Promoting STEM Education and Careers among Hispanics and Other Minorities through Programs, Enrichment, and other Activities

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I currently work as an Assistant Professor of Systems Engineering at Texas A&M International University. I got my Ph.D. in Engineering Management in the Department of Engineering Management and Systems Engineering at Old Dominion University in August, 2012. I received an M.E. degree in Systems Engineering from the same department in May, 2009. I received a B.S. degree in Management Information Systems (MIS) from the department of Business Administration at the Faculty of Economics and Administrative Sciences at the Hashemite University, in Zarqa, Jordan, in 2007.

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Dr. Rohitha Goonatilake, professor of mathematics, received his Ph.D. in Applied Mathematics from Kent State University, in Kent, OH in Fall 1997, three masters in the areas of applied mathematics, mathematics, and actuarial sciences, and a bachelor's in mathematics/science. He joined TAMIU in the Summer of 1999 and has completed 14+ years of service for TAMIU. He and his team was recently awarded a $1.2 million NSF award to promote mathematics education in the area of need in Laredo through providing scholarships to juniors and seniors at TAMIU to prepare talented, skillful, and highly qualified teachers to teach immediately after graduation. Dr. Goonatilake was a recipient of the Scholar of the Year Award in 2006 and the University Honors Faculty of the Year in 2013. He was a PI for more than three program-funded grants and Co-PI for more than 10 different program grants since joining TAMIU. He has a very active research agenda that involves network anomaly detection, probability, disease prevalence, and microeconomics. He was extensively involved with many STEM activities throughout years for local high school and middle school students, outreach efforts with local high schools, and other community involvements for many years through enrichment workshops and summer opportunities for the local community.

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Abstract

Hispanics are the fastest-growing and youngest ethnic group in the United States. It is estimated that Hispanics will comprise 30 percent of the U.S. population by the year 2040 and will become the largest ethnic group by then. Nevertheless, low enrollment of Hispanics in STEM disciplines and lack of professionals in STEM-specific careers is a major concern to many.

As a major Hispanic-Serving Institution (HSI) in southern Texas, Texas A&M International University (TAMIU) has been engaged in providing quality education in STEM disciplines to Hispanic and other minority communities. The STEM-Minority Outreach and Retention Enhancement (STEM-MORE) project, funded by the US Department of Education, is part of such effort, which was established in 2011 with activities planned for the following three years. Several project components including MORE-Education and Enrichment Program (MORE-EEP), MORE-Transfer and Retention Program (MORE-TRP), MORE-High School Outreach Program (MORE-HOP), MORE-Mathematics Enrichment Program (MORE-MEP), MORE-Internship and Research Programs (MORE-IRP), and MORE-Professional Development Program (MORE-PDP) have been implemented. This presentation will highlight the success of this project in its second year with detailed components and how they were implemented.

Keywords: STEM, STEM-MORE, Hispanics, research, students, laboratory, retentions, and enrichment

I. Introduction

Examining the academic success of Latino students in Science, Technology, Engineering, and Mathematics (STEM) majors is a paramount importance to educators and college administrators. There are many challenges Latino students, as well as African Americans and American Indians, face when getting in and out of science and engineering programs. The main concern as to why there is no more diversity in these fields is because there is not enough emphasis placed on them at an early age. In order to promote STEM education, elementary, middle, and high school teachers should become more knowledgeable in mathematics and science subjects to encourage their students. If the STEM disciplines are promoted among Latinos and other minority students, then the self-esteem with regard to science and mathematics will naturally enhance the knowledge and skills possibly through enrichment program activities.[1] In order to promote

STEM courses and encourage students pursue STEM education, colleges and universities need to collaborate with high schools to develop a bridge program to improve student preparation during summers between high school and college. Another way to promote STEM undergraduate education is for academic leaders to establish partnerships with the private sectors. This is encouraged because foundations and private industries can join universities and provide educational technologies, internships for students, and invest in their academic growth. It is also believed that engaging higher-education leaders in this mission and putting the recommendations into effect will remove the most significant barriers to STEM student retention. This will provide students with the skills they need to fill the 21st-century tasks and provide the US with the work force it needs to be innovative and competitive for decades to come.[2] This Hispanic STEM initiative will implement a five year plan to improve the education attained by Hispanic students in the STEM subjects. To achieve this, they have planned on increasing the number of qualified teachers, informing the Hispanic culture of the importance of being involved in their children's education, and increasing both the number of Hispanic students who graduate from high school and pursue a STEM degree. This initiative will not seek to duplicate the actions of any existing program but, instead, it will gather information from other groups, increase the efforts, and expand the positive education outcomes for the Hispanic Americans. Ultimately, this initiative will try to close the academic gap for Hispanic students.[3]

In an attempt to promote STEM education among girls and underrepresented minorities, the main reason why most people turn away from the field is because of pop culture, family, and education systems. In order for them to be positioned in a career in a STEM field, hands-on activities such as introducing role models or mentors that look like the students, providing activities that involve teamwork and collaboration, choosing activities that encourage problem solving with real world applications, and numerous other opportunities should be promoted.[4] There is a big gap between low-income and high-income students in the STEM fields. Low income students do not usually have the opportunity to participate in STEM classes in their high school because they are not offered. According the Department of Education, only 29 percent of high schools with high-minority student populations offer calculus, compared to 55 percent of schools with low-minority populations. A possible solution for closing the academic gap and adding more diversity is by finding teachers who are experts in these fields. Also, a good way to promote the education in STEM is by adding more STEM classes to low-income schools since there are lower than higher-minority student population.[5] With this mind, the STEM-MORE program was proposed and subsequently got funded.

