

Fast Track to Achievement: Promoting Achievement Behaviors In Engineering Freshmen

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Abstract

In making the transition from high school to college, engineering freshmen can benefit from guidance by upperclassmen on how to meet the challenges of engineering and how to negotiate the college environment. Upperclassmen can focus freshmen on behaviors and attitudes that promote achievement and motivate freshmen toward success in engineering; lead by example to encourage freshmen to stay linked to the engineering community; and serve as successful role models for some freshmen who may lack confidence and who may perceive engineering as difficult and unattainable. Freshmen can relate better to upperclassmen who are their peers and who more recently have experienced what it takes to “make it in engineering.” Upperclassmen, particularly those with a proven track record of academic achievement and leadership, are more credible sources and powerful role models for engineering freshmen. This assumption formed the basis for development of a pilot freshman retention program, “Fast Track to Achievement.” The primary strategy of this program is to engage teams of upperclassmen in dialogue with groups of freshmen in a series of workshops focusing on three themes —“Mastering Mathematics,” “Making It in Engineering,” and “Planning to Graduate.” The goal of the program is to expose the greatest number of freshmen to successful engineering undergraduates who can speak from experience on how to adjust to the rigors of the engineering curriculum, earn the best grades, and make the freshman year a good foundation for achievement in engineering.

Introduction

Nearly 25 years ago, Tinto (1975) proposed a conceptual model of college student attrition. Essentially, Tinto theorized that dropout behavior is a longitudinal process based on the quality of the interaction between the student and the institution’s academic and social systems. When precollege background characteristics and experiences are held constant, persistence in college is a result of the student’s level of academic and social integration in the institution. Academic integration is related to the student’s goal commitment (to graduate) and the quality of social integration is related to the student’s commitment to the institution. The greater the academic and social integration, the greater the student’s institutional and goal commitment and the greater the probability the student will persist. Studies conducted by Pascarella and Chapman (1983), Pascarella and Terenzini (1980), and Terenzini and Pascarella (1977) designed to test the validity of Tinto’s model generally support the relationship between social integration and persistence, particularly at four-year residential institutions and for women. These and other studies have concluded that Tinto’s model has “reasonable predictive power in explaining

variance in freshman year persistence/voluntary withdrawal” (Pascarella and Terenzini, 1983, p. 224.)

Social integration is the result of “informal peer group associations, semi-formal extra-curricular activities and interaction with faculty and administrative personnel of the college” (Tinto, 1975, p.107). Tinto theorized that of all the possible types of social interaction, peer-group associations are the most salient in social integration and most directly impact the student’s institutional commitment. The Fast Track to Achievement program is an effort to provide freshmen with a quality, first-time peer group experience as a means of motivating freshmen to stay linked to the engineering community. The program is similar to an activity in the Engineering 101 course at Clemson University where, each semester, a panel of sophomores, juniors, and seniors dialogue with freshmen and have a frank discussion of their experiences in engineering (Crockett, 1999). Like the Fast Track team leaders, the panelists represent a variety of engineering fields and a wide range of grade point averages. Both of these programs suggest a process for peer-group interaction, the key element in social integration.

Program Goals

The goals of the Fast Track to Achievement program are to 1) ease the transition from high school to college for engineering freshmen, 2) to focus as many freshmen as possible on expectations for engineering students and on behaviors that promote success and achievement in engineering, and 3) to introduce freshmen to successful upper-class role models that can provide guidance and make a personal statement that engineering is both achievable and attainable if they are willing to adopt behaviors that lead to success in engineering.

Program Design

The major components of the program are three 25 minute workshops, namely, “Mastering Mathematics,” “Making It In Engineering,” and “Planning To Graduate.” Twenty-five upperclassmen are organized into teams of three to four. Each team serves as workshop facilitators for groups of 25-30 freshmen. Upperclassmen who are engineering organization leaders, academic achievers, and who have a general interest in working with new freshmen, volunteer their services to organize and implement the program. The program has been conducted three times, in Fall 1997 (F97), Fall 1998 (F98), and Fall 1999 (F99).

