Session 2370

The Effect of the Texas A&M University System AMP on the Success of Minority Undergraduates in Engineering: A Multiple-Outcome Analysis

James M. Graham, Rita Caso, Jeanne Rierson
Texas A&M University

I. Introduction

The Texas A&M System Louis Stokes Alliance for Minority Participation (a.k.a. TX AMP), is a multi-institutional, multidisciplinary National Science Foundation program designed to foster significant increases in the number of underrepresented minority students earning baccalaureate degrees in Science, Mathematics, Engineering, and Technology (SMET) disciplines[i]. There are currently 25 LSAMP projects in existence across the U.S. and Puerto Rico. The Texas A&M System AMP was among the first six to be funded, beginning in Fall 1991. In addition to Texas A&M University (TAMU), the TX AMP has actively included 4 other Texas A&M System Universities and 9 community colleges .

Each campus has pursued the objectives of the AMP Program by implementing strategies intended to increase retention, enrich learning, and encourage progression through SMET BS programs into SMET graduate programs for under-represented minority students. While many activities for nurturing the academic success of under-represented minority SMET students were employed in several or all TX AMP partner institutions, the particular repertoire of tactics employed have varied by campus, depending upon the particular needs of their students, as well as their particular institutional mission and culture. A description of TX AMP program activities is provided in Appendix A. Over the years it has also become a fundamental aim of the NSF AMP program to affect the institutional internalization of the program's objectives and institutional "ownership" of program activities.

On the TAMU main campus, the AMP Program has operated from within the College of Engineering as part of the Engineering Academic Programs Office. The program's focal strategy has revolved around building an inviting academic and emotionally supportive minority student community for prospective and enrolled minority students, in which retention and individual academic achievement are fostered. Specific tactics have included high-school to university bridge programs, transfer student bridge activities, scholarship or stipend funding, matching with peer, faculty and/or administration mentors, clustering students, supplemental instruction, special industry internship opportunities, and undergraduate research opportunities.

The TAMU AMP program has traditionally sought to include those minority students often considered most at risk: first generation college students, students with great financial need, and students unprepared to take engineering calculus in their first semester. Since 1996 the TX AMP program has operated under constraints imposed by the Hopwood Decision[ii], which prohibits admission or access to special programs, services or incentives based upon racial or ethnic selection. In 1997, the TX AMP program worked to find legal means by which to hold ground on gains which had been achieved in attracting, nurturing, and increasing pools of under-represented minority engineering students, as well as an effective means of continuing to provide underrepresented minority students with a nurturing academic community and access to academic enrichment. A strategy adopted in the TAMU College of Engineering, in 1998, was to incorporate and institutionalize within the freshman engineering academic program many of the practices which had been initially seeded and supported by the AMP program[iii].

Yearly Annual Reports and progress updates to NSF regularly report on the program's principal success indicator, the number of minority SMET BS students graduated by the TX AMP across all campuses. Our motives for undertaking this study were to probe and evaluate the effect of the AMP program and AMP program tactics upon some of the other important student performance outcomes which reflect upon students' educational experience. We believe that this objective may be accomplished most meaningfully and usefully by studying the individual TAMU main campus program, taking into consideration the particular repertoire of program tactics employed and the particular contexts in which they have been implemented. The Coordinators of the TAMU campus AMP program were interested in exploring both the effectiveness of their program, but also the differential effect of various program tactics, all with an eye toward further improving the TAMU AMP program. Specifically, the current study uses a variety of outcome variables to measure the effectiveness of the TAMU AMP program across time and at different periods in students' academic careers. Additionally, post hoc explorative analyses were conducted to provide possible explanations for findings.

I. Method

A. Participants

Participants for this study were 448 minority students enrolled as undergraduates in the College of Engineering at a large state university. Information regarding each student's undergraduate and high school academic performance was obtained from a longitudinal database created for program evaluation. Participants were selected from three cohort years (those who began their undergraduate careers in 1996, 1997, and 1998) to provide a longitudinal view of the AMP program's effectiveness on academic performance.