A multi-disciplinary approach that involves engaging students, parents, and teachers has been considered implementing. Some people believe that if students are mentored and their perspectives are broadened, more students will become interested in STEM education.[6] Most secondary mathematics teachers major in mathematics since many courses they take focus on mathematics, which are also needed for graduate studies. Teacher education programs include various courses designed to gather the interest in secondary education. It is believed that these courses can help prepare future mathematics teachers by building a strong foundation of mathematical content knowledge.[7] Texas A&M (University) Increasing Diversity and Leading with STEM Education program is trying to achieve diversity in STEM field by engaging in a more hands-on approach with students.[8]

II. Program Synopsis and Features

TAMIU has enormous initiatives that have been placed to maintain a healthy retention for the Hispanic students in STEM Programs. Even though there was a slight shortfall of first-time freshman figures reported in 2013, healthy retention rates were recorded across all STEM majors. However, Systems Engineering and Mathematics programs exhibit a 29.4% and 33.3% increase in the first-time freshman enrollments as compared to 2012, respectively; both of these programs are housed in the Department of Engineering, Mathematics, and Physics. Table 1 provides a summary of retention rates and recruitment success of Hispanic students in STEM programs at TAMIU as of Fall 2013.

In order to succeed, many University-wide initiatives (not specifically for STEM disciplines) are set up. Engaging Sophomores, for example, encompasses Graduation Roadmap, a program designed to increase the academic success of TAMIU's Hispanic, low-income student population by: 1) strengthening sophomore academic, career, and personal counseling support services; 2) assessing the sophomore academic experience; 3) increasing professional opportunities for faculty development that build pedagogical and academic connectedness for sophomore students; 4) institutionalizing financial resources for faculty development; and 5) creating an endowment for student scholarships.

Table 1. Full-time first-time freshman enrolled in STEM major for Fall 2013, Fall 2012, and Fall 2011

	Bio.	**Chem.**	**Environ. Science**	**Math**	**Physical Science**	**Pre-Engr.**	**Science**	**Systems Engr.**	**Total**
FT FFR Enrolled in STEM Majors: Fall 2013	117	7	-	16	-	44	-	22	206
FT FFR Enrolled in STEM Majors: Fall 2012	124	9	2	12	7	49	3	17	223
FT FFR Enrolled in STEM Majors: Fall 2011	115	12	1	11	3	29	1	5	177
Returned 2nd Year	104	5	1	9	4	39	3	12	177
%	**83.87**	**55.56**	**50.00**	**75.00**	**57.14**	**79.59**	**100.00**	**70.59**	**79.37**

Focus on Student Success, Student Success Mentoring program, and TG Philanthropy are programs that are primarily involved with retention, just to name a few. In addition, there are numerous STEM specific initiatives and activities. It is a multi-faceted program with six program components that attempt to address some of the remedies suggested earlier. These are under the umbrella program STEM-MORE grant program funded by the Department of Education. For each component of the STEM-MORE program, a brief summary is provided regarding the progress made in its second year's activities in the following subsections.

III. Program Descriptions, Implementations, and Results

a) MORE-Education and Enrichment Program (MORE-EEP)

The goal of this program is to improve the recruitment and preparation of Hispanic and other minority students, particularly women, through participation in summer workshops that improve students' knowledge in a variety of STEM areas, including mathematics, chemistry, biology, and engineering. Features of STEM-MORE EEP include: 1) Hispanic and other minority sophomores and juniors in high school will attend two-week summer workshops; 2) Workshop sessions will be conducted by discipline-specific instructors with an emphasis on critical thinking and problem-solving skills.

One-hundred thirty nine applications were received by the deadline. Out of those total applicants, 62 were chosen to participate in the workshops. Students were to complete 60 hours of lectures and activities unique to STEM disciplines in two workshops: Workshop 1 held from June 10-21, 2013 (35 students) and Workshop 2 held from June 17-28, 2013 (27 students). Overall, out of 58 students surveyed, 1% of the students thought the program was fair, 16% of students thought the program was good, 45% of the students thought the program was very good, while 38% thought it was outstanding. There was also a question which asked if they would recommend this workshop to other peers: 97% answered "yes" and only 3% answered they were "not sure". Figures 1 and 3 illustrate the results for these survey questions for Workshops 1 and 2, respectively. For questions 4-7, a comparison of the responses between males and females was done and both Tables 2 and 3 demonstrate that there was a significant similarity on both genders for Workshops 1 and 2, respectively. In addition, Figures 2 and 4 illustrate the results of questions 8-11 for Workshops 1 and 2, respectively.

