

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, particularly those with a proven track record of academic achievement and leadership, are 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 Fast Track 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.*

Index Terms — *academic achievement, freshman year, peer mentoring, retention, transition from high school.*

INTRODUCTION

Nearly twenty-five years ago, Tinto [8] 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 [3], Pascarella and Terenzini [5], and Terenzini and Pascarella [7] 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" [4].

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" [8]. 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 [2]. 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) focus as many freshmen as possible on expectations for engineering students and on behaviors that promote success and achievement in engineering, and
- 3) 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-

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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 four times, in Fall 1997 (F97), Fall 1998 (F98), Fall 1999 (F99) and Fall 2000 (F00).

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, F99, and F00 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, 72% in F99, and 75% in F00.

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.

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 given and encouraged to read two NACME (National Action Council of Minorities in Engineering) 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/university 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.

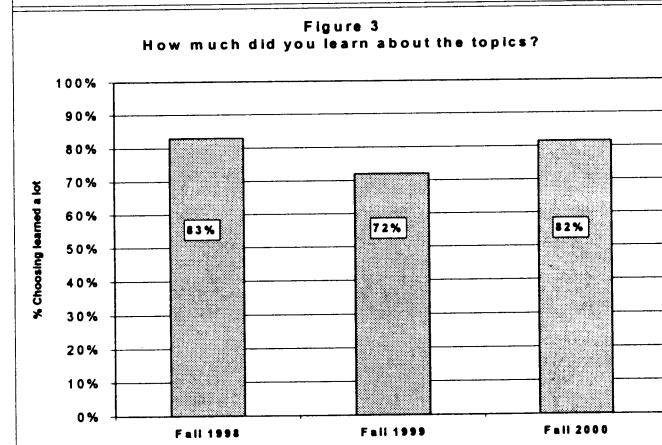
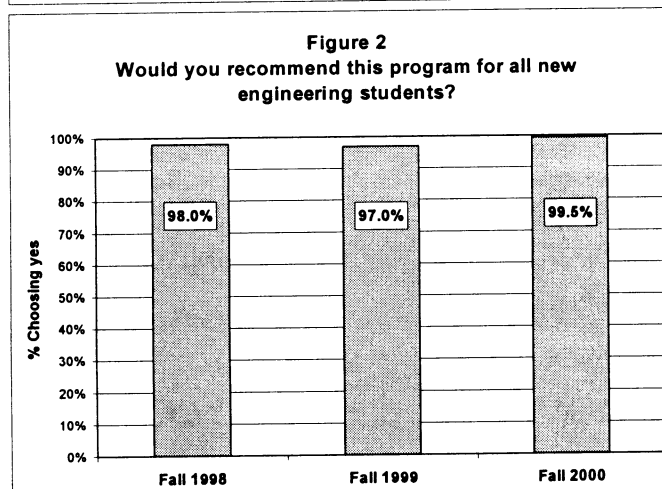
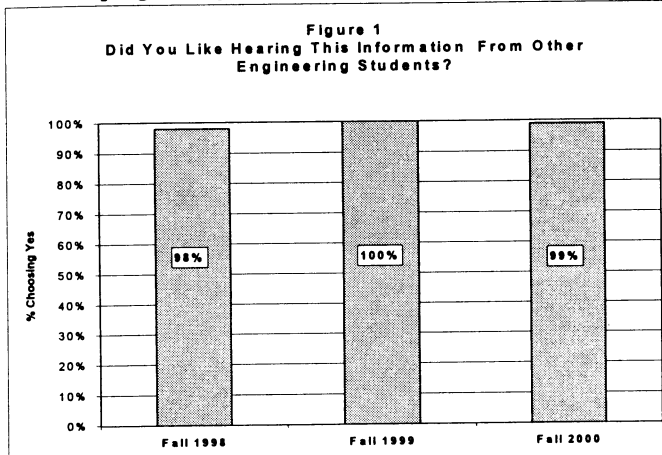
TABLE 1
FAST TRACK TO ACHIEVEMENT PROGRAM SCHEDULE

	Introduction to Orientation ORIE 104:001		Introduction to Orientation ORIE 104:002
10:00 – 10:10	Opening Session Schaefer Lecture Hall		
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 Schaefer Lecture Hall
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 Schaefer Lecture Hall 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 Schaefer Lecture Hall Guest Speaker(s) Wrap-Up/Evaluation

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 NACME 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 the timekeeper and 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, F99, and F00 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 four questions about the program:

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, F99, and F00, nearly all the freshman participants liked hearing the information from other engineering students (Figure 1).