Participants were divided into two groups based on their participation in AMP-related activities (AMP and Non-AMP). Due to the higher proportion of minority students not participating in AMP activities, all AMP students were included as participants for this study, with an equal number of non-AMP students selected from a larger pool. To account for confounding variables, these groups were matched as closely as possible in terms of sex, specific ethnic group, high school percentile rank, and scores on standardized tests (SAT and ACT). This matching resulted in two groups which were highly similar in all pre-undergraduate variables. The genders and ethnicities of these students are presented in Table 1. Differences between the two groups' high school percentile ranks and SAT/ACT scores tested as statistically non-significant for all cohort years.

Table 1
Distribution of Participant Gender and Ethnicity by Cohort Year and AMP Status

		1996		1997		1998		Total	
		AMP	Non-AMP	AMP	Non-AMP	AMP	Non-AMP	AMP	Non-AMP
Female	African-American	9	5	16	6	16	16	41	27
	Hispanic	16	18	15	15	9	9	40	42
	Asian/Pacific Islander	2	4	6	10	2	2	10	16
	Native American	-	-	-	-	-	-	0	0
	Other Minority	-	-	-	2	-	-	0	2
Male	African-American	12	8	8	2	15	13	35	23
	Hispanic	36	38	19	23	29	30	84	91
	Asian/Pacific Islander	3	5	6	10	-	1	9	16
	Native American	1	1	1	1	1	1	3	3
	Other Minority	-	-	2	4	-	-	2	4
Total		79	79	73	73	72	72	224	224

B. Variables
The present study examined student performance across three phases of their undergraduate career: Freshman, Progression, and Upper-Division.

1. Freshman. Academic performance during the freshman year was measured through examining students' grade point average (GPA) during their first academic year, their GPA in Core Body of Knowledge (CBK) courses, and their first yesr retention status.

a. First year GPA. Students' cumulative grade point average for the fall and spring semesters of their first year were measured on a 4.0 scale.

b. CBK GPA. The Core Body of Knowledge (CBK) courses are classes required of all undergraduates in the College of Engineering, regardless of their specific discipline. As these classes are traditionally taken by students during their first year, they were included as "freshman" variables, though it is possible that students took these courses during their second year. CBK classes include offerings in mathematics, chemistry, physics, and engineering principles. CBK GPA was measured on a 4.0 scale.

c. First year retention. Students were considered retained during their first year if they were enrolled in the College of Engineering during fall of their freshman year and remained enrolled in fall of the following year. Students who were retained after one year were assigned the value of 1, while those who left the College of Engineering after one year were assigned the value 0.

2. Progression. Progression variables were used to examine students' progression from freshman to upper-division status. Upper-division status is determined by a student's completion of required CBK courses with a GPA acceptable to their chosen major program and, in some cases, selection of a specific field of study within the College of Engineering.

a. Semesters to progression. The total number of semesters, from first entering the university to progression to upper-division status, was used as a measure of the timeliness of students' completion of core curriculum.

b. GPA at progression. The cumulative GPA at time of progression, measured on a 4.0 scale, was used as a measure of students' academic standing at time of progression to upper division status.

3. Upper-Division. The following variables were used as a measure of student academic performance in upper-division courses.

a. 21x GPA. Students' GPA in 21x courses (ENGR211, 212, and 213) was used as a measure of student performance in upper-division engineering courses. The 21x courses are standard upper-division "sophomore" courses required of most engineering undergraduates, and thus provide a consistent measure of student performance in upper-division engineering courses across engineering disciplines. 21x GPA was measured on a 4.0 scale.

b. 2nd year GPA. Students' cumulative grade point average for the fall and spring semesters of their second year were measured on a 4.0 scale.

c. Upline impact. 21x courses are considered by the participating university as upper-division extensions of basic freshman engineering courses (ENGR109 and ENDG105 for cohorts 1996 and 1997, ENGR111 and ENGR112 for cohort 1998). To provide a measure of student performance in upper-division engineering courses as compared to freshman engineering courses, each student's GPA in freshman engineering courses was subtracted from his or her 21x GPA. A negative score indicates a decline in student performance in upper-division engineering courses compared to freshman engineering courses, while a positive number indicates an increase in performance.

