

# **Texas A&M University System**

**Texas A&M University**

**Prairie View A&M  
University**

**Texas A&M University –  
Corpus Christi**

## **Louis Stokes Alliance for Minority Participation**

**Impact Report  
2015**





# THE TEXAS A&M UNIVERSITY SYSTEM



# 2015 Impact Report

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## I. TAMUS LSAMP

### A. Alliance Partners

**Texas A&M University (TAMU)**, with Hispanic-Serving (HSI), **Texas A&M University-Corpus Christi (TAMUCC)**, and Historically Black College and University (HBCU) **Prairie View A&M University (PVAMU)** form the Senior-Level *Texas A&M University System Louis Stokes Alliance for Minority Participation (TAMUS LSAMP)*. The three institution alliance continues to sustain and institutionalize successful practices on the three campuses that continue to increase STEM enrollment, graduation, and preparation for graduate school for underrepresented minority (URM) students (Black, Alaskan Native, Native American, and Hispanic).

**Texas A&M University-Corpus Christi (TAMUCC)**, a HSI and TAMUS member, enrolls over 11,000 students (38% Hispanic). Their College of Science and Engineering leads LSAMP efforts, and is also a university leader in mentoring of first-year learning communities. TAMUCC has received state and national awards, including *National Role Model Institution* by Minority Access. It is one of only 12 institutions named *Founding Institutions of Excellence in the First College Year* by the Brevard Policy Center. In 2009 an undergraduate Mechanical Engineering (ME) program began and by Fall 2012 enrolled 230 students. In Fall 2014 there were 418 undergraduate majors and 12 post-baccalaureate majors in the ME program. Electrical Engineering Technology and Mechanical Engineering Technology programs are also offered. An undergraduate program in Electrical Engineering has since been added.

**Prairie View A&M University (PVAMU)**, a member of TAMUS and a HBCU, enrolls more than 8,400 students, 81% Black. PVAMU has been a partner campus since Alliance inception (Phase I) with the Colleges of Engineering and Arts &

Sciences (STEM fields) participating. Targeted for institutionalization are retention efforts for STEM majors, along with academic research experiences in the institution's M.S. degree programs in Biology, Chemistry, Mathematics, Computer Science, and the M.S. and PhD programs in Electrical Engineering.

PVAMU's College of Engineering has the fourth largest number of graduates at the institution. The university has developed a pathway for graduate students to continue on to TAMU to pursue a PhD in STEM disciplines not offered at PVAMU.

**Texas A&M University (TAMU)**, a major research university and the flagship institution of the TAMU System, serves as leader for the TAMUS LSAMP, and has five partnering STEM colleges: Science (COS), Engineering (DLCOE), Geosciences (COG), Agriculture and Life Sciences (COALS), and Texas A&M University – Galveston (TAMUG). The university holds membership in the Association of American Universities, one of only 61 institutions with this distinction. In 2010, Forbes ranked TAMU as 14<sup>th</sup> among U.S. institutions that are successful at helping racial or ethnic minorities succeed in STEM fields.

Nationally, TAMU's Dwight Look College of Engineering ranks in the top five schools for undergraduate engineering enrollment, 8<sup>th</sup> among U.S. public institutions' undergraduate programs, 7<sup>th</sup> among public graduate schools, and 4<sup>th</sup> in the granting of B.S. engineering degrees to Hispanics. Data indicate the College of Engineering has the second largest number of B.S. graduates at TAMU. The College of Science graduate program in Chemistry is ranked 8<sup>th</sup> among public institutions, and has over 300 undergraduates involved annually in research projects with faculty. In 2015 the Biological and Agricultural Engineering program was ranked 2<sup>nd</sup> among public universities. NSF ranked TAMU's doctoral degrees granted as 5<sup>th</sup> in engineering and 15<sup>th</sup> in physical sciences. The Texas Higher Education Coordinating Board in 2014 ranked TAMU as 1<sup>st</sup> overall and for minorities



in student retention and graduation rates within the state.

## B. Operating History

The TAMUS LSAMP, funded by the National Science Foundation (NSF), is part of a national initiative to increase the number of underrepresented minority (URM) students earning undergraduate degrees who are well-prepared in science, technology, engineering and mathematics (STEM) and motivated to pursue graduate education. The alliance has developed strong ties with several partner institutions and community colleges. The objectives of the LSAMP program in Phase I focused on increasing URM STEM enrollment and degree production. So for the first five years, the TAMUS LSAMP program was mostly a scholarship program. As the goals of the LSAMP program expanded over the years to individual student retention and progression to baccalaureate degrees and graduate school, the TAMUS LSAMP added objectives and shifted funding to develop *community college partnerships* for recruitment of URM students into STEM majors through integrated interactions with alliance institutions, develop *retention efforts* for STEM URM undergraduates with a focus on first-year and transfer URM students at alliance institutions, promote and encourage URM students to pursue *doctoral degrees* and build a community of scholars from the undergraduate to graduate school levels at and across alliance institutions, and provide *international experiences* for URM STEM students.

Since its inception in 1991, as one of the first six LSAMPs funded by NSF, the TAMUS LSAMP has functioned as a key vehicle in enhancing retention and degree completion for underrepresented students in science, technology, engineering and math (STEM) at its alliance institutions. Over the past 25 years, the TAMUS LSAMP institutions have produced almost 13,000 URM STEM graduates and seen an approximate 300% increase in the annual enrollment of URM STEM students.

In 2003, NSF introduced the Bridge to Doctorate (BD) initiative that provides LSAMP undergraduate students with funding for their first two years of graduate school. The TAMUS LSAMP has hosted eleven cohorts of BD scholars who receive, in addition to their two-years of funding, faculty mentoring, academic and personal support, research experiences, and travel support to conferences. To date, 132 students have participated in the TAMUS BD program, and of the 96 who have completed the program, 58 have bridged to PhD programs, 27 have completed the PhD, and 7 are employed as faculty or administration at institutions throughout the world.

The TAMUS LSAMP program also demonstrated its impact on a number of other academic success indicators, such as 1<sup>st</sup> year GPA and GPA in core engineering requirements. Six-year graduation rates of the 1994 First-Time Freshman Cohort of TAMUS LSAMP students were 183% higher than the National six-year graduation rates for URM STEM students. The average one-year retention rate of TAMUS LSAMP First Time Freshman and First Time Transfer Cohorts, between 1991 and 2001 across all university and community college partner institutions was 87.8%. As an Alliance, the TAMUS LSAMP distinguished itself as one of first LSAMPs to double, or nearly double (98% increase), the number of BS degrees awarded to URM students in STEM majors, during Phase I, and achieve a 108% increase by 1998-99, the second year of Phase II.

Moreover the TAMUS LSAMP program became a catalyst and cornerstone for innovative strategies, aimed at enriching the learning experience for URM STEM students, which were later adopted by other programs, universalized and institutionalized for all STEM students at TAMU and at TAMUCC. This proved to be critically important in Texas following the Hopwood court decision in 1996, as the provision of benefits and program services to students targeted by race or ethnicity became illegal. Universal institutionalization of these



largely retention and persistence-enhancing measures at TAMU, was the primary means by which the proportion of URM to Non-URM students, enrolled in STEM majors, was maintained at a higher level than the same proportional relationship in Non-STEM majors. During the same period of time, the ratio of URM to Non-URM students enrolled in STEM majors, at TAMUCC, experienced a steeper rising trend than the same proportional relationship trend in Non-STEM majors, despite the fact that the representation of URM students remains higher in Non-STEM fields.

At PVAMU, the TAMUS LSAMP supported and encouraged persistence and attainment for many STEM students who would otherwise not have demonstrated resilience and achievement. For the TAMUCC partner, which was a considerably smaller and much younger university, the TAMUS LSAMP program provided models for practices, and motives for policies, which were created and implemented at formative junctures in the development of its university, and the College of Science and Technology. For the community college partners of the TAMUS LSAMP, the program provided student participants with incentives and support for URM STEM students, which, from cohorts 1991 to 2000, yielded higher rates of TAMUS LSAMP student transfers (91.58%) to Texas public universities than for URM STEM students (57.17%) who did not participate in the TAMUS LSAMP.

A number of TAMUS LSAMP program by-products have contributed significantly to systemic improvements throughout the years. These include the means and the practices of data collection on program processes and outcomes for formative monitoring and evaluation of program effectiveness. Together with the development of extensive databases and collateral data resources, these practices have helped promote institutionalization and universalization of promising TAMUS LSAMP strategies. In addition, the TAMUS LSAMP created

a group of academic leaders for the TAMUS institutions who have risen to positions of prominence while working to formulate and implement strategies, and champion attitudes which have nurtured diversity and inclusion in the face of formidable and mounting anti-affirmative action sentiments introduced by the 1996 Hopwood Decision.

## II. Leveraging Strategies

The following section highlights examples of how the TAMUS LSAMP has leveraged LSAMP dollars with other sources, including other federal projects, state funds, and private contributions.

### A. Bridge to the Doctorate

The TAMUS LSAMP has been the recipient of eleven LSAMP Bridge to the Doctorate (BD) awards. The BD program is an initiative aimed at increasing the number of URM students who matriculate to graduate school. The BD program financially supports incoming graduate students for the first two years of their graduate programs. BD Fellows are grouped in a cohort of twelve and benefit from a program of academic and professional development activities and social support. BD support strategies are designed to help students develop skills needed to succeed in their courses, learn from participation in research activities, develop good research proposals, provide excellent leadership and mentoring for undergraduate URM STEM students, establish collegial networks, plan for doctoral studies, and apply for NSF and other national graduate fellowships. Many of the BD program goals overlap with other programming at TAMU. LSAMP BD has leveraged funding and programming with several other organizations and programs on campus.

#### *Texas A&M University PhD Diversity Fellowships*

As a major public institution of higher education resolute on creating and maintaining a climate that affirms diversity of persons and maximization on



the educational benefits of it, the TAMU Diversity Fellowship (DF) award was born. The DF reflects TAMU's commitment to increase the diversity of its graduate student population with \$3.75 million in annual funding. Since 2004, students from the colleges of Engineering, Science, Agriculture and Life Sciences, and Geosciences have averaged approximately 15 DF awards each year. Fourteen (14) BD Fellows have been awarded the DF.