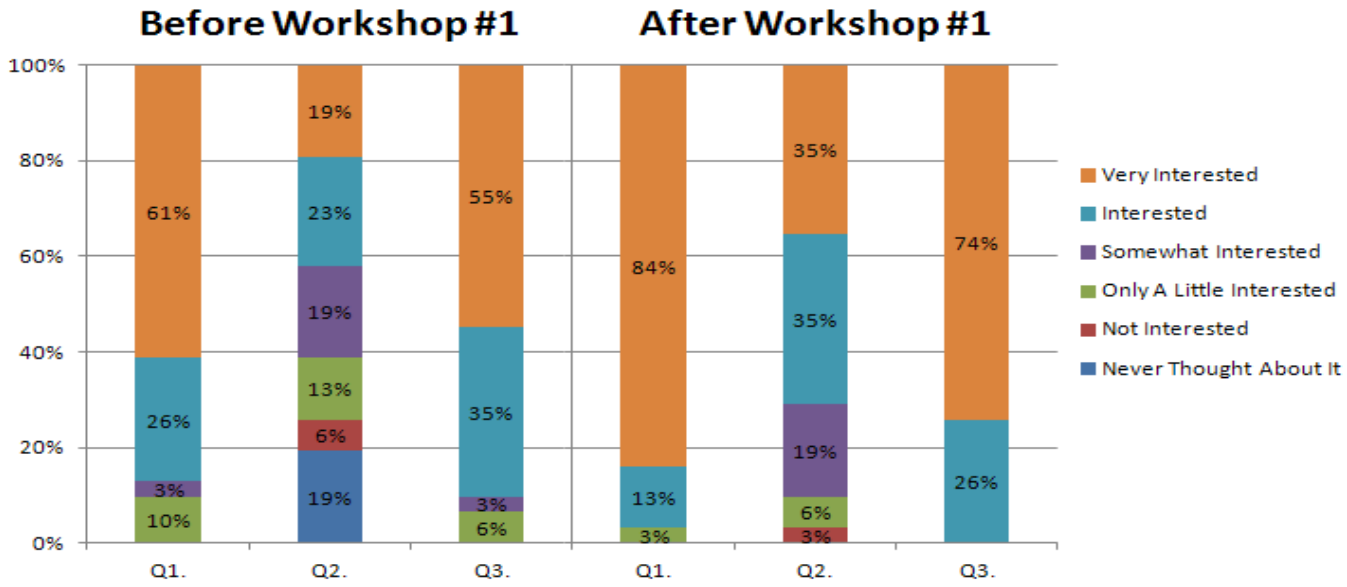

Figure 1. Pre- and post-Workshop 1 survey results:
Q1. How important did you believe it is for you to go to college? Q2. How interested were you in majoring in a STEM field? Q3. How possible did you think it was for you to go to college?

Table 2. Male to female ratios of extent of learning motivation from Workshop 1 survey

How much did you learn during the workshop about…		Not Any	Only a Little	Some	Quite A Bit	A Lot
Q4.	STEM careers? (male:female)	0:0	0:0	2:2	8:8	6:5
Q5.	Selecting a college? (male:female)	4:2	5:4	5:5	1:3	1:1
Q6.	Engineering/Math/Science? (male:female)	0:1	0:0	2:0	4:1	10:13
Q7.	Selecting your college major? (male:female)	1:0	3:3	2:3	5:5	5:4

A comparison of the responses between males and females was done and Table 2 demonstrates that there was a significant similarity on both sides.