In F98, F99, and F00, 98%, 97%, and 99.5% respectively of participants would recommend the program for all new students in engineering (Figure 2). In F98, F99, and F00, the majority of freshman participants felt they learned a lot (Figure 3) about each topic and that the information

TABLE 2
WORKSHOP CONTENT

Mastering Mathematics	Planning to Graduate	Making It in Engineering
<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • 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 Math 141 the next semester • Take advantage of the summer "Bridge" programs • Keep your books for future courses - You will see the mathematics again 	<ul style="list-style-type: none"> • Set goals and establish priorities • Manage/organize time • Organize course work • 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, and 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

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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.

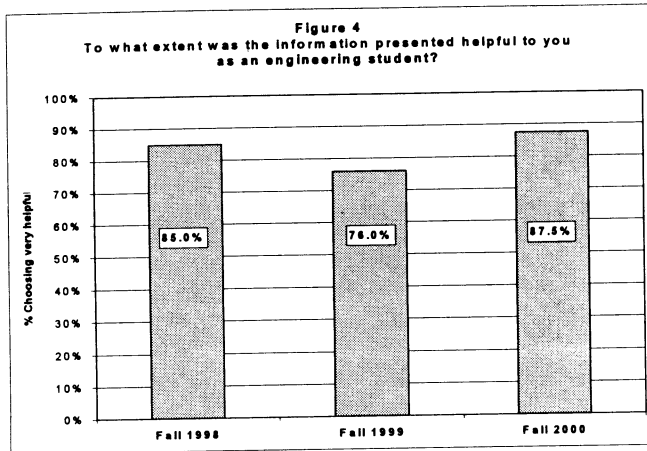


Table 3 compares the success rates in content and delivery of the workshops for F98, F99, and F00. In F98, all three workshops exceeded the 80% success criteria for content and delivery. The three workshops were rated from 86% - 94% for content, and 81% - 94% for delivery. In F99 only the "Making It In Engineering" workshop exceeded the 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. In F00 all workshop facilitators were veterans and all three workshops exceeded the 80% success criteria for both content and delivery. The success rate may be attributed to a more experienced group than that of the previous year, F99.

Table 3
WORKSHOP EVALUATION:
CONTENT AND DELIVERY RATED VERY GOOD/EXCELLENT

Workshop Topic	Content			Delivery		
	Fall 1998	Fall 1999	Fall 2000	Fall 1998	Fall 1999	Fall 2000
<i>Planning to Graduate</i>	94%	71%	96%	94%	72%	95%
<i>Mastering Mathematics</i>	86%	71%	94%	81%	71%	95%
<i>Making It in Engineering</i>	90%	90%	97%	87%	92%	94%

In Fall 1999 as an afterthought at the end of the evaluation session, the participants were asked to write down (on the back of the questionnaire) the one greatest challenge they had faced since the beginning of the term. Although there were a many answers (studying enough, staying focused, getting to early classes on time, etc.), time management was cited most often by the freshmen as the

one thing that gave them the most challenge. In a follow-up to the "challenge" question, the F00 participants (beginning of the semester) were given a checklist on the back of the evaluation questionnaire and were asked, "What have been your five greatest challenges at Morgan State University since the start of the semester?" The results (Table 4) indicated that almost half the participants cited studying enough (49%) and time management (48%) as one of their five greatest challenges. Staying focused was cited by 30% of participants while understanding foreign instructors (27%), mathematics course (26%), and finances (25%) were cited by about 25% of participants as challenges for the semester. This information is important for developing workshops to assist freshmen in making the transition to college during the first semester. Moreover, this checklist procedure gives students the opportunity to describe what they have experienced rather than what the support staff assumes is the most challenging, e.g., mathematics.