In the TAMUS LSAMP grant proposal for a new BD cohort for Fall 2016, the TAMU Office of Graduate and Professional Studies (OGAPS), led by PI Dr. Karen Butler-Purry in her position as Associate Provost for Graduate and Professional Studies, committed to provide six 3-year PhD Diversity Fellowships (distributed over the four STEM colleges – Engineering, Science, Agriculture and Life Sciences and Geosciences) for the remaining 3 years of a BD Fellow's doctoral program. The commitment totals \$622,800 (\$103,800 per student). Each fellowship includes \$9,000 per year for tuition and fees, \$18,000 per year in stipend payments, a minimum of \$7,569 per year in departmental assistantships or scholarships, and medical benefits from the graduate student health plan or the state employee plan. The OGAPS also will enthusiastically partner with the LSAMP program on graduate student development activities and invite all BD Fellows to events offered to all university-level fellows.

#### *NSF TAMUS AGEP*

The TAMUS Energy & Sustainability Texas Alliance for Graduate Education and the Professoriate (AGEP) program is NSF-sponsored program intended to increase the number of domestic students receiving doctoral degrees in STEM fields, with special emphasis on underrepresented populations. TAMU was awarded an AGEP-Transformation grant in September 2013. AGEP and LSAMP BD have co-sponsored several workshops and seminars for graduate students in both programs.

A prominent example of the leveraging of these two programs is the summer national fellowship “boot camp.” Students involved in AGEP and LSAMP BD attended a series of three workshops geared toward preparing the students to apply for the NSF Graduate Research Fellowship (GRF) and other national fellowships. Invited speakers conducted workshops on how to create successful PhD fellowship applications.

Other select workshops on stress management, leadership development, and funding opportunities were open for graduate students involved in AGEP and/or LSAMP to attend. Several LSAMP BD Fellows attended AGEP conferences and institutes with various themes related to completing the PhD. The programs shared costs for graduate students who attended co-sponsored workshops, conferences, and institutes. BD Fellows who do not plan to continue their PhD studies at TAMU are linked to existing AGEP programs at prospective institutions to continue their doctoral studies. This includes sponsoring visits and making introductions to potential faculty advisors.

#### *TAMU College Partners*

Demonstrating support for the BD initiative, the four TAMU STEM colleges and their departments have offered guarantees to fund the doctoral studies of any student who: (1) began graduate studies funded by the LSAMP BD program, (2) completed his or her first two years in graduate school with a satisfactory GPA, (3) was admitted to a doctoral degree program in that department, and (4) makes satisfactory progress towards their degree.

#### *Center for the Integration of Research, Teaching, and Learning*

The Texas A&M University NSF-funded Center for the Integration of Research, Teaching and Learning (TAMU@CIRTL) has advanced professional development of future faculty (doctoral students) in teaching and learning through both institutionalized CIRTL programs and existing TAMU programs.



One activity in particular is the new STEM learning community that targets STEM doctoral students who have not served as teaching assistants. STEM faculty serve as mentors. BD Fellows are targeted to participate in this program during their 3<sup>rd</sup> or 4<sup>th</sup> year of graduate studies.

#### *Sloan Program for Exemplary Mentoring*

The Sloan Program for Exemplary Mentoring (PEM) is a two-year learning community program sponsored by the Alfred P. Sloan Foundation. The PEM is designed to support the success and retention of diverse populations in graduate school. First-year PEM students learn how to navigate graduate school, their respective departments and research areas. These students receive peer mentoring, develop leadership skills, and conduct self-assessments in order to identify strengths and weaknesses. In year two, students begin personalized career development and become graduate student mentors for the incoming PEM cohort. LSAMP BD has co-sponsored a joint session with PEM and AGEP on funding opportunities for graduate students. Expenses were shared amongst the three co-sponsors.

### **B. NSF Scholarships in Science, Technology, Engineering, and Mathematics (S-STEM)**

TAMU LSAMP housed two transfer scholarship programs and effective articulation agreements which resulted in significant increases in URM transfer enrollment and retention to graduation. The strategies targeting retention of URM engineering students at TAMU were based on academic support collaboration with the three major URM student engineering organizations, MAES Latinos in Science and Engineering (formerly the Mexican American Engineering Society), the National Society of Black Engineers (NSBE), and the Society of Hispanic Professional Engineers (SHPE). Students involved in both transfer scholarship programs were invited to attend the TAMUS LSAMP symposium which highlights LSAMP BD

and undergraduate research (UGR) students' research from across the Alliance.

#### *Engineering Transfer Scholars (ETS) Program*

Engineering Transfer Scholars (ETS) at Texas A&M University was a National Science Foundation Scholarship in Science, Technology, Engineering, and Mathematics (S-STEM) program designed to increase the quantity, quality, and diversity of the engineering workforce in Texas and abroad through enabling academically talented and financially needy students to transfer to Texas A&M University and obtain baccalaureate degrees in engineering. ETS was funded from 2009-2013. ETS students attended select LSAMP UGR student seminars and workshops about graduate school opportunities.

#### *College of Science Scholarship in Science, Technology, Engineering, and Mathematics (S-STEM)*

The College of Science (COS) had a NSF S-STEM project that focused on a partnership with Palo Alto College (PAC), a two-year college with a predominately Hispanic population (about 66% of PAC students were URM at the time of the partnership). The project, which began in Fall 2008, provided scholarships for undergraduate students majoring in biology, chemistry, mathematics or physics to begin their studies at PAC, a two-year program, then transfer to Texas A&M to complete their four-year degrees. In addition to the scholarships, the project included support activities to address retention to graduation efforts.

### **C. Other NSF STEM Related Programs**

PVAMU has leveraged LSAMP programmatic efforts with other campus STEM-related programs such as the NSF Historically Black Colleges and Universities Research Infrastructure for Science and Engineering (HBCU-RISE) program, the NSF Historically Black Colleges and Universities - Undergraduate Program (HBCU-UP) program, and



the NSF Centers of Research Excellence in Science and Technology (CREST) program.

From the HBCU-UP program summary website, “The Historically Black Colleges and Universities Undergraduate Program (HBCU-UP) is committed to enhancing the quality of undergraduate STEM education and research at HBCUs as a means to broaden participation in the nation's STEM workforce. To this end, HBCU-UP provides awards to develop, implement, and study evidence-based innovative models and approaches for improving the preparation and success of HBCU undergraduate students so that they may pursue STEM graduate programs and/or careers.” The HBCU-UP program aims to promote excellence in STEM discipline through the cultivation of a broadly inclusive science and engineering workforce “to educate the next generation of undergraduate students to confront the challenges in computational and data-enabled science.”

From the CREST program website, “The Centers of Research Excellence in Science and Technology (CREST) program provides support to enhance the research capabilities of minority-serving institutions (MSI) through the establishment of centers that effectively integrate education and research. CREST promotes the development of new knowledge, enhancements of the research productivity of individual faculty, and an expanded presence of students historically underrepresented in science, technology, engineering, and mathematics (STEM) disciplines. HBCU-RISE awards specifically target HBCUs to support the expansion of institutional research capacity as well as the production of doctoral students, especially those from groups underrepresented in STEM, at those institutions,” and the Eisenhower Scholars program.

#### **D. Other STEM-Related programs.**

*U.S. Education Department STEM Outreach, Access, and Retention (SOAR) Program*

TAMUCC's LSAMP has worked closely on many efforts with the Title V-funded STEM Outreach, Access, and Retention (SOAR) program since SOAR received funding in 2012. SOAR offers many services exclusively for STEM students including supplemental instruction, a lending library program where equipment and textbooks are lent out to students, career development workshops, as well as providing some funding for conferences and undergraduate research. In 2012 & 2013, LSAMP and the College of Science & Engineering at TAMUCC partnered with SOAR during Hispanic Heritage month to co-sponsor events including the *Hispanics in STEM Career Expo* as well as *Hispanics in Higher Ed: Inside Edition*. Panel sessions were held at both of these events. Successful Hispanic individuals with positions in STEM fields served as panelists. LSAMP students showcased their research at poster sessions during these Hispanic Heritage month events. In 2012, the TAMUCC LSAMP Program Coordinator, along with a SOAR representative, traveled to several different community colleges throughout the region in a recruiting effort. Various programs from the College of Science & Engineering were promoted including LSAMP. TAMUCC LSAMP students are encouraged to take advantage of SOAR's services. The SOAR director has been invited to speak to TAMUCC LSAMP students at welcome luncheons.

TAMUCC LSAMP students often partner with undergraduate research students in the NSF-funded Computing Alliance for Hispanic Serving Institutions (CAHSI) grant at TAMUCC. The CAHSI is a grant that funds undergraduate research students in Computer Science and encourages Hispanic students to enter the professoriate in computing areas, or enter the computing workforce with advanced degrees. Many CAHSI students work in TAMUCC's iCORE Lab on various projects, including creating apps. Some LSAMP GIS & Engineering students have teamed up with CAHSI students on these efforts.



### *U.S. Transportation Department Dwight D. Eisenhower Transportation Fellowship Program*

PVAMU has leveraged LSAMP programmatic efforts with the Eisenhower Transportation Fellowship (ETF) program on campus. The ETF program funds upper-level undergraduate and graduate students who demonstrate a strong interest in pursuing careers in the transportation profession. The Eisenhower Fellows conduct transportation-related research with PVAMU faculty and disseminate their findings.