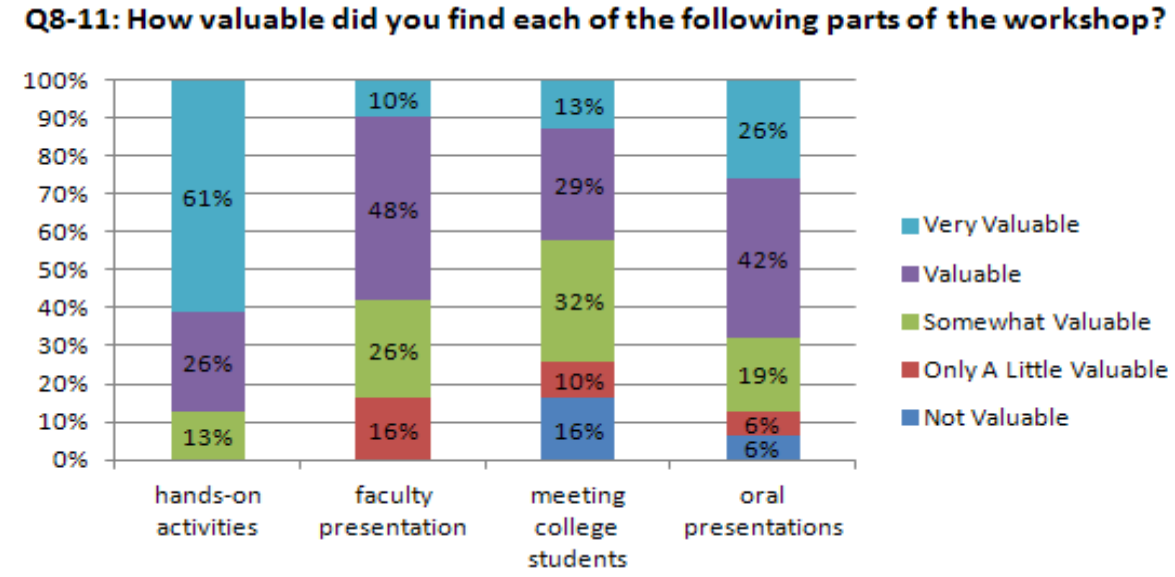

Figure 2. Workshop 1 survey results for questions 8 to 11

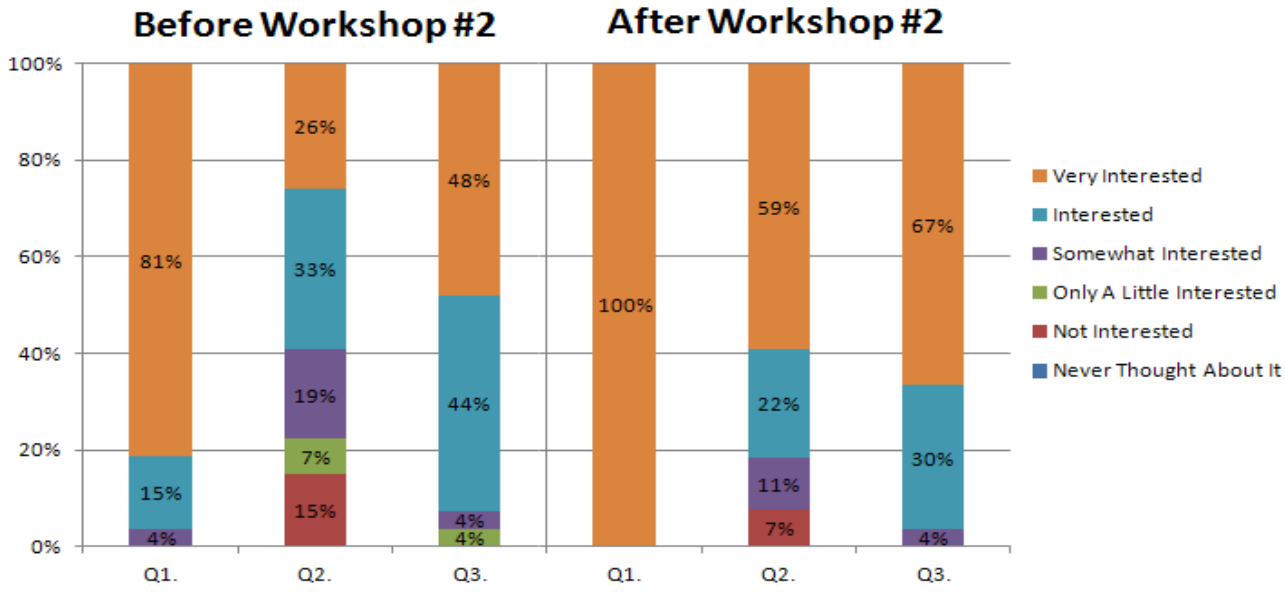

Figure 3. Pre- and post-Workshop 2 survey results:
Q1. How important did you believe it is for you to go to college? Q2. How interested were you in majoring in a STEM field? Q3. How possible did you think it was for you to go to college?

Table 3. Male to female ratios of extent of learning motivation from Workshop 2 survey

How much did you learn during the workshop about…		Not Any	Only a Little	Some	Quite A Bit	A Lot
Q4.	STEM careers? (male:female)	0:0	0:0	1:0	4:5	9:8
Q5.	College? (male:female)	5:6	1:1	5:4	2:0	1:2
Q6.	Engineering/Math/ Science? (male:female)	0:0	0:0	0:0	7:5	7:8
Q7.	College major? (male:female)	3:0	0:2	4:3	6:5	1:3

Table 3 shows a comparison of the responses between males and females and demonstrates that there was a significant similarity on the responses from both genders.

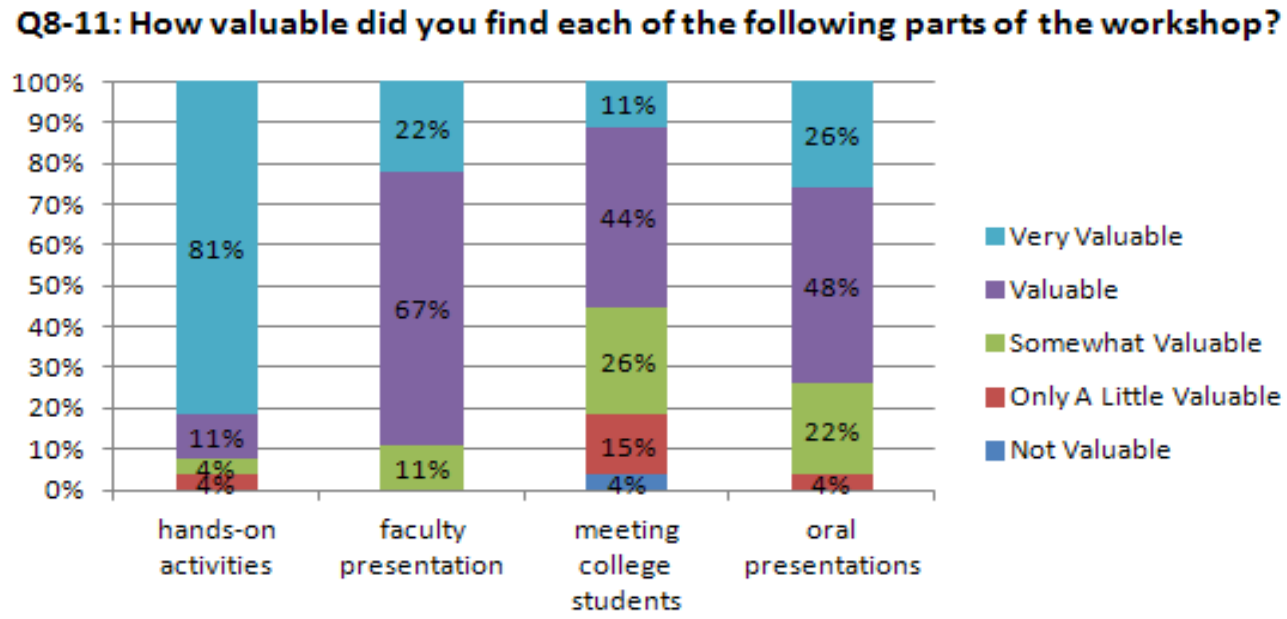

Figure 4. Workshop 2 survey results for questions 8 to 11

Aside from the above results, students were asked open ended questions that provided them to share that they thought would be the most valuable part of this workshop. They have specifically mentioned some sessions by the names, session leaders, and some simple ways to improve an activity. Project leaders will be taking them into consideration when planning similar activities in the future. The percentage of absences reported was 3.4%, mainly by four out of town students that had transportation problems. From the data collected, it can be concluded that students benefited from the workshop sessions. The student's responses after the workshop, in comparisons to that of before the workshop, showed higher average ratings in their interest in STEM field and pursuing a college degree program, thereafter.