C. Analysis

To reduce the loss of participants due to attrition across the academic year, a total of nine separate analyses were performed, one for each phase of each cohort's academic careers. Multivariate Analyses of Variance (MANOVA) were conducted for each of the aforementioned groups and time periods to compare the academic performance of minority students involved in AMP programs with the academic performance of minority students not affiliated with AMP.

While the MANOVA requires that dependent variables be univariate and multivariate normally distributed, it is generally robust to the violation of this assumption if group sizes are equal. In cases where data violated this assumption, therefore, participants for the given cohort and time period were reduced to equal group sizes, matching for sex, ethnicity, high school percentile rank, and SAT/ACT scores. These cases are marked as such in the presentation of the results.

II. Results

A. Freshman project

The analysis of the freshman variables, summarized in Tables 2 and 3, show AMP students out-performing non-AMP students in cohorts 1996 and 1997, with no differences between AMP and non-AMP students in cohort 1998.

Table 2
Descriptive Statistics for Freshman Variables by Cohort Year and AMP Status

		Cohort 1996		Cohort 1997		Cohort 1998	
		Mean	SD	Mean	SD	Mean	SD
GPA in CBK Courses							
	AMP	**2.63**	.72	2.61	.68	2.38	.87
	Non-AMP	**2.15**	1.00	2.42	.91	2.25	.81
1st Year Retention							
	AMP	**.90**	.30	.77	.42	.84	.37
	Non-AMP	**.73**	.45	.76	.43	.82	.38
1st Year GPA							
	AMP	**2.65**	.52	**2.77**	.49	2.50	.80
	Non-AMP	**2.33**	.88	**2.42**	.74	2.38	.69

Bold indicates that univariate mean difference between AMP and Non-AMP students was statistically significant at the .05 level.

Table 3
Freshman Variable MANOVA Results by Cohort Year

	N AMP	N Non-AMP	Wilk's Lambda	F	Error df	df	Stat. Sig.	Partial Eta-Squared
Cohort 1996╪	62	62	.916	3.658	3	120	.014*	8.4%
Cohort 1997	66	59	.905	4.253	3	121	.007**	9.5%
Cohort 1998╪	57	57	.994	.227	3	110	.877	0.6%

* Statistically significant at the .05 level.
** Statistically significant at the .01 level.
╪ Reduced matched sample used due to violation of MANOVA normality assumption.

B. Progression

The analysis of progression variables, summarized in Tables 4 and 5, show AMP students taking longer to advance to upper-division than non-AMP students in cohorts 1996 and 1997, with no differences between AMP and non-AMP students in cohort 1998. An examination of each progression variable's contribution to the results reveals that AMP students have the same GPA at time of progression as non-AMP students, though they take longer to advance.

Table 4
Descriptive Statistics for Progression Variables by Cohort Year and AMP Status

		Cohort 1996		Cohort 1997		Cohort 1998	
		Mean	SD	Mean	SD	Mean	SD
Semesters to Progression							
	AMP	**3.81**	1.27	**3.73**	1.12	2.83	.83
	Non-AMP	**2.93**	1.46	**2.97**	1.23	2.58	.51
GPA at Progression							
	AMP	2.80	.44	2.84	.45	2.85	.58
	Non-AMP	2.79	.48	2.81	.47	2.80	.46

Bold indicates that univariate mean difference between AMP and Non-AMP students was statistically significant at the .05 level.