### **Highlight ETS Student Profile: Cherish Vance**

*“When I returned to school after a long hiatus, the term “non-traditional” did not begin to explain it. It was the spring, full of hope and renewal, right? However, my first semester was anxiety-filled and may have turned out to be my last. For even though I had been an undergraduate many years ago, that effort was remarkably frustrating and unfruitful.*



*By a stroke of dumb luck, I was introduced to the ETS S-STEM program and began participation in the fall. In addition to much appreciated funding, I was provided with resources to not only foster my success as an undergraduate, but also inspire and inform my aspirations for graduate school. The ETS seminars provided me with the fundamentals of being a successful student: time management, setting priorities, networking, professional development, stress management, accountability...not to mention the watchful eyes of Drs. Walton and Butler-Purry.*

*As a part of ETS, we were also invited to participate*

*in various LSAMP functions – the most memorable of which was the annual symposium within the system schools. It was at these events that I was first exposed to the notion of undergraduate research. Witnessing the fine work and enthusiasm of both graduate and undergraduate researchers strongly influenced my own thirst for discovery. The definite turning point, however, was the symposium with the GEM GRAD Lab sessions. Only then did I understand how “attainable” a graduate education could be for a STEM student of color. Previously, I would never have thought that I could either afford or desire a terminal degree.*

*Above and beyond the programmatic elements of ETS and LSAMP, I greatly benefitted from the support network of not only underrepresented students like myself, but also administrators and faculty dedicated to our continuing success and future endeavors. I can assert unequivocally that without the encouragement and mentoring from these programs I would not have been able to muster the courage (and generous resources) to pursue my PhD.”*

*With great appreciation,*

*Cherish C. Vance ‘13  
National Science Foundation Graduate Research Fellow*

### **III. Alliance Enrollment Statistics**

Enrollment of URM STEM students has significantly increased at TAMUS LSAMP institutions collectively and individually. For example, the total annual enrollment of URM STEM undergraduate students among the three primary TAMUS LSAMP partners, TAMU, PVAMU, and TAMUCC, has nearly tripled from 2,782 students in the 1991 baseline year to 8,609 students in Fall 2014. Also, at TAMUCC and TAMU, the ratio of URM to non-URM students in



STEM majors had a larger increase than the same ratio in non-STEM majors.

Since 1996, TAMUS LSAMP has operated under the constraints imposed by the Hopwood Court Decision, which prohibits admission or access to special programs, services or incentives based upon racial or ethnic selection. The TAMUS LSAMP at TAMU was the only targeted URM program that remained on campus after Hopwood and played a major role in reducing its impact on URM STEM enrollment.

### A. Freshmen enrollment

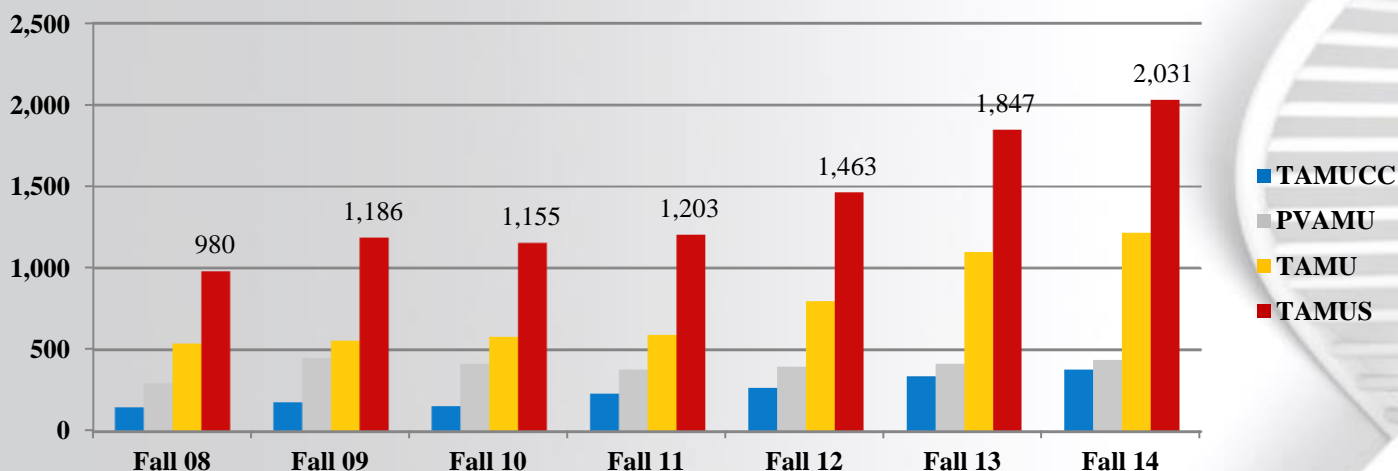


Figure 1: TAMUS LSAMP URM STEM First Time Full Time Freshmen Enrollment

A key element of increased URM STEM enrollment at the TAMUS LSAMP institutions is that of first time freshmen. In 1997, the Texas “Top 10” law mandating guaranteed college admission to every Texas high school student in the top 10% of their graduating class posed challenges to TAMUS LSAMP first-time freshmen URM STEM enrollment, believed to disproportionately affect underrepresented minorities. Accordingly, TAMUS LSAMP continued its focus on URM targeted strategies although consciously opening those strategies to the general population. Particularly in alliance institutions in which non-URM stem students significantly outnumbered URM STEM students, TAMUS LSAMP employed tactics that yielded success in increasing first-time URM STEM

enrollment. To demonstrate the impact of these targeted strategies, Figure 1 shows the first-time, full-time (FTFT) URM STEM freshmen enrollment numbers for each alliance institution and the alliance enrollment of Phase III which increased by 47% over that period.

### B. Transfer enrollment

In Texas, more than two-thirds of underrepresented minority students in higher education attend community college, making the encouragement of community college student transfers to baccalaureate institutions in STEM a major focus

of TAMUS LSAMP. Over the course of 20 years, TAMUS LSAMP has actively included 15 community colleges and community college systems. The development of good feeder/receiver relationships between our partner community colleges and universities has shown positive impact on community college transfers. In Phases I and II, there were nine TAMUS LSAMP community college partners. During this time, the focus was the expansion of community college partnerships to encourage URM STEM transfers. By 2000, a total of 3,156 URM STEM students had transferred into primary TAMUS LSAMP institutions.



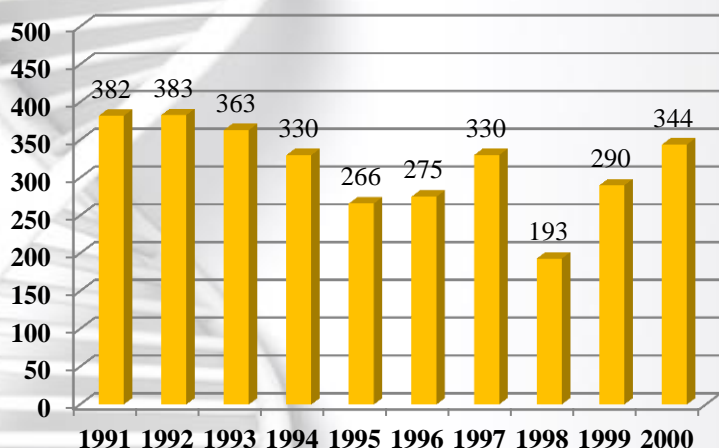


Figure 2: TAMUS LSAMP URM STEM Community College Transfer Enrollment from 1991-2000

As shown in Figure 2, TAMUS LSAMP community colleges successfully encouraged URM STEM students to transfer to TAMUS LSAMP 4-year institutions, and particularly from 1998-2000, succeeded in increasing URM transfers. The level 1 transfer rates (% of entering cohort) compared quite favorably to transfer rates of non-level 1 URM STEM of the same entering cohorts.

In Phase III there were no direct community college partners as in Phases I and II. During this phase, community college transfer enrollment was geared towards recruitment and skill development through joint research experiences. Efforts included leveraging with programs on community college campuses and summer REU experiences. TAMUS

LSAMP continued to encourage URM STEM transfer enrollment. Figure 3 shows first-time full time (FTFT) URM STEM transfer enrollment numbers for TAMUS LSAMP Phase III.

### C. Total enrollment

To sustain gains made during Phases I–IV of the TAMUS LSAMP, the current Renewal's (Phase V) efforts continue to focus on further developing strong ties with five community college partners, each having large URM student enrollment. Through integrated interactions, TAMUS LSAMP is impacting enrollment through annual Community College STEM Transfer Conferences, community college campus visits, and leveraged partnerships with NSF S-STEM scholarship programs at the TAMUS LSAMP institutions and community colleges, and NSF summer REU experiences. The TEES Strategic Initiative Office provides assistance to community colleges throughout the state in writing NSF S-STEM proposals which enhances the community college ties and STEM recruitment efforts.

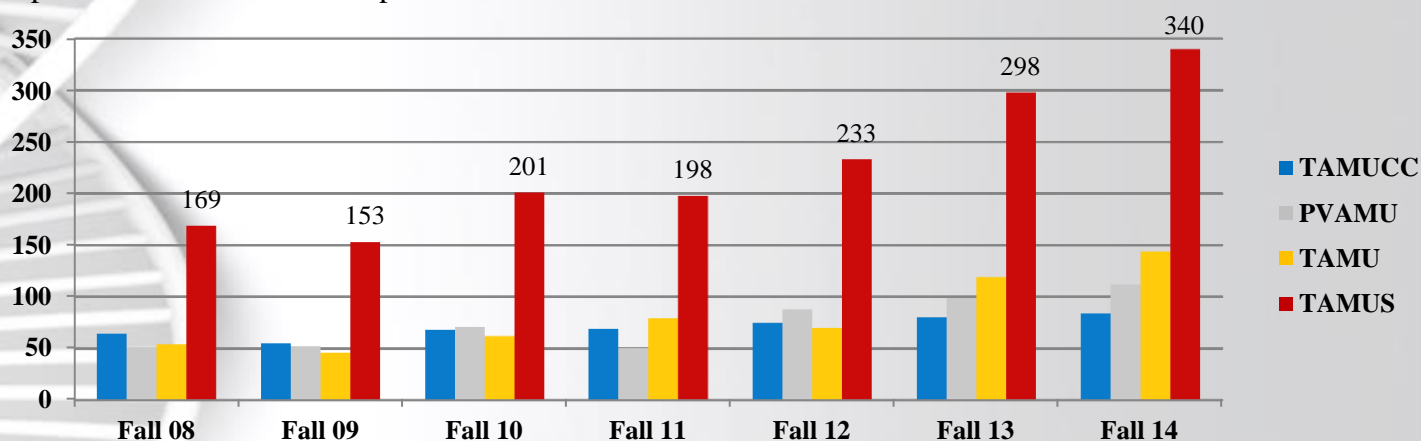


Figure 3: TAMUS LSAMP URM STEM First Time Full Time Transfer Enrollment in Phase III



In Phase III, the total enrollment of URM STEM returned to an all-time high, 39% over the 2001 Phase III benchmark year, recovering ground lost during Phase II. In the first year of this pipeline repair phase, TAMUCC made significant progress when compared to the other two institutions, growing enrollment by approximately 9% higher than the benchmarked levels. Now on track with enrollment strategies, TAMUS LSAMP has seen continued growth.

one institution saw a decrease during this same time period and that was due to a drop in overall enrollment at that university for two years. Total enrollment and degree data (STEM and non-STEM) are cyclic and the three institutions are not usually at the same point in their cycle.