Two models were developed to get students to participate in the program. In F97, the first year of the program, the *Open Invitation Model* invited freshmen and transfer students (via posters and announcements) to come to the student center on main campus to participate in a half-day Saturday program. Approximately 50% of eligible students attended the voluntary program. In F98 and F99, the *Open Invitation Model* was abandoned for the *Integration Model*, a more inclusive model designed to increase the level of freshman participation. This model integrates the Fast Track program in the “Introduction to Engineering” course, the required orientation course for engineering freshmen and offers the program as a regular class session. In the *Integration Model*, freshmen are required to attend the program. In contrast to the *Open Invitation Model* where the level of participation was only 50%, the *Integration Model* increased participation to 86% in F98 and 72% in F99.

The program is offered in two overlapping sessions of about 100 students each (Table 1). The program includes an opening session that explains the purpose and procedure for the program, three workshops (Table 2) and a closing session with a motivational speaker(s). Participants are divided into three groups by assignment of a code. Each group of freshmen rotates through each of the three workshops.

Table 1
Fast Track to Achievement Schedule

	Introduction to Orientation ORIE 104:001		Introduction to Orientation ORIE 104:002
10:00 – 10:10	Opening Session <i>Schaefer Lecture Hall</i>		
10:15-10:40	<i>Planning to Graduate</i> S202 (#1) <i>Mastering Mathematics</i> S203 (#2) <i>Making It In Engineering</i> S204 (#3)		
10:45 – 11:10	<i>Planning to Graduate</i> <i>Mastering Mathematics</i> <i>Making It In Engineering</i>	11:00 – 11:10	Opening Session <i>Schaefer Lecture Hall</i>
11:15- 11:40	<i>Planning to Graduate</i> <i>Mastering Mathematics</i> <i>Making It In Engineering</i>	11:15 - 11:40	<i>Planning To Graduate</i> S208-209 (A) <i>Mastering Mathematics</i> ITV 126 (B) <i>Making It In Engineering</i> ITV 122 (C)
11:45 - 12:00	Closing Session <i>Schaefer Lecture Hall</i> Guest Speaker(s) Wrap-Up/Evaluation	11:45 – 12:10	<i>Planning To Graduate</i> <i>Mastering Mathematics</i> <i>Making It In Engineering</i>
		12:15 - 12:40	<i>Planning to Graduate</i> <i>Mastering Mathematics</i> <i>Making It In Engineering</i>
		12:45 – 1:00	Closing Session <i>Schaefer Lecture Hall</i> Guest Speaker(s) Wrap-Up/Evaluation

Packets are distributed that include a schedule, a booklet of the workshop content and resource information like department and student services, office locations and phone numbers, campus computer laboratory hours, tutorial schedules, contact information for engineering organization leaders, planning guides for completing departmental requirements, and a copy of departmental student status (audit) sheets. Participants are encouraged to read two NACME publications, “Academic Gamesmanship: Becoming a Master Engineering Student” and “Design for Excellence: How to Study Smartly.” Participants also receive incentives for participation (hat, pennant, and planners) with engineering school logo.

Scheduling, space, resource materials, selection of workshop facilitators are coordinated by the Recruitment/Retention Coordinator and the Director of Freshmen Programs. Ideally, the program is implemented within the first month of the first semester of the freshman year. The program is supported by funds earmarked for retention (Alliance for Minority Participation -- National Science Foundation; Infrastructure Support Education Program -- Office of Naval Research; Dean of Engineering).