TABLE 4
GREATEST CHALLENGES AT MSU
SINCE THE START OF THE FALL 2000 SEMESTER

Challenge Faced	PERCENT
Studying Enough	49%
Time Management	48%
Staying Focused	30%
Understanding Foreign Instructors	27%
Math Course	26%
Finances	25%
Food/Meals	21%
Getting To Early Morning Classes On Time	21%
Science Course (Biology, Chemistry,	20%
Work Load	19%
Knowing Where To Go To Get	19%
Handling All My Responsibilities	18%
Making Friends/Meeting People	13%
Dealing With MSU Administration	12%
Instructors	10%
Time Constraints/Meeting Deadlines	10%
High School to College Transition	10%
English Course	7%
Having Self Confidence	7%
Adjusting to New Country Or Culture	6%
Distracted by Opposite Sex	4%

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Table 5
THE ONE GREATEST CHALLENGE
FACED AT MSU DURING THE FALL 2000 SEMESTER

Challenged Faced	Percentage
Time Management	18%
Studying Enough	12%
Staying Focused	12%
Science Course	9%
Math Course	7%
English Course	6%
Finances	6%
Getting to Early Morning Class on Time	6%
Handling All My Responsibilities	5%
Work Load	4%
Understanding Foreign Instructors	3%
High School to College Transition	3%
Time Constraints/Meeting Deadlines	2%
Distracted by Opposite Sex	2%
Dealing with MSU Administration	2%
Knowing where to go to get help/ Getting	1%
Instructors	1%
Adjusting to New Country or Culture	1%
Having Self Confidence	1%
Making Friends/ Meeting People	0%
Food/ Meals	0%

At the end of the semester F00, freshmen students in the orientation class were again given the checklist. This time, they were asked to name the *one* greatest challenge faced at Morgan State University for the *entire* semester. Time management (18%), staying focused (12%), and studying enough (12%) were still at the top of the list (Table 5).

In an effort to determine if Fast Track participants were using the information/following suggestions presented in the workshops, the freshmen were given a second checklist at the end of the semester. They were asked, "Read through the list of items below. If the statement accurately reflects your behavior during the semester, place a check in the box next to the item." The items came from the points stressed by the facilitators in the workshops (three per facilitator for each workshop). Those who did not participate in Fast Track were asked not to complete the second checklist.

Table 6 summarizes the results of the Fast Track behavior checklist. Items are ordered by the percent of participants who checked the item as accurately reflecting their behavior. Results indicate that 50-78% of students checked ten of the recommended behaviors, 24-48%

checked 13 of the recommended behaviors and 13% or less four of the behaviors.

Table 6
RECOMMENDED FAST TRACK BEHAVIOR
ADOPTED BY FALL 2000 FRESHMEN

Behavior	Percentage
I am planning to graduate and I have a plan to graduate in 4-5 years	78%
I did not drop my mathematics course	75%
I know the MSU graduation requirements	74%
I am keeping my books for future courses	73%
I respected my classmates and professors	71%
I know my departmental graduation requirements	70%
I took notes in my mathematics class and reviewed them	60%
I plan to take advantage of the SEM summer programs - Catch - Up, Summer Research, Etc.	52%
I made mathematics a priority	51%
I always thought positively, acted positively	50%
I asked an upper level student or the student support staff for help/advice	48%
I set goals and established priorities; I organized my time	44%
I always did my best to get the best grade possible	43%
I did everything possible to be successful in mathematics	42%
I followed the syllabus in my classes – maintained the course schedule	39%
I balanced study/work/leisure	39%
I saw a mathematics tutor	39%
I sought advice and got alternative opinions before making a decision	35%
I went to see my mathematics instructor during office hours	34%
I allocated sufficient time to study mathematics	34%
I knew when to seek help and got it as soon as possible	33%
I participated in a mathematics study group	28%
I always got involved in professional student organizations	24%

Behavior	Percentage
I went to Mr. Charles Hall (Student Work Experience Program Coordinator) about an internship or job	13%
I did not procrastinate	9%
I sat in on courses I would be taking in the future	4%
I got a letter of recommendation from one of my professors	3%

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 future Fast Track programs included conducting staffed 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 focus groups 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 easily can 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 [6]. The Freshman Interest Group Program at the University of Washington provides each student with a small community of peers who help each other negotiate the transition to college [9]. This peer interaction provides a necessary link to engineering community 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% [1]

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. Three subsequent programs in Fall 1998, Fall 1999, and Fall 2000 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, Fall 1999, and Fall 2000 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. A follow-up checklist administered at the end of the Fall 2000 semester, provides some evidence that participants are adopting the recommended behaviors. 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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