The Renewal (Phase V) has a 17.3% increase over the last year of Phase IV. All institutions increased URM STEM enrollment from the previous year, in

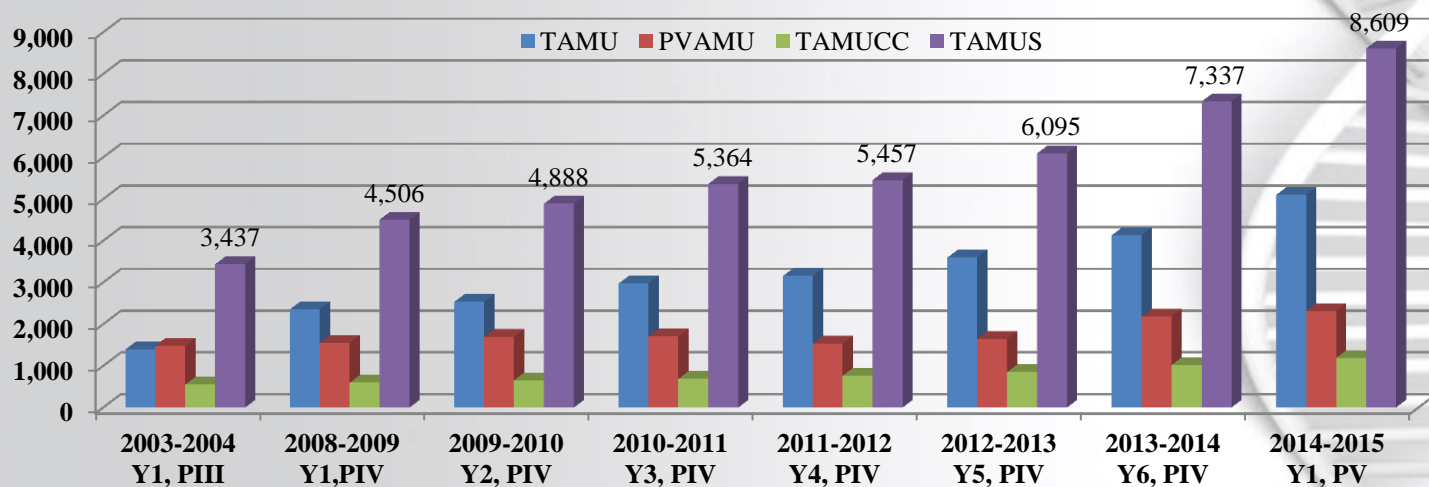


Figure 4. TAMUS LSAMP URM STEM Enrollment for Year 1—Phase III, all years of Phase IV, and Year 1—Renewal (Phase V). Data source: TAMUS WebAMP (represents only U.S. Citizens and Permanent Residents)

Figure 4 graphically represents the last year of Phase III, all years of Phase IV, and the first year of the Renewal (Phase V). The data beginning in 2010 had a change in the race/ethnicity categories to reflect the ones used in the U.S. Census. Beginning with Year 1 of the Renewal, the number of STEM disciplines was increased from nine to 11 with some of the previously defined disciplines being re-organized into the new categories. This further clarified some areas that had not been previously included.

During Phase IV (2008-2014), URM STEM enrollment at TAMUS LSAMP primary institutions had a net increase of 62.8%. This was the result of enrollment at most of the Alliance institutions increasing each year during this time period. Only

#### D. Enrollment Outreach Activities

TAMUS LSAMP has instituted a number of programmatic activities, which have been supported in the literature as notable success strategies for increasing the enrollment of URMs in STEM. Several of the activities implemented over the 25 years of TAMUS LSAMP that have positively impacted URM STEM enrollment are provided.

##### *Pre-College and Bridge Programs*

Summer bridge programs bring together high school students, college student peer mentors, and college faculty and staff to help students prepare for the rigors of college math and science prior to their freshmen year. These programs offer an opportunity to get a head start in undergraduate



coursework and make a smooth transition from high school to college. Student participation continues throughout the academic year with advising and other activities designed to increase retention, promote academic excellence and expose students to internship and undergraduate research opportunities. Some examples and brief descriptions of TAMUS LSAMP Pre-College and Bridge programs include:

**Phase I (TAMU)** – A 5-week residential program. Students were enrolled in pre-calculus and Engineering 289 for course credit. Students also attend seminars on study skills and time management and adjustment to college lectures. Key objectives of the program were 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.

**LEEP (Learning to Excel in Engineering through Preparation) (TAMU)** - A 5-week summer bridge program bringing incoming freshmen to campus during the second summer session prior to their first fall semester. Participants experience life as a student at Texas A&M University through instruction in engineering, math, physics and study skills. LEEP students served as ambassadors to peers who did not participate in the program and were clustered in a design course for credit in the fall.

**ESCI (Engineering and Science Concepts Institute) (PVAMU)** – Instituted in 2002, ESCI is an innovative intensive eight-week freshmen summer program that introduces recent high school graduates to the professions of engineering and computer science as viable career choices. Students earn 9-11 hours of course credit.

**Engineering Insights (EI) Summer Camp (TAMU)** - The Engineering Insights summer camp

is a special 4-day summer program designed to give high school students with an interest in science, mathematics and engineering an opportunity to explore engineering as a career. Underrepresented groups interested in engineering at Texas A&M are particularly encouraged to apply (African Americans, Hispanics, Native Americans and women). Participants stay on campus in modern residence halls, attend special classes, see engineering activities in progress in laboratories and do a bit of engineering themselves.

**Society of Hispanic Professional Engineers – Advancing Careers in Engineering (ACE) Program (TAMU)** - The ACE program provides the opportunity for SHPE members to conduct pre-college outreach activities in the community. TAMU LSAMP joined Texas A&M SHPE chapter to reach high school students and encourage them to pursue STEM fields. This 3-day event hosts 20-30 students from United High School, an engineering magnet school, in Laredo, Texas. The participants get the opportunity to indulge in team projects, meet and greet engineering faculty and students, and tour the TAMU campus.

**Women Explore Engineering (WEE) (TAMU)** – WEE is a special 4-day summer program designed to give female high school students with an interest in science, mathematics and engineering an opportunity to explore engineering as a career. The camp focuses on issues important to women and other groups that are under-represented in the field of engineering (African Americans, Hispanics, and Native Americans). Sessions include panel and group discussions with women engineering faculty and students that focus on what it's really like in the workplace and in college for female engineers. Tips on how to balance an engineering career and a family, and other career options for women in engineering are also discussed.

**E-12 Exploring Engineering Program (E-12 EE) (TAMU)** – The E-12 EE program focuses attention



on a small group of targeted Texas high schools in order to establish partnerships with top performing Texas high schools. The 4-day summer program gives students with an interest in STEM an opportunity to explore engineering as a career. During the camp, students live on campus in modern residence halls, participate in group and panel discussions, see engineering activities in progress and complete an engineering design project.

## IV. Completion Rate and Current Status of LSAMP Participants

### A. Completion Rate for URM STEM

TAMUS LSAMP demonstrates a positive impact in the number of URM STEM students that graduate from core partner institutions. For instance, annual degree production of URM STEM students from the three primary TAMUS LSAMP institutions more than tripled from 303 in 1991 to 918 in 2015 at the end of Phase IV and from 1991's 303 to 2015's total of 1,165 at the end of Year 1 of the Renewal (a 284% increase), a significant contribution to the NSF goal of a diversified STEM national workforce. In the one year of the Renewal there has already been an increase of 26.8% over the last year of Phase IV. Over the past 25 years, the TAMUS LSAMP institutions have produced approximately 14,675 URM STEM graduates. Phase III produced 2,660 URM STEM bachelor awardees while Phase IV produced 4,689.

Figure 5 presents the URM STEM bachelor degree production for the last year of Phase III, all years of Phase IV, and the first year of the Renewal (Phase V) for the three alliance institutions.

During Phase III, the TAMUS LSAMP focused on repairing the pipeline that deteriorated due to the aforementioned state policies. As a result, at the end of Phase III, TAMUS LSAMP BS degree production increased 86% over the original 1991 baseline. When examining the yearly data for Phase

III it indicates the cycle to be at the same place in the first and last years.

In Phase IV, URM STEM BS degree production continued to increase. Each year increased a minimum of 7% over the previous year's total. The net increase from Year 1 to Year 6 was 52%. This phase ended with a production increase of approximately 203% above the original 1991 baseline of 303 URM STEM degrees.

Phase V (Renewal) has only one year of degree data that already has an increase of 247 URM STEM bachelor degrees over the last year of Phase IV for a 26.9% yearly net gain. The data is representative of an increasing trend for Phase V.

Overall, the increases and decrease in URM STEM bachelor degree production have been cyclic and following the enrollment trend cycle. Due to changes in data collection efforts, the data is more representative in the latter phases than in the earlier phases. The CIP Code Crosswalk was updated in 2014-2015 and changed how some degrees were classified as the number of disciplines changed from nine (9) to eleven (11).