Table 5
Progression Variable MANOVA Results by Cohort Year

	N		Wilk's Lambda	F	df	Error df	Stat. Sig.	Partial Eta-Squared
	AMP	Non-AMP						
Cohort 1996	53	33	.898	4.716	2	83	.011*	10.2%
Cohort 1997	41	36	.884	4.867	2	74	.010**	11.6%
Cohort 1998	23	19	.956	.892	2	39	.418	4.4%

* Statistically significant at the .05 level.
** Statistically significant at the .01 level.

C. Upper-Division

The analysis of upper-division variables, summarized in Tables 6 and 7, show no statistically significant differences between AMP and non-AMP students. An examination of the eta-squared effect sizes, however, reveals that this lack of statistical significance is likely due to the small sample sizes used. "What If?" analyses show that the analysis of cohort 1997 would be statistically significant at the .05 level if only 17 more students were included, and the analysis of cohort 1998 would be statistically significant at the .05 level if only 13 more students were included. While not statistically significant, the results of these analyses indicate poorer upper-division performance for AMP students when compared to non-AMP students.

Table 6
Descriptive Statistics for Upper-Division Variables by Cohort Year and AMP Status

		Cohort 1996		Cohort 1997		Cohort 1998	
		Mean	SD	Mean	SD	Mean	SD
GPA in 21x Courses							
	AMP	2.53	.62	1.89	1.11	2.55	1.01
	Non-AMP	2.56	.77	2.58	.67	3.00	.75
Upline Impact							
	AMP	-.45	.69	-1.35	1.21	.22	.67
	Non-AMP	-.11	.88	-.61	.73	-.40	.91
2nd Year GPA							
	AMP	2.87	.38	2.81	.43	2.80	.60
	Non-AMP	2.72	.41	2.75	.35	3.07	.33

Bold indicates that univariate mean difference between AMP and Non-AMP students was statistically significant at the .05 level.

Table 7
Upper-Division Variable MANOVA Results by Cohort Year

	N		Wilk's		Error		Stat.	Partial
	AMP	Non-AMP	Lambda	F	df	df	Sig.	Eta-Squared
Cohort 1996	32	16	.922	1.238	3	44	.307	7.8%
Cohort 1997	14	13	.823	1.651	3	23	.205	17.7%
Cohort 1998	10	9	.756	1.611	3	15	.229	24.4%

D. Post-Hoc Explorations
A number of post-hoc explorative analyses were conducted to provide possible explanations for the statistically significant MANOVA results.

1. Freshman. To explore possible explanations for AMP student's out-performance of non-AMP students in cohorts 1996 and 1997, as well as their failure to do so in 1998, correlations between the freshman outcome variables and a number of AMP-participation variables (including participation in specific AMP activities, total number of AMP activities participated in, and number of semesters receiving financial support) were examined. These results are summarized in Table 8 (note that only the correlations discussed below were included, all other correlations were statistically insignificant).

Table 8
Pearson r Correlations between Freshman Variables and AMP Activities by Cohort Year

# of AMP Activities		GPA in CBK	1st Year Retention	1st Year GPA
1996	r	**.296**	**.305**	**.238**
	sig	.001	.000	.005
1997	r	.079	.117	**.260**
	sig	.406	.159	.002
1998	r	.038	-.102	-.056
	sig	.697	.224	.799

Note: Correlation between cohort 1998 GPA in CBK and participation in Strategic Teams in Engineering Professional Success r=.240, p=.013.

This exploration revealed that no specific AMP activity was strongly correlated with higher freshman performance in cohorts 1996 and 1997. Rather, the total number of AMP activities, or the student's amount of involvement in AMP, was statistically significantly correlated with greater performance on all outcome variables. These correlations, however, were not consistent through cohort 1998. In cohort 1998, only one AMP activity, the Strategic Teams in Engineering Professional Success (STEPS) program, was strongly correlated with an outcome variable, GPA in CBK.