b) MORE-Transfer and Retention Program (MORE-TRP)

This 2-week summer workshop is intended to improve the recruitment and retention of highly motivated Hispanic and other minority students in the Systems Engineering program at TAMIU. A major goal is to facilitate the transfer of Laredo Community College (LCC) students into the Systems Engineering Program at TAMIU by allowing them to take the first two years of core

and engineering courses at LCC. LCC students who wish to transfer to TAMIU will be encouraged to participate in a summer engineering design workshop. However, as far as engineering-specific transfer articulation agreement is concerned, the agreement is pending due to mainly each institution is seeking respective internal approval process and a snag has occurred when a course map is designed due to revisions of core curriculum state-wide. It is proposed that this work begins and will be in place approximately 1 year from now after the Accreditation Board for Engineering and Technology, Inc. (ABET) review is concluded and the proposed School of Engineering is in place at TAMIU.

Out of all participants, 17 were Hispanic and 1 was African-American. As the proposed engineering specific agreement between TAMIU and LCC was not yet in place, all of the participants were TAMIU students with a minimum average GPA 3.275 on the scale of 4.00. The breakdown of the participant composition further shows that there were 18% females, 92% students from TAMIU pre-engineering program, 95% Hispanics, and 27% of them were first year freshman students. The workshop was offered during the weeks of May 20-24 and June 3-7, 2013. The time was divided among group projects, invited speakers, and field trips to the water plant and manufacturing plant. It provided opportunities for working on project proposals, meeting with mentors, and talking to some local engineers. The students worked in small groups on the engineering project of their choice, previously approved by the instructors. At the end of the workshop, each group presented their project to the rest of the participants.

The seven invited speakers were local engineers from Laredo, TX and Nuevo Laredo, Mexico who talked about their college experience and current career. All speakers encouraged the students for further conversation and possible plant visits in the future. During the field trips, participants visited places that include Terracon Labs, City of Laredo's Air Control Tower, Prolamsa, Inc. all in Laredo, TX, and the Toyota Plant and Southwest Research Institute both in San Antonio, TX.

A survey conducted at the end of the program shows that the workshop was very well received by the participants. In addition, the average of the survey questions from all respondents was 4.6 out of 5.0. The student comments on the survey reflected that: 1) speakers should come from different engineering backgrounds as opposed to all from civil engineering, 2) projects should be set up by the workshop staff so that all the necessary materials are available since the start and so that the workshop staff is familiar with the project, and 3) students also indicated their desire to spend more time working on the projects.

From the data collected it is clear that the workshop was successful in encouraging the participants to continue working towards a STEM degree. Overall, the participants indicated they really enjoyed their time in the workshop activities.

c) MORE-High-School Outreach Program (MORE-HOP)

TAMIU's Outreach and Retention Specialists (recruiters) make bi-weekly visits to each high school campus. For the seven surrounding county high schools, recruiters will visit each campus twice a month. Recruiters are available to meet with prospective students, parents, and guardians. It is expected that students in nearby high schools will select TAMIU above other universities to

pursue the STEM program of their choice. Additional outreach officers in the surrounding cities have been established to provide information for possible STEM program opportunities at TAMIU. The website, http://www.tamiu.edu/enroll provides the extent of these activities designed to increase student enrollment in these programs.

d) MORE-Mathematics Enrichment Program (MORE-MEP)

MORE-MEP provides a pre-freshman camp for incoming Hispanic and other minority students to help them make connections between mathematics and science, to increase success in freshman science and engineering courses, to develop more sophisticated understanding of their own study skills and strengths, and to develop learning communities of peers. In the 2012-2013 project year, the MORE-MEP had a main focus on developing and implementing two one-week math enrichment workshops for pre-freshman students. For the purpose of recruitment, a workshop flyer, schedule, and application form were sent to local high schools to recruit students. Moreover, the Mathematical Society of TAMIU also helped to distribute the recruiting materials to the incoming freshman students in TAMIU Dusty Camps. A total of 103 applications were received. Of which, 49 of the applicants were males and 101 were Hispanics. Ages varied from 13 to 23 years, but the majority was in the age group of 18 years. Selection criteria included completion of application and grade level of applicant. As planned in project proposal, 30 students were selected for each workshop (a total of 60 students). Fifty-two students completed the week-long event. The other 8 students quit due to personal reasons and/or other commitments. Except for 2 students identified as Asian, all the other students were of Hispanic origin.

The workshop was conducted by four experienced instructors from TAMIU on August 19-23, 2013. The workshops focused on major topics of College Algebra, which include real numbers, linear equations, exponents and radicals, linear inequalities, polynomials, quadratic equations, factoring, system of equations, and equation of lines. Students worked in pairs during the workshop. A six-week license and detailed instructions of ALEKS were provided to each group. ALEKS is a Web-based, artificially intelligent assessment and learning system. It uses adaptive questioning to quickly and accurately determine exactly what a student knows and doesn't know in a course. A student who shows a high level of mastery of an ALEKS course will be successful in the actual course she is taking.[9] ALEKS course mastery of each workshop is shown in Figure 5.