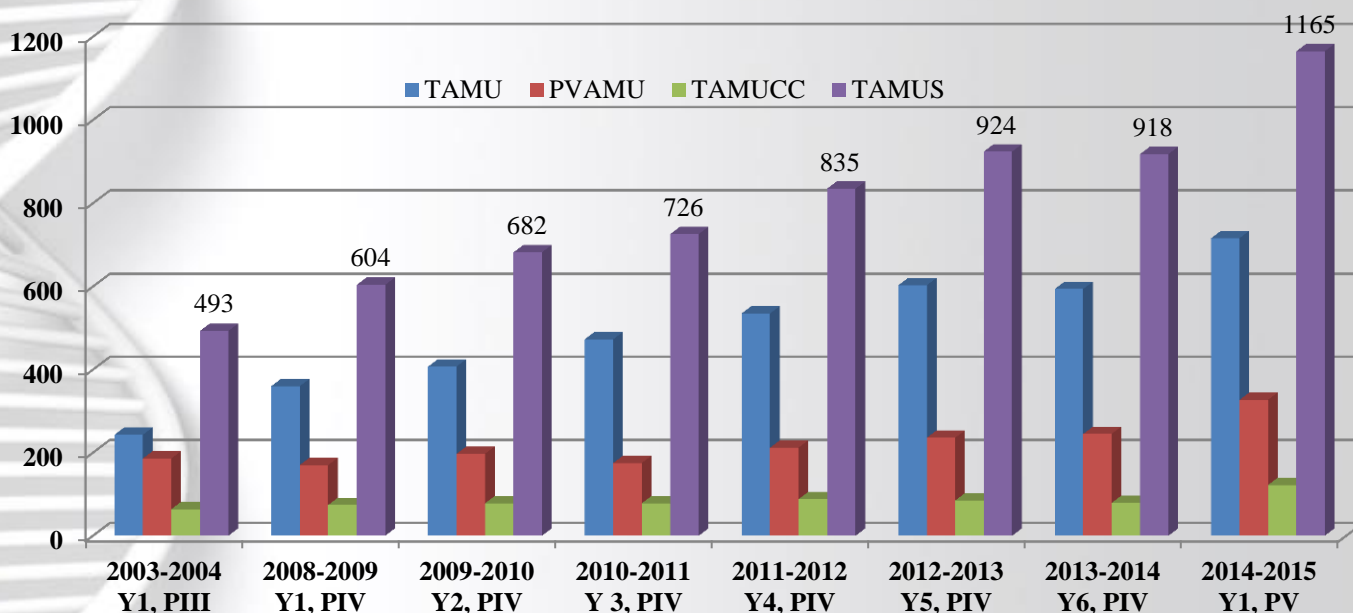


Figure 5. TAMUS LSAMP URM STEM BS Degrees for Year 1–Phase III, all years of Phase IV, and Year 1–Renewal (Phase V). Data source: TAMUS WebAMP (represents only U.S. Citizens and Permanent Residents)

To evaluate the impact of the mandated state policies, the 1996 Hopwood Decision and the 1997 “Top 10” law, the TAMUS LSAMP undertook a single-campus study of its program and program tactics and how they influenced degree production. The study focused on the TAMU campus and cohort years 1996-1998. Student cohort years 1996, 1997 and 1998 were selected in order to note changes in the effects of TAMUS LSAMP resulting from the impact of the state mandated policies. The exploration revealed that the state mandates had a strong negative effect upon TAMUS LSAMP enrollment and hence, degree production.

#### B. Level 1 LSAMP Participant Completion Rate

For the time period beginning with Phase I (1991-

1992) through the first year of Phase V (2014-2015), WebAMP data for TAMU reported 3,603 LSAMP URM STEM participants actively involved during the academic year. PVAMU reported 1,144 LSAMP URM STEM participants and TAMUCC reported 475 LSAMP URM STEM participants actively involved. A small portion of these participants were classified as Level 2s (attended conferences and meetings funded by LSAMP). The alliance total was 5,222 LSAMP URM STEM participants over 24 years (through Fall 2014).

Data collection for determining the baccalaureate degree completion has been accumulated by going back through records. Therefore, it has to be assumed that the majority of the participants were Level 1s in the prior years. With few exceptions, most former URM STEM LSAMP participants completed their degrees although less than ten changed their majors before being awarded the baccalaureate degree.



Since the Fall of 2011, TAMUCC has had 70 students join the LSAMP program at TAMUCC, and including the Fall 2015 semester, thirty-eight (38) students will have completed the program through graduation.

## V. Undergraduate Activities

### A. Academic Year and Summer Undergraduate Research (TAMU, PVAMU, TAMUCC)

Undergraduate research experiences translate science and engineering content into a real world context. Research indicates that undergraduate research experiences advance retention and academic attainment by improving self-direction (self-efficacy) for URM STEM students, and then, improving the quality of learning and hence persistence toward graduation. Also by engaging students earlier, students have multiple research experiences that increase in depth as they mature intellectually.

#### *Activities and Seminars*

#### **Skill Building Seminars** (TAMU, PVAMU, TAMUCC)

The undergraduate skill building seminars are designed to enhance academic development and leadership skill sets by providing TAMUS LSAMP students with a toolkit for success. Throughout the course of the academic year, students are exposed to an array of topics that include useful study skills, effective presentations, time management, graduate school preparation and mentorship. These sessions are facilitated by faculty and staff from both inside and outside of the respective institutions.

TAMUCC LSAMP joined the STEM Outreach, Access, and Retention (SOAR) program in sponsoring two Hispanic Heritage Month events, *Hispanics in Higher Ed: Inside Edition* and the *Hispanics in STEM Career Expo*.

PVAMU LSAMP has sponsored various programmatic seminars including *Fun Freshman Fridays*, *STEM Town*, town hall meetings, and engineering banquets.

#### **Undergraduate Research** (TAMU, PVAMU, TAMUCC)

The TAMUS LSAMP Undergraduate Research (UGR) Program promotes the opportunity for LSAMP students to enhance their academic and professional skills while conducting research during the main academic semesters. The program links undergraduate students with active and supportive faculty- researchers who mentor the students and provide them with opportunities to engage in research- related activities. In some cases, this opportunity is extended over a 10-week span during the summer. Deliverables throughout the duration of program includes research plans, progress reports, abstracts, final papers and poster presentations. TAMUS LSAMP supports students to present at the TAMUS LSAMP Symposium and other student conferences such as NSBE, SHPE, MAES Latinos in Science and Engineering, and SACNAS.

TAMUCC LSAMP has co-sponsored the annual Sigma Xi Undergraduate Research Symposium hosted by the TAMUCC Sigma Xi organization. TAMUCC LSAMP has also co-hosted the Science Innovation Undergraduate Poster Session and Panel event in Spring 2015 with the TAMUCC Chemistry Club of which many LSAMP students are members. Many TAMUCC LSAMP students showcased their research at this event.

#### **Teacher Preparation** (TAMU, PVAMU, TAMUCC, and six other TAMUS institutions)

The diversity and quality of teacher education programs in STEM underscores TAMUS LSAMPs commitment to meeting the needs of K-12 school districts, providing innovative pathways for working with students, and to further improving teaching education programs. As such, TAMUS



LSAMP proactively supports and assists URM STEM student's pursuit of professional K-12 teaching through seamless transitions to TAMUS teacher certification programs and participation in K-12 teacher preparation activities with in-service professionals. In addition to the formal teaching education programs, over the years TAMUS LSAMP has partnered with several outreach activities and projects related to specific school sites.

### ***The Texas Collaborative for Excellence in Teacher Preparation (TxCETP)***

The Texas Collaborative for Excellence in Teacher Preparation (TxCETP) was a Texas A&M University System partnership focused on critical issues facing math and science preparation and committed to statewide reform. NSF funded TxCEPT to address the critical issues of demographics, diversity, and integration within the statewide systemic reform environment. The goals of TxCETP included (1) course reform (integrating content, pedagogy, and classroom management); (2) recruitment to teaching; (3) support for pre-service and novice teachers (integrating early field experiences, student teaching, credentialing, induction/novice teacher support, math and science technical internships, and informal science experiences); and (4) strengthening systemic connections (Texas RSI, Texas SSI, Texas LSAMP).

### **Enrichment Experiences in Engineering (E<sup>3</sup>) Teacher Summer Research Program (TAMU)**

E3 is a NSF-funded Research Experience for Teachers (RET) Site program in the TAMU College of Engineering that offers Texas secondary school science and math teachers and pre-service teachers (base criteria is algebra or IPC teacher) a 4-week summer residential engineering research experience at TAMU. The E3 program provides the secondary science and mathematics teacher participants with the ability to introduce engineering concepts to their students, increase student awareness of engineering, and encourage students to consider an engineering career. The

overall mission of the E3 RET program is to excite, empower, and educate teachers about engineering so they in turn will excite, empower, and educate students they come in contact with each day about engineering.

The TAMUS LSAMP program has partnered with the E3 program in providing the E3 teachers opportunities to interact with LSAMP students to gain a better understanding of undergraduate engineering curriculum, and math and science knowledge and academic skills needed to persist in engineering.

### **Workshops at the TAMUS LSAMP Symposium (TAMU, PVAMU, TAMUCC)**

Alliance-wide workshops were held at the TAMUS LSAMP Symposiums on teacher certification. Targeting both the undergraduate and graduate level, these sessions addressed various topics regarding teacher certification. These included, but were not limited to, how to obtain teacher certification and the required training, encouragement and insight on the pursuit of professional K-12 STEM subject teaching, and tips for critically marketing and selecting teaching positions.

The TAMUS LSAMP Symposium, originally called the TAMUS LSAMP Mini-Symposium, was held in conjunction with the Texas A&M University System Pathways Research Symposium from 2004 to 2006. The events were conceived as joint activities in order to allow TAMUS LSAMP students the opportunity to make oral and/or poster presentations based on research conducted with their professors. In 2007, the TAMUS LSAMP Symposium was instituted as a single, stand-alone event immersed with skill building seminars, graduate school information and preparation sessions, and student research presentations. The goals of the TAMUS LSAMP Symposium is to (1) stimulate an interest in STEM research and graduate studies; (2) encourage interaction among the students alliance-wide; and (3) stimulate URM STEM interest in STEM teaching and in possible careers in research.



The symposium provides a forum for TAMUS LSAMP students to make oral presentations and/or participate in poster presentations based on faculty-guided research; allowing students to practice effective communication and presentation skills, goal setting, team building and networking. The exercise is aimed at enhancing retention, enabling transition to graduate school, and enhancing the graduate experience by contributing to the confidence and self-assurance of students.

## **B. Recruitment to Graduate School**

**Academic year research – UGR (Undergraduate Research)** The TAMUS LSAMP Undergraduate Research (UGR) Program promotes the opportunity for LSAMP students to enhance their academic and professional skills while conducting research during the main academic semesters. The program links undergraduate students with active and supportive faculty-researchers who mentor the students and provide them with opportunities to engage in research-related activities. In addition to the research activities, UGR students attend professional development seminars motivating and preparing them for graduate school. After graduation, many UGR participants continue on to graduate and/or professional school. In the Spring 2014 and 2015 semesters, TAMU had 12 UGR participants program who graduated. Six (6) UGR alums pursued either a MS or PhD, four (4) alums were accepted and admitted into medical school, one (1) graduate began work as a university laboratory researcher, and one (1) graduate has matriculated to dental school.