2. Progression. In order to determine why AMP students took longer to advance than non-AMP students in cohorts 1996 and 1997 (and not in 1998), the courses students were enrolled in and the grades they received were examined between groups. It was discovered that a higher proportion of AMP students were enrolled in MATH150 during their freshman year when compared to non-AMP students in cohorts 1996 and 1997. MATH150 is an introductory math class offered to students who are deemed not yet ready to enroll in the first math class required of all undergraduate engineers, MATH151. Essentially, students required to enroll in MATH150 are expected to take an extra semester to advance to upper-division. A chi-square test, summarized in Table 9 reveals that the higher proportion of AMP students in MATH 150 is statistically significant for cohorts 1996 and 1997, but not in 1998.

Table 9
Proportion of Students Enrolled in MATH150 by Cohort Year and AMP Status

	Cohort 1996		Cohort 1997		Cohort 1998	
	AMP	Non-AMP	AMP	Non-AMP	AMP	Non-AMP
MATH150	21	6	19	5	6	8
Not MATH150	32	27	22	31	17	11
Chi-Square	4.341		9.410		1.201	
Df	1		1		1	
Asymp. Sig.	.037*		.002**		.273	

* Statistically significant at the .05 level.
** Statistically significant at the .01 level.

III. Discussion

It is evident that AMP program participation has had a strong positive effect upon the freshman academic experience and freshman program academic performance for under-represented minority engineering majors at TAMU.

Taking under consideration that underrepresented minority students in the TAMU AMP included the most at risk students[iv] with regard to socio-economic, and educational preparation factors, evidence that the AMP helped its participants perform on par with other, non-AMP under-represented minority students, should be considered quite positive. In light of these conditions, study results associating AMP program participation with better academic performance among under-represented minority engineering students are commendable.

The most exemplary AMP effect was seen in students' Freshman program experience in 1996 and 1997. In 1998, the program seems to have made less of a distinguishing impact, and the initially more challenged AMP students performed as well as non-AMP minority students, except for those AMP students who participated in one particular AMP activity (STEPS), who did out-perform their non-AMP peers in regards to GPA of CBK courses.

With the exception of the STEPS activity in 1998, particular AMP program activities were indistinguishable from each other in their effect upon student performance. It appears that any degree of participation in the AMP program has had positive effects, but the more AMP activities in which AMP students participated, the better they performed in regards to freshman outcome measures.

The effect of the AMP program upon minority students' progression to upper division is less positive. AMP students in cohorts 1996 and 1997 required more time to advance to upper-division status than their non-AMP peers. However, students from these cohorts tended to begin their freshman engineering program unprepared to take the first calculus course more often than non-AMP minority students; therefore, delayed progression from the time of enrollment is likely a result of the additional course requirement of non-calculus ready students. Furthermore, the fact that AMP and non-AMP students' GPAs at time of progression were similar indicates that AMP students were not academically disadvantaged by entering unprepared for the freshman calculus courses; differences between groups were due to time to progression, not performance.

In cohort 1998, the difference between AMP and non-AMP students was insignificant on the same measures. Additionally, in cohort 1998 there was no difference between AMP and non-AMP minority students with regard to their readiness to enroll in the first CBK calculus course in the first semester of the freshman program. This further supports the hypothesis that the delay in progression for cohort 1996 and 1997 AMP students was due to the higher percentage of AMP students entering the university unprepared for freshman calculus courses.

The effects of AMP program participation did not appear to have any significant effect on students' upper division performance, though large effect sizes in cohorts 1997 and 1998 suggest that results indicating poorer upper-division performance for AMP students might have been found had a larger sample been available. This reinforces the conclusion that while the TAMU AMP program, which has focused most intensively upon interventions for freshmen, is an effective force in the academic experience of minority freshmen, the effects of the program do not seem to be long-lasting.

