d) examinations will be fair and comprehensively cover most material presented in class.	—	—	—	—
e) the amount of time and effort required to succeed in a class will not be much different from high school.	—	—	—	—

E. Difficulty of material continued

1. (continued) I think that . . .

	SA	A	D	SD
f) an important ingredient for success will be knowing the right people.	—	—	—	—
g) an important ingredient for success will be learning the "ropes."	—	—	—	—
h) the competition for grades will be intensive.	—	—	—	—
i) there will be a lot of homework and preparation required before going to class.	—	—	—	—

F. Discussion opportunities

1. I think that . . .

a) students are encouraged to speak out, ask questions, and offer alternatives during class.	—	—	—	—
b) professors like to be challenged on their ideas during class.	—	—	—	—
c) professors enjoy answering student questions.	—	—	—	—
d) class time is set aside each meeting for questions and/or discussion.	—	—	—	—
e) class discussions are usually stimulating and intense.	—	—	—	—
f) student discussion can make a professor change his mind.	—	—	—	—

G. Practical benefit

1. I think that . . .

a) the required engineering courses will be of benefit when I am "on the job."	—	—	—	—

G. Practical benefit

1. I think that . . .

	SA	A	D	SD
b) the engineering curriculum will adequately prepare me for a job when I graduate.	—	—	—	—
c) getting to know the faculty and students will make the program easier for me.	—	—	—	—
d) an engineering education teaches students how to solve problems.	—	—	—	—
e) an engineering program gives the student a well-rounded education.	—	—	—	—
f) an engineering education teaches a student how to get along with other people.	—	—	—	—
g) I know what an engineer does on the job.	—	—	—	—

APPENDIX C

FRESHMEN QUESTIONNAIRE

MICHIGAN STATE UNIVERSITY East Lansing - Michigan

College of Engineering - Office of Student Affairs - Engineering Building

Dear Engineering Freshman:

The College of Engineering is interested in your expectations and attitudes as you begin your college career. The enclosed questionnaire is designed to help us in this purpose.

The information obtained will be helpful to the college, the faculty, and the advising staff when modifying our programs and literature. In addition, this material will comprise the data for the completion of my own dissertation.

Thank you for your co-operation with this project.

Sincerely,

Les L. Leone
Specialist

LLL/plc

- -

Complete anonymity will be observed throughout this study. The nature of such a study, however, does require that follow-up procedures be conducted to assure the maximum response possible. To facilitate these procedures, it would be appreciated if you would sign below, tear along the above dotted line, and turn this in with your completed questionnaire. This will enable me to keep accurate records of total responses and avoid unnecessary and timely follow-up attempts.

Thank you.

NAME (please print)_____

There are no right or wrong answers to the following questions. All of the questions pertain to your expectations and attitudes as you begin your program in the College of Engineering.

Please check the one response for each question which best represents your present feeling.

A. Faculty-student relationships

1. I expect that faculty members in the College of Engineering . . .

	Strongly Agree	Agree	Disagree	Strongly Disagree
	SA	A	D	SD
a) enjoy talking with students on an informal basis outside of class time.	___	___	___	___
b) encourage students to come to them for help if they are having difficulty with course material.	___	___	___	___
c) are interested in a student's personal problems.	___	___	___	___
d) are interested in discussing career opportunities with students.	___	___	___	___
e) are available when they are needed.	___	___	___	___

B. Student-student relationships

1. I expect that fellow students in the College of Engineering . . .

a) are a closely-knit group.	___	___	___	___
b) will go out of their way to help other students with class assignments.	___	___	___	___
c) are interested in one another's personal problems	___	___	___	___

B. Student-student relationships (continued)

1. (continued) I expect that fellow students in the College of Engineering . . .

	SA	A	D	SD
d) participate in many social activities together.	—	—	—	—
e) have a definite voice in determining policies and programs which affect other students.	—	—	—	—

C. Teaching-learning environment

1. I expect that . . .

a) success in my engineering courses will be dependent on a good grasp of the principles and theories from sciences and mathematics.	—	—	—	—
b) lectures will be very important in the learning process.	—	—	—	—
c) a clear, defined logic will be important in engineering problem solving.	—	—	—	—
d) most classes will stress the theoretical rather than the practical.	—	—	—	—
e) mathematics will be the most important element for success in my engineering course.	—	—	—	—
f) laboratories will be an important part of the engineering curriculum	—	—	—	—
g) there will be adequate opportunities for me to do research and study in an area I am interested in.	—	—	—	—

D. Personal attention

1. I expect that . . .

	SA	A	D	SD
a) I will feel like a person and not a number in the college.	—	—	—	—
b) most of my professors and fellow students will know my name.	—	—	—	—
c) people will take the time to listen to my problems.	—	—	—	—
d) if I need help with a class assignment I will know where to get help in the college.	—	—	—	—
e) if I need general information, I will know where to go for help in the college.	—	—	—	—

E. Difficulty of material

1. I expect that . . .

a) it will be difficult to pass a course without a great deal of studying.	—	—	—	—
b) most classes will require a lot of preparation and study before going to class.	—	—	—	—
c) most examinations will require a thorough knowledge of the class material.	—	—	—	—
d) an important ingredient for success will be knowing the right people.	—	—	—	—
e) an important ingredient for success will be learning the "ropes."	—	—	—	—
f) the competition for grades will be intensive.	—	—	—	—