### **REU (Research Experience for Undergraduate, usually held in the summer)**

During Summer 2011, PVAMU had seven (7) students participating in REUs on the campus. The purpose of the Summer REU program was to involve recently admitted community college transfer students interested in research and pursuing graduate studies in research projects with a faculty member at Prairie View

Summer 2013 had one TAMUCC STEM student participating in the MIT Summer Research Program which promotes the value of graduate education, to improve the research enterprise through increased diversity, and to prepare and recruit the best and brightest to eventually enter graduate school at MIT. Students have the opportunity to conduct research alongside an MIT faculty member and postdoctoral fellow, a weekly stipend, travel expenses covered, and a poster presentation at the end of the program. The program was designed as an institutional effort to address the issue of underrepresentation of African Americans, Mexican Americans, Native Americans, and Puerto Ricans in engineering and science. TAMUCC Level 1 student, Marco Messina, participated in research titled “Synthesis of Cyclic Polymers by a Novel UV Initiated Ring Expansion Polymerization.”

During Summer 2014 TAMUCC had another STEM student participating in the Louisiana Alliance for Simulation-Guided Materials Application (LA-SIGMA) which is a 7-member alliance of universities across Louisiana. LA-SIGMA is comprised of numerous REU projects for the students to become familiar with interdisciplinary research and have the opportunity to work on cutting edge research in material sciences and computational tools. Only 5 students are selected to attend at each LA-SIGMA campus and they each receive a stipend of \$4,500, free housing in university dorms, and up to \$400 in travel expenses to and from their REU site. LA-SIGMA students learn how to use the most current cyberinfrastructure tools with individually designed training sessions targeted to their specific degree of preparation. REU students are also exposed to the ins and outs of international collaborations. Mariela Vazquez had the opportunity to work on this project with LA-SIGMA, which helped her with her research project at TAMUCC. She was able to present her research during a poster presentation at Tulane University and gained more experience in that area, as well.



## Undergraduate Summer Research Grant (USRG)

Each summer, the Dwight Look College of Engineering (DLCOE) at TAMU sponsors the USRG program. The purpose of USRG is to involve outstanding students who have completed their sophomore year and are interested in learning about undergraduate research and graduate school. Participants are paired with current research faculty and are expected to make contributions to ongoing research projects. Through this opportunity, students are provided with research experience and skills and faculty mentorship. TAMU LSAMP partners with the DLCOE to expose and promote the LSAMP BD program to USRG participants. We have also partnered by funding participants from TAMUS LSAMP institutions.

## GIG (Graduate Interest Group) Program

The Graduate Interest Group (GIG) is a new initiative through TAMU LSAMP to encourage URM students to pursue graduate school in STEM fields. The program partners with student organizations on campus that reach out to URM STEM populations. GIG offers incentives to participants for attending and hosting events on campus related to graduate school. The goal is to provide students with accurate information about graduate school to make it a viable option after graduation. Fall 2015 GIG activities included the TAMU GEM GRAD Lab Event and the following workshops and webinars: *Funding Your Graduate Education*, *Graduate School Applications*, *Finding and Applying to Summer Research Programs*, and *Finding a Sciences Internship Student Panel*. The workshops were sponsored by the TAMU Career Center, and the webinars were archived on the Institute for Broadening Participation website.

## GEM GRAD Lab Event

GEM stands for the National GEM Consortium, formerly, the National Consortium for Graduate Degrees for Minorities in Engineering and Science.

GRAD Lab, or Getting Ready for Advanced Degrees Lab, is a comprehensive, hands-on symposium designed to excite and encourage promising undergraduate and community college engineering and science students to consider master's and PhD technical research programs. TAMUS LSAMP has hosted two GRAD Labs. Texas A&M University-Corpus Christi hosted the first GEM GRAD Lab in conjunction with the 2012 TAMUS LSAMP Symposium. Texas A&M University hosted the second GEM GRAD Lab Event on Friday and Saturday, September 25 – 26, 2015, with Prairie View A&M University and Rice University as co-sponsors.



Dr. Howard G. Adams speaks to TAMU GEM GRAD Lab participants

The TAMU GRAD Lab was a fun and engaging symposium where science and engineering undergraduate participants received information on the importance of graduate school and what is needed to successfully gain admittance with financial support. GRAD Lab encouraged young people to consider graduate engineering or science education, and to apply for the GEM fellowship. Industry and academic professionals and current graduate students were invited as speakers and panelists to share their career, graduate school, and GEM experiences with the undergraduate student participants. Texas A&M hosted 77 students in total from the following universities: Prairie View A&M University (18), Rice University (9), Texas A&M



International University (13), Texas A&M University (16), Texas A&M University – San Antonio (1), Texas A&M University – Galveston (2), Texas Southern University (1), University of Texas at Austin (7), Trinity University (2), University of Houston (2), University of Houston Downtown (2), and University of North Texas (4).

## VI. International Engagement (Study Abroad)

### International Engagement (Study Abroad) (TAMU, PVAMU, TAMUCC)

Science and engineering research is increasing globally. Advanced global telecommunication networks are making it possible to have virtual global working teams. To assist our students in enhancing their technical skills and capabilities, in addition to exposure to working with people of other cultures, students participate in international research and study experiences.

In 2008, TAMUCC LSAMP participant, Adriana Leiva, participated in an international research experience in Mexico. Adriana's research investigated strategies to save a critically endangered species of marine mammal, vaquita, from extinction caused by anthropogenic effects. This experience led to her return to Mexico in Summer 2009, for a 28-day mission aboard the R/V Atlantis for the first systematic exploration of waters deeper than 1000 meters in the Gulf.

In Summer 2009, two TAMU LSAMP students participated in the NSF LSAMP Center for International Undergraduate Research (LSAMP-INT) program. This program provided awards for LSAMP students with significant previous research experience to participate in research in a variety of renowned laboratories around the world. TAMU LSAMP students Justin Wilkerson (Aerospace Engineering) and Alvaro Rodriguez (Biology), studied in Brazil and Europe, respectively. Today, both students are actively enrolled in doctoral programs.

TAMUS LSAMP encourages LSAMP students to participate in study abroad experiences to expose students to an in-depth experience with another language, culture, history, government, and economy and have field trips to sites that would involve direct interaction with professionals. Students have an option to stay in host homes or an apartment/hotel. Students have direct interaction with students and TAMUS faculty not only in a social setting, but in the classrooms as well. TAMUS LSAMP students have participated in international study locations including Brazil, France, Mexico, Spain, Asia, Costa Rica, Europe and Japan.

During Summer 2011 there were two PVAMU LSAMP students participating in a Spanish language and culture program in Barcelona, Spain. This experience provided insight into the language and cultural traditions of the country. TAMU LSAMP supported a total of five participants to study in three different countries during the same time period. Two participants went to Spain, two to Brazil, and one to Mexico to do research in STEM fields.

Summer 2012 saw eight TAMU LSAMP students traveling out of country to do research. Four students went to Spain, one to Brazil, one to Dominica, one to Belgium, and one to study in both Mexico and Panama.

The study abroad program during Summer 2013 sent three PVAMU LSAMP students from the College of Engineering to China to be exposed to experiences internationally that add to their overall experience as undergraduates. Students were enrolled in an elementary Chinese class as well as a mechatronics course where they conducted experiments and research projects as a part of their graded activities. The trip emphasized the importance of study abroad programs as a part of the undergraduate experience and provided students with a greater understanding and appreciation of working, studying, and living outside of the United States.



Study Abroad Summer 2014 took place in Cusco, Peru was requested by UGR student Javier Santiago and was approved by the TAMU LSAMP office during the Spring 2014 semester. The goal of this program was to provide and expose Javier to medical experience before he begins medical school in the Fall 2014 semester. From Javier's reflection, he found the two-week experience eye-opening. He saw firsthand the medical roadblocks and hurdles associated with living in an improvised third-world country. He also indicated that he would like to return to Cusco or areas similar in the future so that he can make an impact as a medical professional.

PVAMU also sent six LSAMP students to the University of Jinan in China for their study abroad experience. This was designed for students in the College of Engineering to be exposed to experiences internationally that add to their overall experience as undergraduates. Students were enrolled in an elementary Chinese class as well as a mechatronics course where they conducted experiments and research projects as a part of their graded activities. The trip emphasized the importance of study abroad programs as a part of the undergraduate experience and provided students with a greater understanding and appreciation of working, studying, and living outside of the United States.

Study Abroad with the PVAMU College of Engineering in China during Summer 2015 included five PVAMU URM participants. The participants enhanced the University's international presence and engagement through leadership, support, and development of activities and exchanges that create a deeper global awareness among students, faculty, staff, and other stakeholders. They performed research in the engineering fields. The 5 students participating in the experience were DeMarcus Pierre, Victoria Livingston, Victoria Cummins, Scott Rossel, and Kayla Robinson.

TAMU LSAMP funded 15 Dwight Look College of Engineering (DLCOE) First Generation Undergraduate Engineering Regents' Scholars to

engage in the Engineering Learning Community Introduction to Research (ELCIR) program during a two-week trip to Merida, Yucatan. The project began in March with a series of orientations prior to the trip. The orientations prepared the students for the trip. While in the Yucatan the students were partnered with faculty research mentors at the University of ANAHUAC in Merida, Yucatan. The students ended the program in Fall 2015 with a Global Experience and Introduction to Research and Online Community to complete the research project conducted while in the Yucatan. Students presented their research project proposals at an ELCIR poster session.



ELCIR students present their research at a poster session



Dr. M. Katherine Banks, Dean of the DLCOE, has strongly recommended that the ELCIR program be a 1-hour credit class. This will impact the program in



ELCIR students in Merida, Yucatan, Mexico

two instances. First, it will allow DLCOE to count those students going abroad towards national rankings. Second, the course will be integrated into the curriculum so students may use it on their degree plans.

## VII. Community College Efforts

### A. Effective interfaces with Community Colleges (TAMU, PVAMU, TAMUCC)

Transfer Day, initiated by TAMUS LSAMP, identified two areas as being necessary for success of transfer students, cultural articulation and course

articulation. Cultural articulation refers to a “transfer-receptive culture,” which includes the establishment of an institutional voice for transfer students. For instance, orientation programs that parallel those provided for freshmen that address issues such as a lack of adequate transfer information or the financial aid process. Course articulation guarantees that certain courses can be transferred from one institution to another, saving students and programs time and money by eliminating the need to repeat courses and decreasing time to graduation. These models have been instituted at TAMU, PVAMU and TAMUCC.