Program Planning and Implementation

The Recruitment/Retention Coordinator and the Director of Freshman Programs are responsible for the Fast Track to Achievement Program. Each fall, they conduct a preliminary planning meeting with the workshop facilitators where program goals, program overview, preliminary schedule, and workshop content are discussed and agreed upon. Upperclassmen initially select the workshop of their choice. However, every effort is made to balance the teams by gender and major. The facilitators are divided into six teams, three teams for each session. Each session is assigned a program manager who is responsible for moderating the general session and monitoring the activities. A team includes three facilitators and one monitor. Team members are responsible for reading the two publications and standardizing the workshop presentation by deciding which of three key points each facilitator will focus on. These three points must be presented consistently in each of the three workshop presentations. The workshop facilitators are required to meet at least two more times to practice and critique their presentation and to decide upon an “icebreaker” for the first rotation. To avoid confusion and save precious time, the participants remain in the same room and the facilitators rotate. The monitor is responsible for making certain the evaluation questionnaire is completed at the end of each workshop and the closing session. No staff or faculty is present at the workshop presentations. The participants receive their incentives as they leave the closing session and drop-off the evaluation.

Results

Each Fast Track to Achievement participant completes a questionnaire to evaluate each workshop and the overall program. No evaluation instrument was collected in F97, the pilot year. The results of the evaluation questionnaire administered in F98 and F99 appear in Figures 1 – 4 and Table 3. A positive rating of 80% or better was set as the standard for a successful program. The participants were asked five questions about the program:

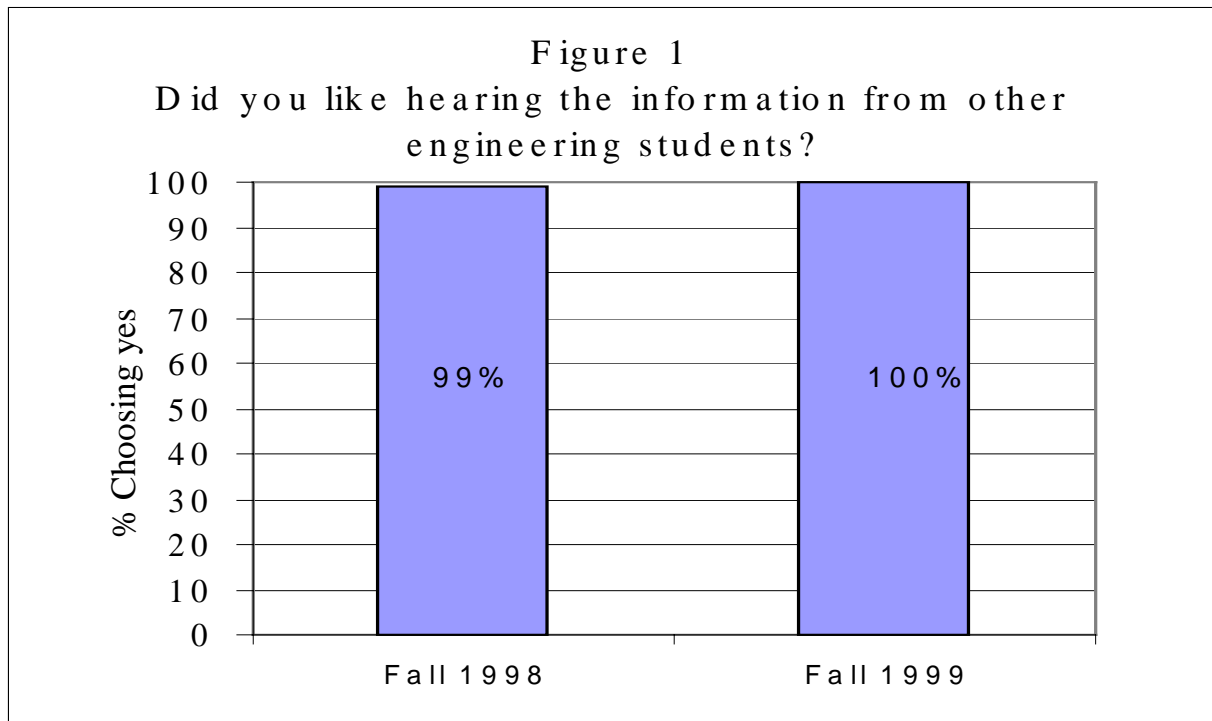
**Table 2
Workshop Content**

Mastering Mathematics	Planning to Graduate	Making It in Engineering
<p>Make mathematics a priority Believe you can do it Don't let the perception of your mathematics background prevent you from going on the attack to conquer mathematics Set a goal to do everything you can to be successful in mathematics Take mathematics every semester-Follow the correct sequence Don't drop mathematics Be prepared for class Take notes and review them Utilize tutorial and academic support services Utilize instructor office hours Practice! Practice! Practice! Allocate appropriate time to study mathematics Avoid making careless mistakes Organize and work in a mathematics study group Be cautious of the shaky "C"-Master the subject</p>	<p>Plan to graduate and have a plan to graduate in 4-5 years Know the MSU graduation requirements Know the departmental requirements Know course pre-requisites and co-requisites Be aware of the engineering "No D" policy Be aware of the MSU "No D" rule Complete your audit form each semester Schedule the writing proficiency/class-Take after English 102 Schedule the speech proficiency/class Repeat deficient grades immediately Don't drop mathematics-Understand how this affects your plan to fulfill requirements Plan to get to Calculus in one year-Get an "A" in Math 106 and take 141 the next semester Take advantage of the summer "Bridge" programs Keep your books for future courses-You will see the mathematics again</p>	<p>Set goals and establish priorities Manage/organize time Organize coursework Follow the syllabus-Maintain the course schedule-Attend class-Do the homework-Keep up! Always do your best-get the best grade possible Do more than what it takes just to "get by" Be thorough-Don't procrastinate-Study! Balance study/work/leisure Know when to seek help and get it as soon as possible Get maximum information-Seek advice-Get alternative opinions before making a decision Follow student tips on engineering survival-If you have questions or need help, ask an upper level student or the student support staff Be persistent and persevere Get to know and work with faculty on research projects-They will get to know you better and what you are capable of Think positively, act positively, be positive! Be assertive Get involved in professional student organizations-Develop leadership skills Respect yourself, classmates, professors Maintain a professional attitude Sit-in on future classes Attend senior project presentations to know what is expected Get involved in engineering projects sponsored by engineering organizations, e.g., concrete canoe Goal: Be able to get a letter of recommendation from <u>any</u> professor Seek work experience-Give Mr. Charles Hall (SWEP Coordinator) your resume</p>