F. Discussion opportunities

1. I expect that . . .

	SA	A	D	SD
a) students are encouraged to speak out, ask questions, and offer alternatives during class.	—	—	—	—
b) professors like to be challenged on their ideas during class.	—	—	—	—
c) professors enjoy answering student questions.	—	—	—	—
d) class time is set aside each meeting for questions and/or discussion.	—	—	—	—
e) class discussions are usually stimulating and intense.	—	—	—	—
f) student discussion can make a professor change his mind.	—	—	—	—

G. Career outcomes

1. I expect that . . .

a) the required engineering courses will adequately prepare me for a job when I graduate.	—	—	—	—
b) an engineering program gives the student a well-rounded education.	—	—	—	—
c) an engineering education teaches a student how to get along with other people.	—	—	—	—
d) I know what an engineer does on the job.	—	—	—	—

APPENDIX D

UPPERCLASSMEN QUESTIONNAIRE

MICHIGAN STATE UNIVERSITY - East Lansing - Michigan 48824

College of Engineering - Office of Student Affairs -
Engineering Building

Dear Engineering Student:

The College of Engineering is interested in your perceptions and attitudes of your college program. The enclosed questionnaire is designed to help us in this program.

The information obtained will be helpful to the college, the faculty, and the advising staff when modifying our programs and literature. In addition, this material will comprise the data for the completion of my own doctoral dissertation.

Thank you for your co-operation with this project.

Sincerely,

Les L. Leone
Specialist

LLL/plc

Enclosure

Present Class Status: FR SOPH JR SR

Sex: MALE FEMALE

Major: _____

There are no right or wrong answers to the following questions. All of the questions pertain to your perceptions and attitudes of your program in the College of Engineering.

Please check the one response for each question which best represents your present feeling.

A. Faculty-student relationships

1. I think that faculty members in the College of Engineering . . .

	Strongly Agree	Agree	Disagree	Strongly Agree
	SA	A	D	SD
a) enjoy talking with students on an informal basis outside of class time.	___	___	___	___
b) encourage students to come to them for help if they are having difficulty with course material.	___	___	___	___
c) are interested in a student's personal problems.	___	___	___	___
d) are interested in discussing career opportunities with students.	___	___	___	___
e) are available when they are needed.	___	___	___	___

B. Student-student relationships

1. I think that fellow students in the College of Engineering . . .

a) are a closely-knit group.	___	___	___	___

B. Student-student relationships (continued)

1. I think that fellow students in the College of Engineering . . .

	SA	A	D	SD
b) go out of their way to help other students with class assignments.	—	—	—	—
c) are interested in one another's personal problems.	—	—	—	—
d) participate in many social activities together.	—	—	—	—
e) have a definite voice in determining policies and programs which affect other students.	—	—	—	—

C. Teaching-learning environment

1. I think that . . .

a) success in my engineering courses is dependent on a good grasp of the principles and theories from science and mathematics.	—	—	—	—
b) lectures are very important in the learning process.	—	—	—	—
c) a clear, defined logic is important in engineering problem solving.	—	—	—	—
d) most classes stress the theoretical rather than the practical.	—	—	—	—
e) mathematics is the most important element for success in my engineering course.	—	—	—	—
f) laboratories are an important part of the engineering curriculum.	—	—	—	—
g) there are adequate opportunities for me to do research and study in an area I am interested in.	—	—	—	—

D. Personal attention

1. I think that . . .

	SA	A	D	SD
a) I feel like a person and not a number in the college.	—	—	—	—
b) most of my professors and fellow students know my name.	—	—	—	—
c) people take the time to listen to my problems.	—	—	—	—
d) if I need help with a class assignment I know where to get help in the college.	—	—	—	—
e) if I need general information, I know where to go for help in the college.	—	—	—	—

E. Difficulty of material

1. I think that . . .

a) it is difficult to pass a course without a great deal of studying.	—	—	—	—
b) most classes require a lot of preparation and study before going to class.	—	—	—	—
c) most examinations require a thorough knowledge of the class material.	—	—	—	—
d) an important ingredient for success is knowing the right people.	—	—	—	—
e) an important ingredient for success is learning the "ropes."	—	—	—	—
f) the competition for grades is intensive.	—	—	—	—

F. Discussion opportunities

1. I think that . . .

	SA	A	D	SD
a) students are encouraged to speak out, ask questions, and offer alternatives during class.	—	—	—	—
b) professors like to be challenged on their ideas during class.	—	—	—	—
c) professors enjoy answering student questions.	—	—	—	—
d) class time is set aside each meeting for questions and/or discussion.	—	—	—	—
e) class discussions are usually stimulating and intense.	—	—	—	—
f) student discussion can make a professor change his mind.	—	—	—	—

G. Career outcomes

1. I think that . . .

a) the required engineering courses will adequately prepare me for a job when I graduate.	—	—	—	—
b) an engineering program gives the student a well-rounded education.	—	—	—	—
c) an engineering education teaches a student how to get along with other people.	—	—	—	—
d) I know what an engineer does on the job.	—	—	—	—