

STARTING OFF RIGHT: CAREER PLANNING & ACADEMIC ADVISING IN AN INTRODUCTORY ENGINEERING COURSE

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ABSTRACT

Clemson University's General Engineering Program introduced several new career planning elements into its first-semester introductory engineering course in order to help students make an informed choice regarding their major and ultimately their career path. By using the Strong Interest Inventory and career-related databases, students were better able to link their interests to appropriate choices of majors. Students who left engineering did so sooner and were able to move into other areas of the university thereby increasing overall retention. Students who remained were more confident in their decisions and were retained for the right reasons.

BACKGROUND

The General Engineering Program (GE) was established in 1986. The staff consists of three faculty members, two full time professional advisors and one office manager to meet the needs of 1100 students. Advising issues are divided among academics, personal decision making and career selection. The freshman year for engineering students is very structured. Students are required to complete two English composition courses, two calculus courses, two general chemistry courses, one physics course, one humanities/social science course and two introductory engineering courses. After completion of these courses with minimum grades of "C", students select a specific engineering major. Each fall approximately 750 new freshmen enroll in the General Engineering Program. (The other 350 consist of students who have not completed the GE curriculum.)

Visits to the GE Office are voluntary; students are not required to meet with advisors. (The only exceptions are students on academic probation who must meet twice during the semester with advisors.) Students are not assigned to a particular advisor but may request a specific individual should they so desire.

INTRODUCTION

The transition from high school to college is difficult. For freshmen in engineering it can be especially traumatic. In addition to the usual adjustments of roommates, lack of parental supervision, and a totally new environment, engineering students must meet a more demanding academic schedule than their contemporaries. Most freshmen come to college totally unaware of the time and effort required to earn an engineering degree.

Should every student who enters as an engineering major remain an engineering major? Of

course not! But neither should every student who questions his or her major choice be encouraged to leave. The challenge faced is to help students realistically assess their interests and aptitudes to succeed in a rigorous and demanding curriculum. Or to help them recognize that their interests and abilities would be better utilized in another field and move into that area as soon as possible. How can we accomplish this? With the large number of students and the small staff, it is impossible to give every student one-on-one attention. So our most efficient method of delivery is the classroom where we can reach most of the students at one time.

Clemson University's General Engineering Program has several goals. First to help students gain the solid academic foundation required to become a successful engineer. Second, to allow students to explore the field of engineering by giving them information about the profession and exposing them to professional engineers. And third, to help them decide if they truly want to be engineers. It was this third objective that we decided should be enhanced to help our students determine early in their academic progress if engineering was an appropriate choice of major. And the most efficient and effective mechanism to do this was our introductory engineering course, Engineering 101.

From 1986 to 1995, our first semester introductory engineering course was solely limited to information about what engineering is and what the different types of engineers do. It included the traditional engineering departmental presentations in which the department head or other designated representative lectured to the students about curriculum, salaries, career path, etc. While valuable, these presentations were not fully effective. It seemed that each year there was an increase in the number of students who were still unsure about engineering as a major at the end of the freshmen year. Conversations with these students demonstrated a lack of self awareness regarding their interests and abilities and how to relate those to career choice.

OBJECTIVES AND IMPLEMENTATION

From our observations of and conversations with students we determined that we needed several things.

1. To provide students with practical information about engineering.
2. To directly expose students to the field of engineering.
3. To obtain more definitive information on students' interests.
4. To help students combine information about engineering and their personal interests to make an informed career choice.

We felt we were already reasonably accomplishing Objective One but but wanted a tool that would go beyond the standard "This is engineering and here is what engineers do," kind of approach. We were fortunate to locate a new textbook, *Studying Engineering* by Dr. Raymond Landis¹. More than just an informational text, *Studying Engineering* helps students examine their reasons for wanting to become engineers. Dr. Landis helps them focus on what it "really" takes to succeed. He discusses engineering education candidly and clearly. He poses thought-

provoking questions that promote self-awareness. Previously all students had to do was sit and listen to a lecture. We added several reading and written assignments from this text to actively engage them.

To meet Objective Two, tours of the various engineering departments were implemented. Because Clemson has no organized engineering tour, this was the first opportunity that many of our students had to view the various laboratories and facilities. The tours are organized by departmental faculty and students. Students are led through the department in small groups of 20 where they observe demonstrations and participate in discussions about the latest research. These tours occur late in the semester after all departments have made the presentations. Since students are only required to attend three tours, they are able to select the majors in which they are most interested. However, they are free to attend more tours should they so desire. Students are asked to evaluate each tour they attend in order to provide feedback to the individual departments.

In attempting to reach Objective Three, we looked for an instrument that provided insight into our students' career interests. In consultation with our Career Planning office, we decided to use the Strong Interest Inventory (the Strong)².

The Strong is well known and easy to administer. It is age and developmentally appropriate for this group. The Strong asks about preferences toward occupations, school subjects, work activities, people and leisure pursuits. Subjects select characteristics that most accurately reflect themselves.

Results are compared to the responses of individuals who have been employed in particular professions for a minimum of three years. Responses are grouped into several categories: General Occupational Themes, Basic Interest Scales, Professional Occupational Scales, and Personal Style Scales. This information helps students begin to understand that they are complex individuals with several distinct areas of interest that can be combined in many ways to choose a career. The Strong is administered and interpreted by the career planning staff during two separate class periods. The career staff and the GE advisors continually stress that this instrument is not a prescription for a career, but just one tool to use in making a decision. We encourage students to follow up with either the career staff or the GE advisors if they have additional questions or concerns. In 1995, we administered 680 Strong's, in 1996, 726 Strong's and in 1997, 700 Strong's.