### B. Community College Outreach

A great number of URM students begin post-secondary studies at community colleges, and their access to the baccalaureate largely depends on successful transfer experiences. TAMUS LSAMP has worked to enhance that experience through integrated interactions with community colleges. A few of the community college outreach activities include:

**Community College STEM Conferences (TAMUCC and TAMU)** - LSAMP at TAMUCC hosted South Texas Community College students and representatives, providing them an opportunity to learn about careers in STEM fields at TAMUCC. During the conference, students participated in networking activities while attending meetings and workshops pertaining to careers in STEM

The TAMUCC LSAMP Program Coordinator, along with a STEM Outreach, Access, and Retention (SOAR) program representative, traveled to several different community colleges throughout the south Texas region for recruiting efforts. Various programs from the TAMUCC College of Science & Engineering were promoted including LSAMP.

LSAMP at TAMU hosted community college students interested in STEM majors at TAMU and community college representatives interested in building relationships for their students to transfer



into STEM majors at TAMU. The STEM Conference program included resource roundtables for students and one-on-one sessions with faculty and staff for representatives.

**Summer undergraduate research (TAMUCC)** - Del Mar Community College students interested in ongoing research in physiology/biochemistry/molecular biology are identified and matched with faculty mentors at TAMUCC. The students share their research at the end of the summer and again at the TAMUS LSAMP Symposium. Past evidence of this collaboration has resulted in a 100% transfer rate into TAMUCC.

**Summer Research Experience for Undergraduates (REU) (PVAMU)** - LSAMP at PVAMU hosted a summer research experience for recently admitted community college transfer students interested in research and graduate studies in STEM fields. Student participants worked closely with faculty members from the Roy G. Perry College of Engineering and the Marvin and June Brailsford College of Arts & Sciences on cutting edge research projects, participated in skill building seminars to ease the transition from a 2- year to a 4- year institution, and delivered formal presentations on their research at the end of the 10-week program. Students also earn one research credit hour for participating in the REU at no cost to the participant. The goal of this program is to provide students an opportunity to learn more about the research activities at PVAMU, introduce them to the LSAMP program, as well as graduate school opportunities at PVAMU and other universities.

While there are existing articulation agreements at each primary TAMUS LSAMP institution, there is continued development or refining of those agreements to ensure seamless transfer of URM community college students to STEM majors at TAMUS LSAMP institutions. A student's chances of successfully transferring are greatly improved when community colleges and four-year institutions work together to ensure the majority of credits earned at the community college count towards

their degree. Students thereby benefit by completing their coursework sooner, and having more financial and career options.

In an effort to further enhance the transfer process, TAMUCC and PVAMU have adopted the Texas Higher Education Coordinating Board's Mechanical Engineering Transfer Compact. This voluntary agreement among institutions of higher education in Texas is to ease the transfer processes for students pursuing bachelor's degrees in Mechanical Engineering, and to increase the number and preparedness of students matriculating from two-year Mechanical Pre-Engineering programs at community colleges into baccalaureate Mechanical Engineering programs.

### Highlight LSAMP and BD Student Profile: Natividad Robert Fuentes

*"My participation in the Texas A&M University System Louis Stokes Alliance for Minority Participation (LSAMP) has played a fundamental role in where I am today.*

*I cannot stress enough that the person I was when I began my undergraduate career is not the person I am now. My first two years of undergraduate education, at a four-year institution, Texas A&M University-Corpus Christi (TAMUCC), resulted in a 2.0 GPA and academic suspension. The sad truth is that is where the story ends for most students with my background. Unfortunately, I was not prepared or aware of the challenges of higher education. I was the product of a minority environment with only an expectation that I secure a moderately paying job at the refineries like those around me. However, I refused to let my fate be dictated by the niche I resided in. I sensed my potential to do more with my life, but I had no idea how to get where I needed to be or where that even was. It was a very strange feeling, to know that you want more but have no idea how to get there. I left school for a semester*



then began taking a few classes at Del Mar Community College, while working full time.

The transition to who I am now began when my genetics professor convinced me to participate in a summer research program, South Texas Educational Liaison of Laboratories for Agricultural Research (STELLAR) at TAMUCC. It was not an easy decision for me because although it was a funded opportunity, it required me to forego work during the summer. This was the time of year that I produced most of my income. Somewhere in another universe an exact copy of myself didn't invest in himself, but fortunately for me I participated in STELLAR and set in motion events that would lead me to where I am today. It was just a sequence of A's, T's, G's, and C's -- that's all the genetic code was. Yet the moment I read the sequence aloud, I felt like I had accomplished something great. I completely understood that my sequencing of this one tiny seagrass gene was not going to create the next big cure for cancer, but what it did was provide the spark that ignited the passion for science that still burns strong inside me. LSAMP kept feeding this fire.

LSAMP provided me resources to continue performing undergraduate research after I re-enrolled at TAMUCC. It was not only the funding that LSAMP provided, but it was actually the opportunities and the educational resources that made such an impact on me.

LSAMP allowed me to meet the mentors that have contributed so much to who I am today. Those mentors are composed of professors, graduate students, and program administrators.

I did my best to apply the lessons LSAMP emphasized in our meetings and workshops. One of the items stressed was to pursue other summer research opportunities at other universities. LSAMP supplied me with information (and possibly funding) to attend a Society for Advancement of Chicanos/Hispanics and Native Americans in

Science (SACNAS) conference. While at the SACNAS conference, I applied the advice I learned through LSAMP and did my best to explore information about summer internships and to network with people. Through networking, I met the program advisor who helped me receive a research experience for undergraduates (REU) opportunity at the Boyce Thompson Institute for Plant Research at Cornell University.

As the time to finish my undergraduate degree approached, LSAMP helped me focus on the next step -- graduate school. **Before LSAMP, I had absolutely no idea about graduate school, what it was or even the process required to apply.** I have always wanted to be a scientist; however, I had no idea what the process was to obtain that goal. Participation in LSAMP provided me the knowledge and experience I needed to get in to graduate school. LSAMP even equipped me with resources to help better prepare for the graduate record examination (GRE), such as a GRE preparatory course. I successfully applied to graduate school at Texas A&M University (TAMU).

I'm so grateful for my opportunity to participate in LSAMP's Bridge to the Doctorate (BD) program. This program helped me succeed not only by providing funding, but even more critically, by providing guidance in the form of workshops and seminars that address issues and problems that graduate students may face.

What is so amazing is that I can see the cycle coming full circle. Just as a graduate student once taught me technical laboratory skills and prepared me for the critical thinking and tough skin required to perform research, I now do the same with the undergraduates I mentor. I do my best to instill in them the same passion for research that I have. In fact, two of the students I mentor received the NSF-LSAMP Seeding Undergraduate Student Research scholarship from the College of Agriculture and Life Sciences, as well as the Nutrition and Food Science Undergraduate Research Scholarship, and are



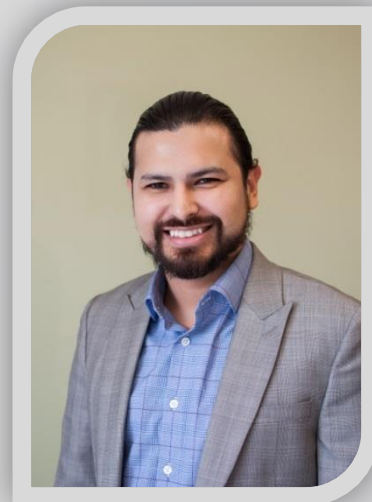
participants in the LAUNCH Undergraduate Research Scholars program here at TAMU.

*The BD program required us to apply to two fellowships. My first attempt was the Ruth L. Kirschstein National Research Service Award (NRSA) Individual Predoctoral Fellowship to Promote Diversity in Health-Related Research (Parent F31 – Diversity). I was not awarded the fellowship, but I used the comments to help me improve my application materials. BD provided seminars that gave useful tips on how to improve the writing and structure of our applications. My second attempt at a fellowship was successful. I received the Pharmaceutical Research and Manufacturers of America (PhRMA) Foundation Pre Doctoral fellowship in Pharmacology/Toxicology.*

*“You have not because you know not”-Ashanti Johnson. I believe that this saying sums up one of the most important ways that LSAMP and BD impacts students. It may be surprising, but I believe that one of the most difficult barriers for underrepresented minorities to overcome is a basic lack of information about what they need to do to succeed. To others the steps involved in achieving higher education degrees are quite obvious because they have been told, by family members or others. However, this basic lack of knowledge is a significant barrier that often plagues underrepresented minorities. LSAMP and BD both provide this initial knowledge, which can make all the difference in helping a student obtain the degree they seek.”*

*Natividad Robert Fuentes  
National Science Foundation  
Bridge to the Doctorate Fellow*

## Natividad Robert Fuentes



### VIII. Post-baccalaureate Activities

#### A. Bridge to the Doctorate

The Bridge to the Doctorate program provides TAMUS LSAMP has been the recipient of 11 LSAMP Bridge to the Doctorate (BD) awards. With the exception of cohort III held at PVAMU, all BD cohorts have been on the TAMU campus.

Since its inception in 2003, the TAMUS LSAMP BD program has attracted 132 BD fellows from 52 institutions, majoring in 45 STEM disciplines. BD couples degree program learning and its complementary research with enhanced support strategies to successfully bridge students to and through completion of PhDs; preparing them to take their place as leaders in research and in academia. BD support strategies are designed to help students develop skills needed to succeed in their courses, learn from participation in research activities, develop good research proposals, provided excellent leadership and mentoring for undergraduate URM STEM students, establish collegial networks, plan for doctoral studies, and apply for NSF Graduate Research Fellowship Program (GRFP) and other national graduate fellowships.