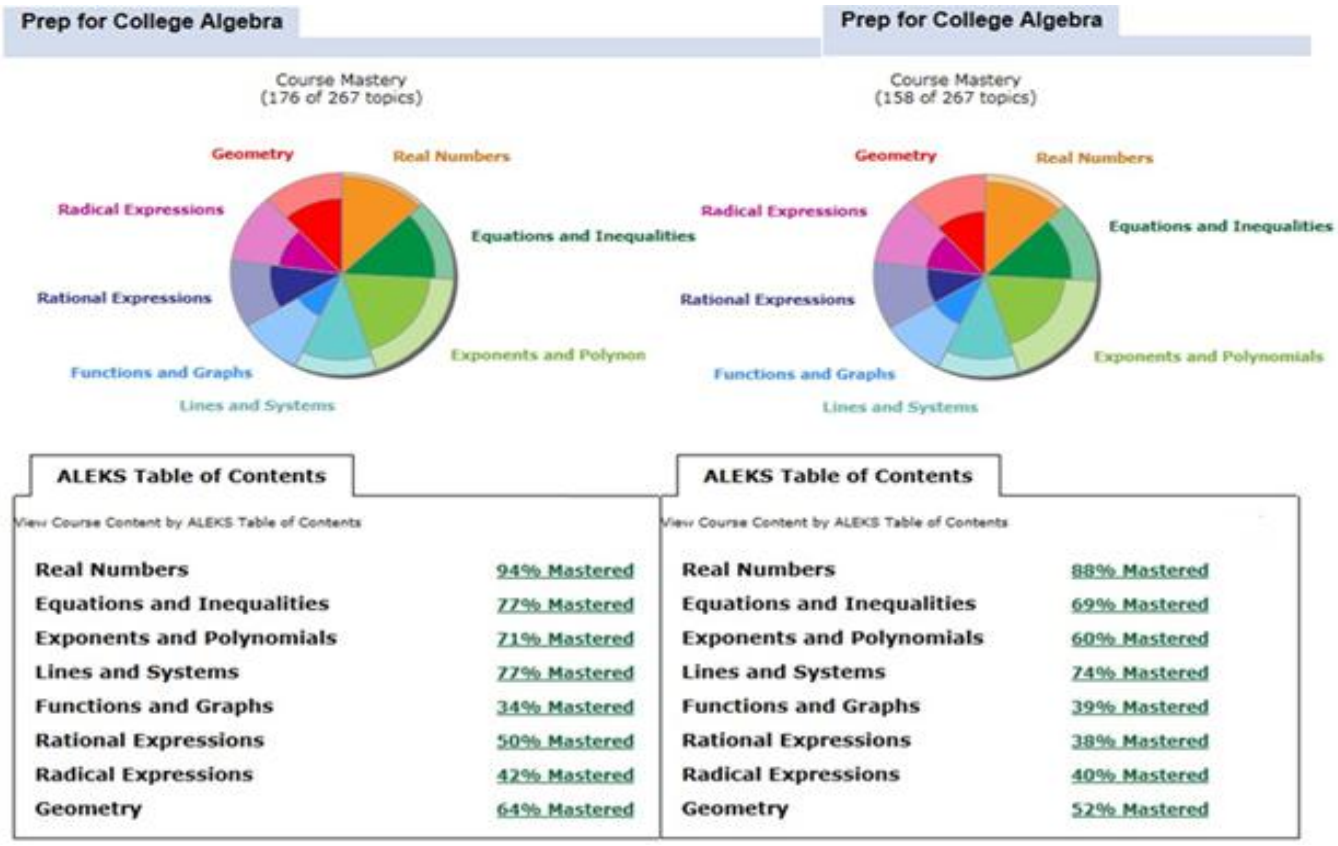

Figure 5. Course mastery with respect to Workshops 1 and 2

An evaluation survey of the STEM-MORE MEP was conducted. Fifty students completed the survey. Survey questions together with students' feedback are found in Table 4.

The ALEKS pie charts and program evaluation data showed positive impact of the workshop on students' knowledge in Algebra. Students realized the importance of mathematics for their future careers, and had learned algebra skills in the workshops.

Table 4. Before and after comparison of benefits (as reported by workshop participants)

Part I. For the following questions, we would like you to answer as you think you would have answered before the MEP Workshop and now that the MEP Workshop is over. Shade in the circle along the scale that indicates your response to the question. (check only one for each item)					
How important do you think it is for you to learn basic algebra skills?	Not important at all	A little important	Somewhat important	Important	Very important
BEFORE/ AFTER this MEP Workshop	2/0*	2/0	7/0	15/10	24/40
On the provided scale, indicate what best describes how much your knowledge increased in each of the following areas as a result of your participation in MEP Workshop.					
	Not any	Only a little	Some	Quite a bit	A lot
Skills in using basic algebraic operations / Interest in Learning with ALEKS	0/0	4/0	9/7	22/18	15/25

Part II. For the following questions, we would like for you to answer as you think you would have answered before the MEP Workshop and now that the MEP Workshop is over. Shade in the circle along the scale that indicates your response to the question. (check only one for each item)					
How likely do you think it is that you will need to succeed in mathematics courses at TAMIU (or high school)?	Not likely	A little likely	Somewhat likely	Likely	Very likely
BEFORE/AFTER the MEP Workshop	0/0	0/0	5/0	18/7	27/43
Indicate how much this MEP Workshop added to your basic algebra skills in each of the following areas.					
	Not at all	A little	Somewhat	A lot	A great deal
Problem solving/ Working as a team	0/1	0/2	10/4	18/21	22/22
Part III. Indicate how much each of the following activities added to your understanding of mathematics. If you did not participate in an activity, please indicate *Did Not Participate.* (check only one for each item)					
	Not at all	A little	Somewhat	A lot	A great deal
Class lectures/ Working in teams	1/3	2/0	18/7	15/13	14/17
Consider your level of knowledge about basic algebra skills both before and after this MEP Workshop. Use the provided scale to indicate the best description of your knowledge.					
	Never heard anything about algebra	Only heard the term algebra	Know only a few things about algebra	Know some basic algebra concepts	Know some basic algebra concepts & applications
BEFORE/AFTER the MEP Workshop	1/0	0/0	4/0	22/7	23/43