To achieve Objective Four, we ask the students to personalize their Strong results in a written assignment. They are asked to agree or disagree with their profile and to defend their position. They are then expected to relate their individual results to engineering and how their interests can be utilized as strengths in their profession. Students are also asked to disclose whether the Strong has affected their decision to leave or remain in engineering.

As advisors, we learn a lot about our students from these essays. We place these in each student file along with a copy of the Strong results. Both are used by the advisors when a student comes in to discuss his or her academic progress and concern about remaining in engineering. Often we can offer the student additional insight about interests that relate to other fields, possibly some area that they've never considered. As we discuss a career path, we point out how similar interests relate to many different fields as well as engineering. We also discuss candidly the discipline and motivation required to become successful in any career, so if they are leaving engineering because of fear or performance anxiety, they will realize that effort is required no

matter what field they choose.

Additionally we have students use electronic career databases to obtain more information about engineering. The three used by Clemson students are Engineering Specific Career Planning & Problem-Solving Environment (ESCAPE) established by Purdue University³, the South Carolina Occupational Information System (SCOIS)⁴, and the System of Interactive Guidance and Information PLUS (SIGIPLUS)⁵. All three are readily accessible either through the public lab facilities or the Internet. We teach about the databases in class and ask the students to research a career using one of the databases. They are required to write a 1-2 page paper using the information they find. Again, we ask that they personalize their findings by telling us why this career is a good fit for them. We ask them to focus on job characteristics and tasks and to relate these to their Strong results.

Since this exercise is accomplished early in the semester, it seems to prepare the students to listen more closely to departmental presentations. They tend to listen for much of the same data that they've researched in order to make comparisons among the various majors. These essays provide advisors with more information about a student's reasoning. These too, are filed with the Strong results and essays and are available to the advisor when a student calls or comes in for a meeting.

Because freshmen have so many questions regarding their curriculum and career, we feel that it is important for them to have some contact with upperclassmen who have selected their engineering major. Each semester a panel of sophomores, juniors and seniors visit the Engineering 101 classes and frankly discuss situations they've encountered. They offer constructive and positive recommendations for surviving the first year. They talk about how to survive calculus and physics, what they did right and what they did wrong. They also discuss their reasons for choosing their major and why it is the right choice for them. We select panelists from all engineering majors who have earned a wide range of grade point averages.

This is one of our most popular class sessions. It is very interactive since the freshmen relate more easily to other students. They begin to understand the challenges ahead of them for the first year and begin to project to the next. Discussion during this class acts as a wake-up call to many, causing them to reconsider their approach to college as well as their career choice.

The final step in our strategy is to help our freshmen develop a career plan that can be implemented during their college years and that will prepare them to find that first job before graduation. This plan incorporates their interests, values, needs, and abilities. And it uses these characteristics to acquire practical work experience and build a network of professional contacts. The initial focus is broad and gradually narrows to more specific areas within an engineering major. The important thing is that students learn how to use the process of elimination to evaluate academic as well as career choices.

RESULTS

Overall, we think that the changes we made in Engineering 101 have been effective. 60% of General Engineering students responded that the presence of advisors in the Engr 101 class helped them feel more comfortable about seeking out advice. Our student contact statistics verify this. In 1994, before we incorporated changes, 3717 students visited the GE Office. In 1995 after introducing more career information, there were 4689 student visits and in 1996, there were 5180 visits.

45% of students told us that the electronic databases were very helpful in finding out more about their career choice. Anecdotal evidence from advisors supports this. When students sit down to discuss their concerns about a particular major, they are able to bring up specific information that they have discovered about themselves. This is then discussed and strategies developed to support or change their choice as needed.

56% of students rated the upperclassman student panel as helpful to projecting their own success. Their class participation in this session is amazing. They listen closely and ask many questions. They are observed nodding in agreement when an upperclassman relates an experience similar to their own this first semester. Inevitably, they come up after class and continue their conversations with the upperclassmen.

51% rated the Strong Interest Inventory as helpful in identifying their interests and linking them to their choice of major. Advisor observation supports this. After the Strong is interpreted, the student appointment rates increase. We show a 68% increase in student visits in November, following the Strong interpretation in late October. Additionally we have seen a difference in the number of freshmen who change their majors since we implemented these changes in our course. In 1995, the first year of our revised course, 116 freshmen changed their majors to some field other than engineering. Of these 69 were first semester freshmen. In 1996, 130 freshmen changed. Of these, 77 were first semester freshmen. Exit surveys of the students who leave engineering indicate that they are not interested in the job tasks engaged in or academic subjects required of engineers. They have found other courses and job tasks more stimulating.

41% of GE students say that the Career Plan has given them some ideas of what they can do to get that first job. For many, this will be information that they will file away for reference until the end of the freshman year. However, we feel confident that they will remember and use the suggestions as the need arises.

CONCLUSION

Have we been effective in helping our students make more informed career decisions? We think so. Students demonstrate by their actions and conversations more awareness of the career selection process. They seek out and use the General Engineering advising services more frequently and are better informed when they do. Those who leave engineering do so earlier and make more rapid progress toward their career. (Most of those who change remain at Clemson, thus increasing the overall retention figures for the University.) And those who remain in engineering do so based on more accurate information and perception of themselves and the field which means we are retaining the right students.

REFERENCES

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4. South Carolina Occupational Information System (SCOIS), SCOIS Coordinating Committee, Columbia, SC.
5. System of Interactive Guidance and Information Plus (SIGIPLUS), Educational Testing Service, Princeton, NJ.

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