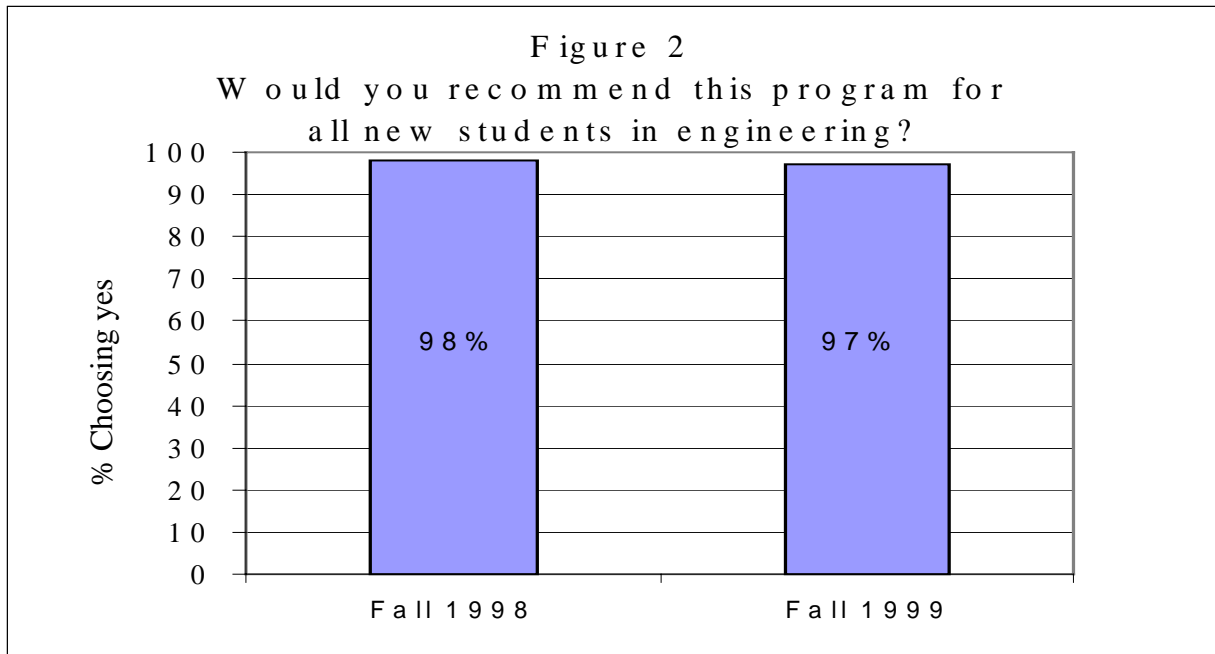
1. To what extent was the information presented helpful to you as an engineering student (very helpful, somewhat helpful, not at all helpful)?
2. How much did you learn about the topics (learned a lot, learned a little, learned nothing)?
3. Did you like hearing the information from other engineering students (yes, no)?
4. Would you recommend the program for all new students in engineering (yes, no)?

Participants also rated the content (information) and delivery (way information was presented) of the workshops as either excellent, very good, good, or fair.

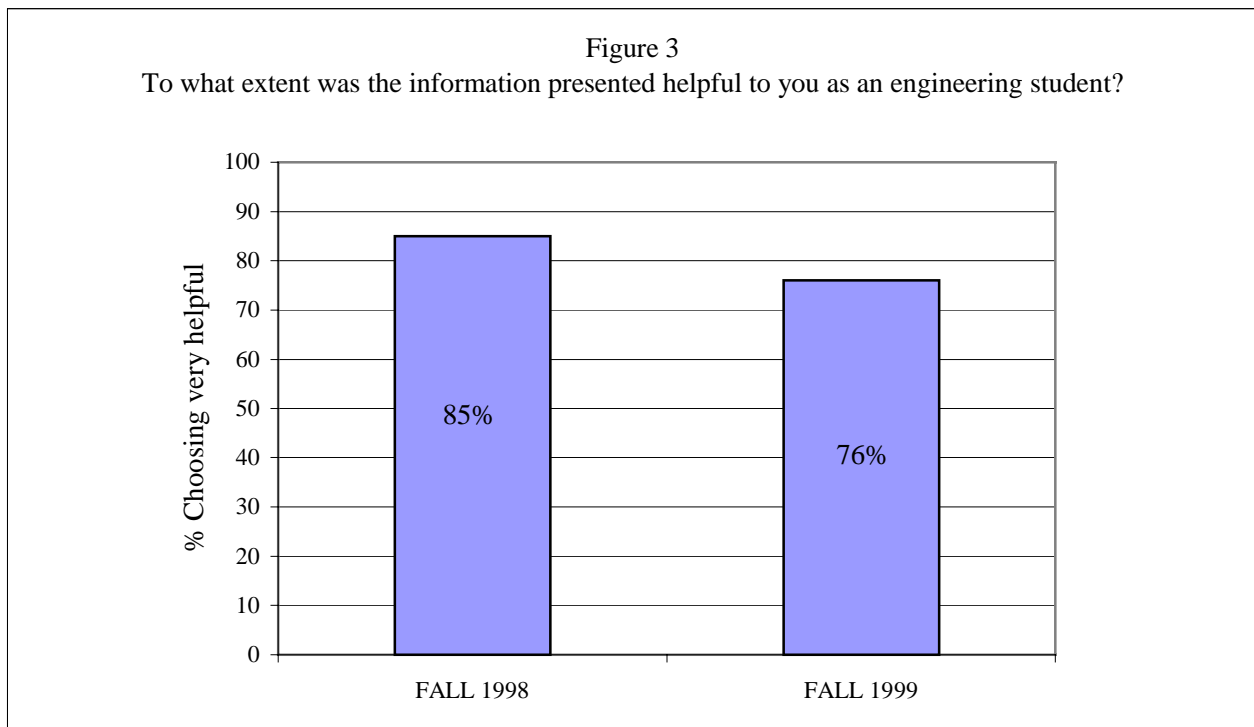
The questionnaire results indicate that in F98 and F99, nearly all the freshman participants liked hearing the information from other engineering students (Figure 1).