*Before/after responses

e) MORE-Internship and Research Programs (MORE-IRP)

This internship program offers real-world learning experiences to STEM majors at TAMIU. The undergraduate research program provides laboratory research experience. Interns are placed in private industry or government positions and mentored by the client organization. Research assistants are supervised and mentored by Engineering, Mathematics & Physics and Biology & Chemistry faculty members conducting research in computer science, mathematics, biology, chemistry, physics, or engineering. This component of the program was able to employ 10 student research assistants (70% female, 30% male), 7 interns (57% female, 43% male), 5 special program aids (60% female, 40% male), and 1 graduate program aid (100% male, 0% male) during October 1, 2012 – September 30, 2013. Out of the total 23 TAMIU students, females make up 65% and males make up 35%.

Table 5. Extent of experience being student research assistants

#		**No Increase**	**A Little Increase**	**A Good Increase**	**A Great Increase**	**Not Sure**	**Not Applicable**
1	Formulating a research question	--	14%	58%	14%	--	14%
2	Planning a research project	--	14%	29%	43%	--	14%
3	Conducting research	--	--	71%	29%	--	--
4	Managing your time while working	--	--	71%	15%	--	14%

	on a research project						
5	"Fitting in" with a new group	--	14%	29%	43%	--	14%
6	Communicating with your project faculty mentor	--	--	14%	86%	--	--
7	Making formal research presentation	14%	--	29%	43%	14%	--
8	Working collaboratively with other students	14%	--	57%	29%	--	--
9	Working independently to find answers to questions	--	43%	28%	29%	--	--
10	Working collaboratively with your faculty mentor	--	14%	43%	43%	--	--
11	Conducting a literature review	14%	--	43%	29%	--	14%
12	Dealing with unanticipated delays	--	43%	14%	43%	--	--
13	Submitting a paper publication	29%	28%	29%	14%	-	--
14	Applying to graduate school	14%	29%	28%	--	--	29%
15	Asking for help when you don't understand something	--	--	43%	57%	--	--
16	Learning new skills	--	--	14%	86%	--	--

Analysis using the sample data showed that 30% percent believed that the experience working as Program Aid is valuable and 66% that is very valuable. All of the participants would recommend this position to other students as well. Table 5 shows the extent of experience gained by student research assistants. Five additional open-ended questions were responded as follows:

What did you learn as a result of your experiences as a Program Aid?

- All of the students that filled out the survey agreed that they learned a lot about communication and collaboration skill between coworkers. They learned that team work was an important skill in the workplace.

What are your future educational and career plans?

- All of the students stated that graduating in their respective degrees was priority one-third of them added that they also wanted to pursue a master's degree.

How was your experience as a Program Aid impacted your future educational and/or career plans and/or helped you be better prepared for your future plans?

- Answers for this question varied from becoming more responsible, learning about decision making, organization, time management, planning, and some others.

What other ways have you been impacted by your experiences as a Program Aid?

- Students agreed that this program helped them with their hectic school schedule and that they felt that the healthy relationship with other influential student coworkers helped them through school.

How could the experiences of the Program Aids be improved?

- It was agreed upon 100% of the students that their experience could not have been improved; that it was perfect already.

Furthermore, responses received for "before/after" questions indicated that 14% had little interest in graduate school before the workshop as opposed to 57% being very interested after the workshop. Last but not least, 57% of the respondents strongly agree to continue conducting

research, would recommend being a Research Assistant to other students, and would like more information about careers in their major, respectively.

The type of projects undertaken by interns varied from an engineering project with Imaginarium of South Texas, systems management internships with Radiant, designing lesson plans and conducting lessons with UISD (GWMS), tutoring mathematics with Limitless Learning Center, Migrant MASTERS with Migrant Education Department, surgical internship with Jorge Vela MD, Modified Teacher Work Sample with Teacher Prep, math lessons and lectures with Martin High School, Intelligent Transportation System with Col Traffic, and pediatric clinical examinations with Foot Specialists of Laredo.[10]

f) MORE-Professional Development Program (MORE-PDP)

The MORE-PDP is intended to enhance faculty teaching skills and abilities, and, therefore, improve the student retention and graduation rates in STEM majors at TAMIU. The 2013 STEM-MORE Faculty Development Workshop was entitled "Writing Issues and Efficacy in STEM Disciplines." A total of 24 participants attended the workshop: 16 from TAMIU, 5 from Laredo Community College, 1 from local high schools, and 2 Pre-Service teachers. The workshop had the opportunity for participants to combine their insights with best practices supported by relevant research. Special attention was given to the use of writing in the STEM classroom, focusing on assigning, assessing, and responding to writing activities encouraging student engagement. The workshop discussed related issues such as graphic organizers, cognitively guided instruction, and challenging culturally relevant experiences that will require students to use technology while working with peers in different collaborative arrangements.