There may even be reason to speculate that the observed tendency of non-AMP students to perform somewhat better than AMP students in their sophomore courses may reflect an "AMP-withdrawal" effect among AMP students in their sophomore year and upper-division program. AMP students could have become accustomed to having the support of an academic community and academic services which became less accessible in their sophomore and later years, and might be less practiced at independently identifying and corralling their own resources to identify or create appropriate substitute communities and supports. Improvements for the AMP program suggested by this study therefore include the development of tactics to support and enrich the academic experience of sophomore and upper-division students in the same intensive manner that they have supported freshmen.

Student Cohort Years 1996, 1997 and 1998 were selected for study in order to note changes in the effects of the AMP program resulting from the impact of the Hopwood decision (1997) and the combination of Hopwood and TAMU's absorption and institutionalization of many AMP program tactics within its revised freshman year program (1998). The greatest changes are noted in 1998. In contrast with earlier years, the freshman program indicators were not significantly different for AMP and non-AMP minority students, and the effects upon progression also revealed a lack of significant difference.

This could be explained in the context of programmatic changes which occurred within the AMP program while changes were taking place in the larger freshman program. Since Hopwood, the intensity of the AMP program tactics had been dampened, while in 1998 the institutionalization of AMP tactics had brought some of the homogenized and diffused benefits of the AMP program to the entire freshman population; hence the observed leveling of effects between AMP and non-AMP groups in 1998. The sole exception to the lack of differentiation between AMP and non-AMP students in cohort 1998 was participation in the STEPS program, the only program which retained its minority-focused mission after the institutionalization of AMP's programs in 1998.

IV. Conclusion

The AMP program at TAMU's main campus has traditionally focused on the academic development of minority freshman. While it has proved highly effective in this regard, it fails to continue positive benefits into students' sophomore years and beyond. The extension of the focus of AMP activities into upper-division curriculum would likely result in the continued high performance of at-risk minority students. Furthermore, the negative impact of the Hopwood decision in diluting the effects of programs designed to provide assistance to under-represented minorities is also apparent in examining the results of this study. State and federal laws permitting, a return to the minority-focused intensive programming which characterized the pre-Hopwood AMP program at TAMU would likely result in the continued strong performance of minority students in the undergraduate engineering program.

Further research, providing outcome results from other campuses, would add greatly to our present knowledge of how minority programs aid in the retention and academic development of under-represented minorities in SMET disciplines. Particularly, information on how other minority initiatives have adapted to the restrictions of the Hopwood decision may allow other such initiatives to continue providing academic opportunities to minority students. Continued research on other under-represented or traditionally at-risk groups, such as women, economically disadvantaged students, and first generation college students, is also invaluable.
As educators, professionals, and researchers in the field of engineering education, it is of the utmost importance that we strive to make engineering education more accessible to under-represented groups. Only through continued re-evaluation and re-vamping of our minority initiatives can we hope to provide equal educational opportunities to all groups, regardless of their ethnicity or sex. The development of such initiatives will, beyond providing opportunities for under-represented students, create a diversity in the field of engineering which will contribute to the discipline's continued advancement and growth.

JAMES M. GRAHAM
James M. Graham is currently a doctoral student in Counseling Psychology at Texas A&M University. He received his B.A. in Psychology from Purdue University and his M.A. in Clinical Psychology from Pepperdine University. James is currently the head graduate assessment analyst for the NSF TX Louis Stokes Alliance for Minority Participation and the TAMU Foundation Coallition Assessment and Evaluation Office.

RITA CASO
Dr Rita Caso is both the Associate Project Director and Evaluation Director of the NSF TX Louis Stokes Alliance for Minority Participation program, as well as the Assessment and Evaluation Manager for the NSF Foundation Coalition Program, and Co-PI on a NSF CRDC Project in the TX A&M University College of Engineering

JEANNE RIERSON
Jeanne Rierson is the TX A&M University Campus Coordinator for the TX LSAMP Program. She is also the Director of Minority Engineering Programs and Campus Liaison for NESBE at TAMU.