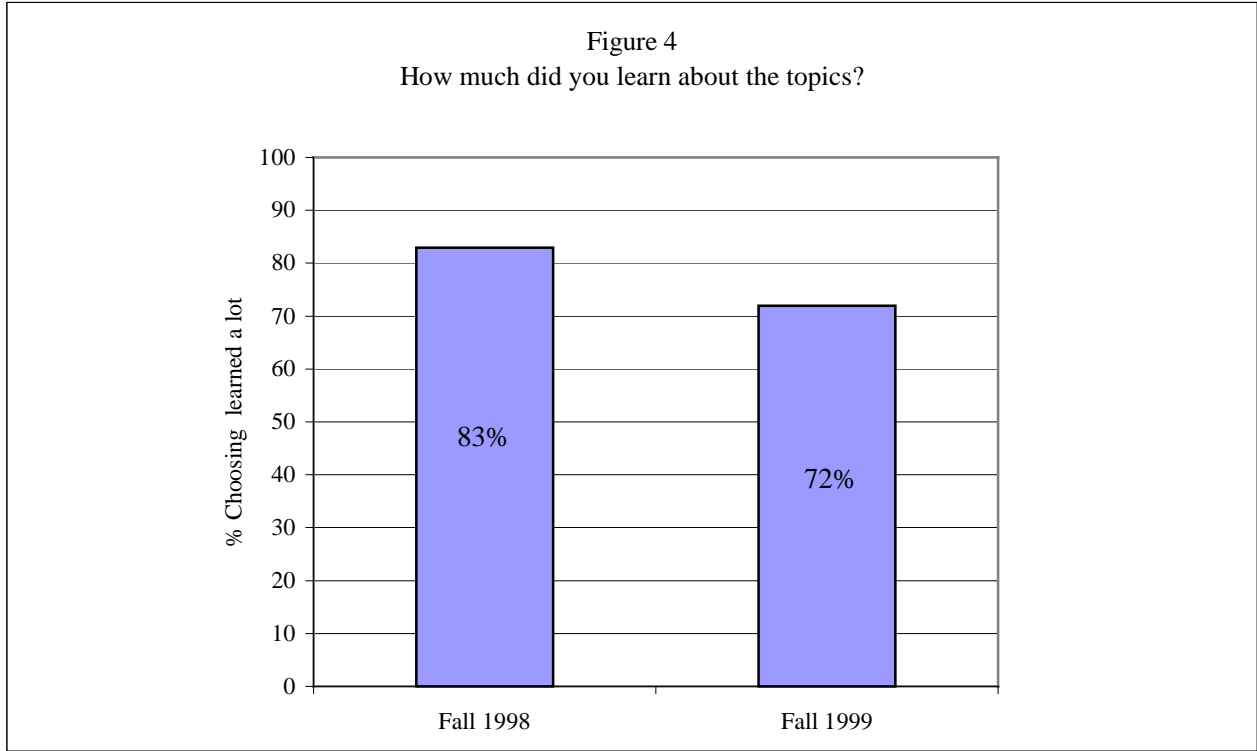


In both F98 and F99, 98% and 97% respectively of participants would recommend the program for all new students in engineering (Figure 2).