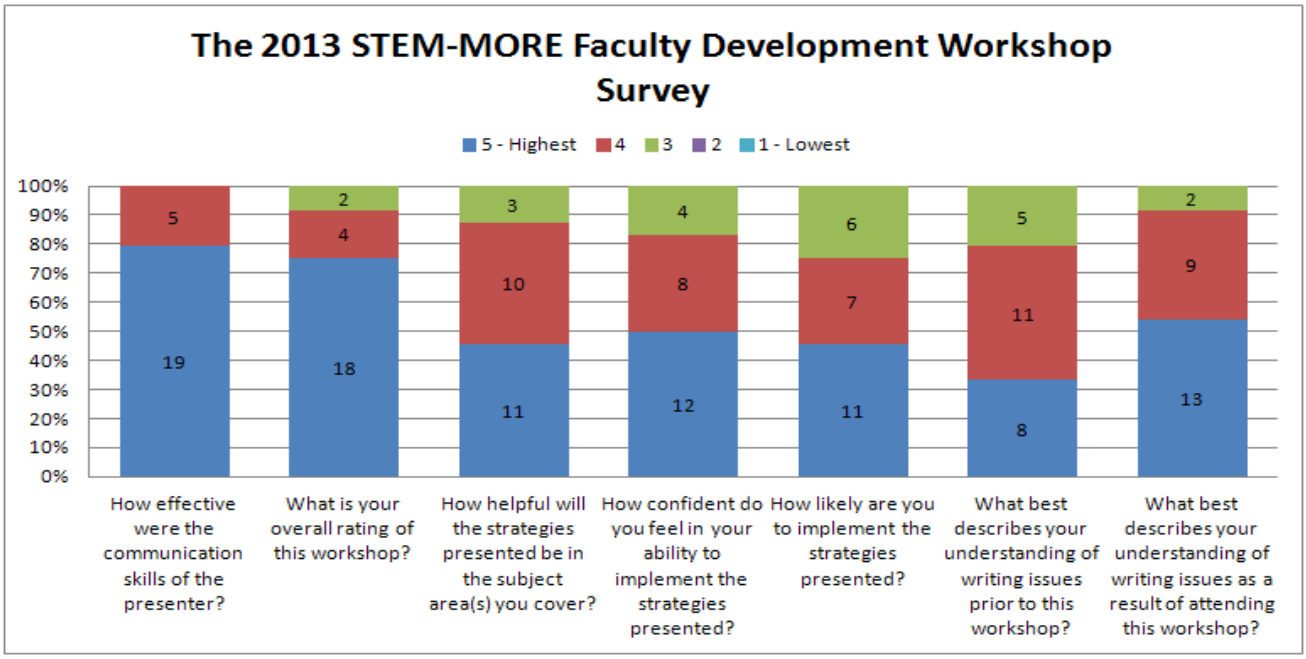

Figure 6. A summary of the 2013 STEM-MORE Faculty Development Workshop survey

This workshop allowed STEM faculty to explore how they can become part of a learning community to support their students' learning by collaborating with faculty delivering freshmen seminars that pays away for freshmen mentors, supplemental instruction leaders, and the director of the early alert system. The workshop was divided into the following sessions:

- *What does writing look like in your discipline?* Opportunity to think about the kinds of writing participants do and share their ideas with one another.
- *Writing-to-learn and low-stakes writing:* Explore and experiment with several sorts of low-stakes writing, including freewriting, dialogues, "objective" writing, and microgenres.
- *Cognitively-guided instruction and learning logs:* Learning logs are a writing activity encouraging students to reflect on their own intuitive understanding of mathematical ideas and to use this understanding to guide their learning.
- *An overview of the writing process:* Introduction to a process student might use to complete more involved writing assignments, including prewriting, drafting, reviewing and revising, and copyediting.
- *Prewriting:* Strategies for prewriting, including the use of graphic organizers like clustering and concept maps.
- *Reviewing and revising:* Strategies for encouraging students to review and revise their writing in process, including responding in writing and through rubrics, face-to-face conferencing, and peer review.
- *STEM and the first-year experience:* Ways in which STEM faculty can play a role in the community that supports the learning of first-year students. The STEM topics that lend themselves well to first-year seminars and ways in which first-year mentors can assist STEM faculty in these courses.
- *Homework:* Each participant was asked to draft a writing assignment that supports the learning goals for a course he or she is currently teaching. Some pointers were provided on how to design such an assignment. Participants used this time to respond to the "assignment."

Figure 6 presents the results of the survey administered at the end of the workshop. The questions were rated on a scale from 1 (lowest) through 5 (highest). The highest rated topics were concerning the effectiveness of the presenter's communication skills and the overall rating of the workshop. Nevertheless, the majority of the participants agreed on the helpfulness of the strategies presented and their ability and likelihood to implement them. Last but not least, a subtle increase is observed on the participants' understanding of writing issues before and after attending the workshop.

Participants suggested addressing writing issues of students who are coming to colleges, more hands-on examples and approaches on writing assignments and projects in STEM areas, correction techniques, plagiarism, grading strategies for large classes, and peer review workshops are much needed additions to the content presented in this workshop. Valuable follow-ups for this workshop would be creating effective strategies for assignments, implementing the techniques covered into more specific contexts may also be needed. Overall, participants felt that this workshop was very helpful and informative.

IV. Conclusions

The preceding discussion has shed some light of what took place in the second year of the program and provided adequate evidence to show the extents of its success. As was clear from these analyses, some project components worked better than the others under different circumstances. However, all projects have achieved their desired objectives. Since there is a third year of the program yet to be implemented, the project investigators are determined to complete this grant successfully by achieving all project objectives. It is evidenced that this multifaceted approach would promote STEM education and careers among Hispanics and other minorities through programs, enrichment, and other planned activities.

External evaluation carried out provided the general comments and recommendations to be continued for the entire project: (1) monitor enrollment, retention, and graduation data. Be sure to disaggregate data by different STEM major in order to see any trends that might warrant attention or that might identify models of best practice, (2) review and make modifications in surveys and other data collection as needed, (3) following-up with or tracking of former project participants to gather information related to project impact and suggestions for improving project strategies, and (4) look for examples of best practice as well as lessons learned that can be used to help leaders with future projects and that would be appropriate to share as part of the dissemination efforts as the project ends.

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