Appendix A: TAMU AMP Activities 1999-2000

Jumpstart: Prospective transfer students to the College of Engineering and Texas A&M will enroll in ENGR111 & 112 for 10 weeks. They will have academic workshops/tutoring and information sessions (I.e., coop/internships, resume writing, career info and graduate school info). Transfer students who attend this session will complete 2 semesters of engineering, thus coming into Texas A&M on schedule with those students who entered as freshmen. Provide transfer students the opportunity to take ENGR 111 & 112 in 10 weeks (rather than one year). This will allow them the opportunity to move into upper-level coursework faster.

Phase One: A five week residential bridge program for entering freshmen. Students are enrolled in pre-calculus and Engineering 289 for credit. Students also attend seminars on study skills and time management. Also attend adjustment to college lectures. To prepare incoming engineering students for the rigors of the engineering curriculum. To improve the retention and graduation rate of ethnic minority groups in engineering.
Academic Workshops: Engineering students who have performed well in the core engineering curriculum courses are hired to attend classes and conduct academic workshops two evenings a week. Course material is covered with additional problem exercises completed in a group student format. Provide students with the necessary tools needed to be successful in engineering. Key objectives are to: (1) provide tutorial support to students in core curriculum courses, (2) provide student modeling of successful studying techniques, and (3) encourage group study outside of scheduled sessions.

Undergraduate Summer Research Program: Students from Texas A&M College Station and other colleges and universities participate in ongoing research with TAMU faculty members. The activity spans 10 weeks. Students make a formal presentation of their research and experience at the end of the program and submit a final written report describing the results of their research. Students participating in the program will make significant contribution to ongoing faculty research and gain an appreciation for and an interest in graduate school and a possible interest in obtaining faculty positions.

Strategic Teams in Engineering Professional Success (STEPS): Peer mentoring program for students in engineering. It offers incoming freshmen and transfer students the opportunity to network with upperclassmen and learn the necessary skills needed to succeed in engineering through direct one-on-one contact with an upperclass student. The goal is to mentor engineering students to become better individuals by providing academic, professional, and social guidance, and to increase awareness and retention within engineering to enhance their overall college experience.

AMP Leadership Institute: Community college students visited the Texas A&M-College Station campus for three days and participated in the Engineering Career fair (150 industry representatives) Students attended classes, interacted with currently enrolled A&M students, attended workshops and professional and leadership seminars conducted by corporate professionals. To introduce community college students to the Texas A&M campus to alleviate the fears of transferring to a large 4-year research institution. To give students a set of skills(resume writing, interviewing skills, leadership training) that they can use at whatever institution they transfer to.

Vanguard: Vanguard is a program where the students are selected by the National Action Council for Minorities in Engineering (NACME). Students are selected while still in high school. The Students attend a three week "Immersion Camp" the summer before their freshman year and attend a one week program during winter break.

Students must attend academic workshops and monthly meetings. Prepare incoming engineering students for a rigorous engineering curriculum. Improve the retention and graudation of ethnic minority students in engineering.

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[i] The full range of AMP Program Objectives specified in AMP Project Cooperative Agreements with NSF include: (1) increasing (by specified percentages, e.g., 100%, over each 5 year award period) the number of underrepresented minorities successfully completing SMET baccalaureate degree programs; (2) improving the quality of the undergraduate educational experience, the knowledge and skills learned by underrepresented minority SMET students; (3) increasing the number of underrepresented minorities progressing from BS to graduate SMET programs; (4) increasing the pool of qualified underrepresented minority SMET teachers in K-12 education.

[ii] US 5th Circuit Court of Appeals decision

[iii] THE 1998 Revised freshman engineering program incorporated, peer mentoring, and supported instruction, study skills, as well as clustering and academic community building

[iv] Despite their higher risk status, please note that all TAMU AMP students were required to have met standard academic admission criteria of the University and the College of Engineering