In F98 and F99, the majority of freshman participants felt they learned a lot (Figure 3) about each topic and that the information presented was very helpful to them as engineering students (Figure 4). It should be noted that the F99 responses did not meet the 80% success criteria.





In F98, all three workshops exceeded the 80% success criteria for content and delivery. The three workshops were rated from 86% - 94% for content, and 81% - 94% for delivery. In F99 the workshops were rated 71% - 90% for content and 71% - 92 % for delivery. Only the “Making It In Engineering” workshop exceeded our 80% standard for content and delivery. This may have been due to the lack of experience or preparation on the part of workshop facilitators. Only two of the workshop facilitators in F99 had previous experience as Fast Track facilitators.

Table 3
Workshop Evaluation
Content and Delivery Rated Very Good/Excellent

Workshop Topic	Content		Delivery	
	Fall 1998	Fall 1999	Fall 1998	Fall 1999
<i>Planning to Graduate</i>	94%	71%	94%	72%
<i>Mastering Mathematics</i>	86%	71%	81%	71%
<i>Making It in Engineering</i>	90%	90%	87%	92%

Overall, this evolving social integration program shows some promise in reaching freshmen early about the expectations for engineering students and the behaviors and attitudes necessary to be successful in engineering. At a debriefing session with facilitators, recommendations for the

next year included conducting staff-led training workshops for workshop facilitators, audio-taping the presentations as a check on workshop standardization, adding a space on the questionnaire for participant recommendations, and conducting follow-up to see how the workshop information is used by freshmen as they progress through the first semester of the freshman year.

Usefulness in Engineering Education

The Fast Track to Achievement program is easily replicated, relatively inexpensive, and can be integrated into the retention effort or services of any engineering school. It provides an opportunity for modeling successful behaviors and attitudes by the most credible source, engineering students. The program can easily evolve into a peer-mentoring program by assigning the upper classmen 2-3 freshmen to mentor and assist through the first year. This approach would be similar to the engineering undergraduate leadership and mentoring program at Oregon State University where sophomores, juniors, and seniors take a one-credit leadership course and then serve as “big brothers/sisters” to get freshmen involved early in the department through peer-group interaction (Rochefort, 1999). This provides a necessary link in engineering and could increase the retention in engineering from freshman to sophomore year a critical time in engineering retention, particularly for minority freshmen. According to NACME, minority freshmen that make it to the sophomore year increase their chance to graduate with a degree in engineering by about 20%.

Summary and Conclusions

Fast Track to Achievement is a freshman retention program developed at the School of Engineering at Morgan State University. The Recruitment and Retention Coordinator, the Director of Freshman Programs, and 25-30 upperclassmen implement the program. The pilot program initiated in Fall 1997 used an *Open Invitation Model* to attract freshman participants. Two subsequent programs in Fall 1998 and Fall 1999 used an *Integration Model* to increase freshman participation by integrating the program into the Introduction to Engineering orientation course. Volunteer upper classmen (balanced by gender, major) in teams of 3-4 dialogue with groups of 20-30 freshmen in three workshops – Making it in Engineering, Mastering Mathematics, and Planning to Graduate. The workshops are followed by a closing session with a motivational speaker. Participants evaluate each workshop and the speaker. Results of evaluation questionnaires collected in Fall 1998 and Fall 1999 indicate that 1) freshman like hearing the information from other engineering students, 2) recommend the program for all new students in engineering, and 3) feel the information is helpful to them as engineering students. The Fast Track to Achievement program is a viable, relatively inexpensive retention effort. It is easy to organize and easy to replicate. It provides freshmen with a quality, first-time peer group experience as a means of encouraging them to stay linked to the engineering community, motivating them to earn the best grades, and providing resources to assist them in making the freshman year a foundation for achievement in engineering.

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