Table 1. TAMUS LSAMP BD Matriculation

Cohort # and Years	# in Cohort	# Matriculating to PhD after BD program completion	# Completed MS	Still Matriculating (MS or PhD)	# Completed PhD
I - 2003-2005	10 -E	10 (100%)	10	-	10 (100%)
II - 2004-2006	4-E 9-S	4 (33.3%)	12	-	3 (23.1%)
III - 2005-2007	10-E 2-S	2 (16.7%)	11	2 (16.7%)	0
IV - 2006-2008	11-E 1-S	7 (58%)	11	2 (16.7%)	5 (41.7%) <sup>Y</sup>
V - 2008-2010	2-E 11-S	10 (83.3%)	1	2 (15.4%)	8 (61.5%)
VI - 2010-2012	4-E 4-S 4-A	8 (66.7%)	7	7 (58.3%)	1 (8.3%)
<i>Sub-Totals<sup>1</sup></i>	72	41 (56.9%)	52 (72.2%)	13 (18.1%)	27 (37.5%)
VII - 2011- 2013	4-E 5-S 3-A	7	5 <sup>Z</sup>	8 <sup>Z</sup>	-
VIII - 2013-2014	4-E 6-S 2-A	10	2	11	-
IX - 2013-2015	1-G 3-A 5-S 3-E	-	-	12	-
X - 2014-2016	2-S 5-E 5-A	-	-	12	-
XI - 2015-2017	2-S 7-E 2-A 1-G	-	-	12	-
<i>Total</i>	132	58	59	68	27

**LEGEND:** E – Engineering, S – Science, A – Agriculture and Life Sciences, G – Geosciences

**NOTE:** BD Cohorts I, II, and IV-XI were hosted at Texas A&M University, and BD Cohort III was hosted at Prairie View A&M University.

**Footnotes:**

**1** – Cohorts sub-totaled have had the minimum amount of time (at least four years) to complete a PhD

**Y** – One BD Fellow included in this number completed a PhD in Education with a concentration in Mathematics after completing a master's degree in Industrial Engineering

**Z** – One BD Fellow included in this number switched from Chemistry and completed a master's program in Education with a concentration in Science Instruction and Curriculum and is in progress of obtaining a PhD in Education with a concentration in Science Instruction and Curriculum



Table 1 shows data on the matriculation of TAMUS LSAMP BD fellows to the PhD. Texas A&M University hosted the first TAMUS LSAMP BD cohort, from 2003-2005, which consisted of 10 students and 100% matriculation to the PhD. One hundred percent of BD Cohort I Fellows completed PhDs. Cohort II had a 33% matriculation rate to the PhD, of which all three have completed their PhD. Of the 12 BD Cohort III Fellows, hosted at Prairie View A&M University, two are actively pursuing doctoral degrees and eleven have completed master's programs. Five Cohort IV Fellows have completed their PhD, and two are actively pursuing their PhD. Ten out of twelve Cohort V Fellows, Fall 2008, matriculated into PhD programs, with one fast-tracked PhD completion. There are eight (8) Cohort V Fellows who have completed their PhD to date. Many students in the TAMU BD cohorts beginning in 2011 or later are still working toward their first graduate degrees. Five (5) students from the BD Cohort VII have obtained master's degrees, as of September 2015. Another eight (8) students from Cohort VII are continuing progress towards their degrees. All students from Cohorts IX, X, and XI are listed as "Still Matriculating (MS or PhD)" since it is uncertain if they will get both the master's and the doctoral degrees.

### Activities

Support and development activities for the BD program range from individualized mentoring and academic advising to leadership skill improvement, all shown to assist in the elimination of barriers to graduate student success. Through collaborations with the TAMU Office of Graduate and Professional Studies (OGAPS), graduate development activities and events are offered to the fellows. For example, one series of hosted seminars covers graduate school

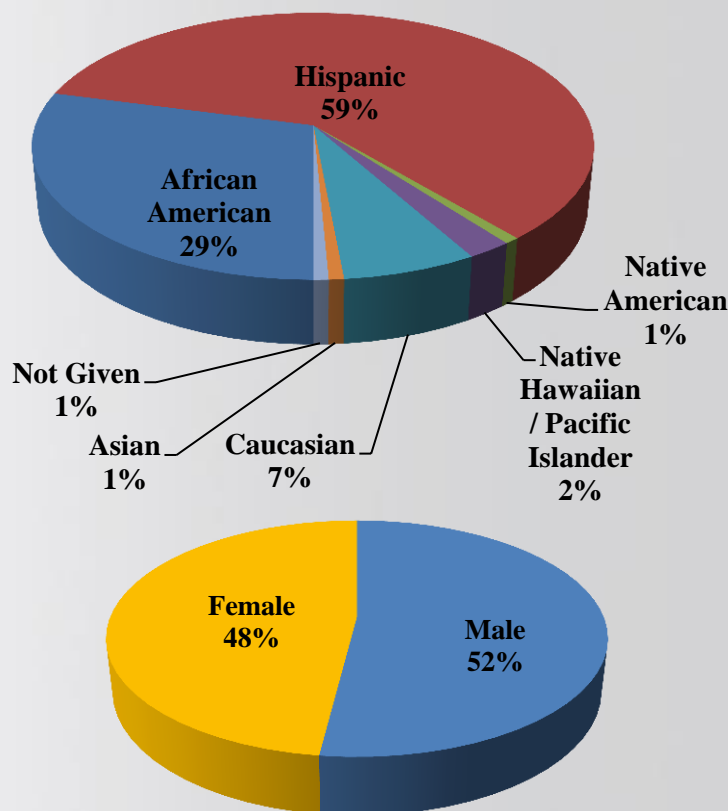


Figure 6. Ethnicity and Gender Demographics for BD Cohorts I-XI

basics. The seminars provide fellows an opportunity to discuss and gain understanding in graduate school terminology, graduate program survival and other issues critical to success in graduate studies and research. Faculty panels and specialized support centers bring about different perspectives on topics found very helpful, in previous cohorts, in adjusting to graduate life. Samplings of the seminars include: *Success in Graduate School*, *BD Panel: What I Wish I Knew*, *Tips for Writing your Thesis or Dissertation*, *Working Smarter, Not Harder*, and *Best Practices in Preparing for and Delivering a Presentation*.

### National Fellowship Application Preparation

BD Fellows are required to prepare and submit an application for the NSF GRFP or another national fellowship relevant to their field. Sessions, led by faculty members, staff, and students, who have served as NSF reviewers, NSF Fellows or have



extensive expertise in the development of fellowship applications, are held to guide each fellow in the development of a competitive application. For example, in Fall 2008 and Fall 2009, a three-part series on “How to Create a Successful PhD Fellowship Application” was conducted for the BD IV and V fellows. Part one consisted of a lecture highlighting the components of a successful application. During part two of the series, students provided the session lead with their fellowship application and scheduled one-on-one appointments for review. During the third session, the follow-up, trends and best practices were discussed and followed up with a final revision of their fellowship applications. The fellowship series continued for all following BD Cohorts. These strategies have resulted in BD fellows receiving six (6) NSF GRFP fellowships, two (2) NSF GRFP, Honorable Mention awards, two (2) GEM fellowships, two (2) NSF Extreme Science and Engineering Discovery Environment (XSEDE) Scholar designations, one (1) Ford Foundation Predoctoral fellowship, and one (1) Ford Foundation Predoctoral fellowship, Honorable Mention. Out of the twenty-seven completed PhDs, 26% are employed in academia.

## B. Funding beyond the BD

Table 2 summarizes national fellowship awards and other recognition received by TAMUS BD Fellows. Funding levels vary for the fellowships. Current NSF GRFP Fellows receive \$32,000 per year for up to 3 years of graduate support.

**Table 2: List of national fellowship awards and recognition for TAMUS BD Fellows**

Cohort/Student	Fellowship/Recognition (Year Awarded)
BD IV (2006-08)	
Maya Johnson	NSF IGERT (2008)
BD V (2008-10)	
Kevin Gagnon	NSF GRF HM (2009); NSF GRF (2010)
Tanya Garcia	GEM Fellowship (2010); FF, HM (2010)
Casie Hilliard	NSF GRF (2009)
Michelle Myers	FF Predoctoral Fellowship, HM (2010)
BD VI (2010-12)	
Joel Barrera	NDSEG Fellowship (2012)
Adolfo Escobedo	NSF XSEDE Scholar (2012,2014)
Rolando Olivares	Diversity Fellowship (2010)
Zaria Torres	Alfred P. Sloan Minority PhD Scholar (2010); HLAE Fellow (2012)
Erin Vehstedt	NSF XSEDE Scholar (2011, 2012)
BD VII (2011-13)	
Alton Burns	Diversity Fellowship (2011)
Zuri Dale	HLAE Fellow (2013)
Spencer Hawkins	NASA Harriett G. Jenkins Graduate Fellow (2014)
BD VIII (2013-14)	
Francisco Birk	Diversity Fellowship (2013)
Ryan Brito	NSF GRF (2015); Diversity Fellowship (2013)
Natividad Fuentes	Pharmaceutical Research and Manufacturers of America Fellowship (2015)
Francisco Gomez	FF Predoctoral Fellowship, HM (2015)
Wilmarie Marrero-Ortiz	NSF GRF (2014); Diversity Fellowship (2013)
Lindsay Nail	NSF GRF (2014)
Andrew Ochoa	Diversity Fellowship (2013)
Sergio Waqued	Diversity Fellowship (2013)
BD IX (2013-15)	
Andrea Delgado	NSF GRF (2015); GEM Fellowship (2013)
Manuel Salgado	Diversity Fellowship (2013)
Michael Whitely	NSF GRF, HM (2015)
BD X (2014-16)	
Stacy Cereceres	Diversity Fellowship (2014)
David Chimene	Diversity Fellowship (2014)
Romina Del Bosque	Diversity Fellowship (2014)
Cordero Magana	Diversity Fellowship (2014)
Adam Orendain	Diversity Fellowship (2014)
BD XI (2015-17)	
Mariela Vazquez	Diversity Fellowship (2015)

HM = Honorable Mention; IGERT = Integrative Graduate Education and Research Traineeship; GRF= Graduate Fellowship; NDSEG = National Defense Science and Engineering Graduate; XSEDE = Extreme Science and Engineering Discovery Environment; HLAE = Hispanic Leaders in Agriculture and the Environment; FF = Ford Foundation



## IX. Institutionalization of Best Practices

### A. Scholarships and Learning Communities

**Regent's Scholars and Century Scholars Programs (TAMU)** – In the 1990's, TAMU LSAMP developed programs which showed that learning communities and scholarships can effectively lead to retention of URM STEM students to graduation. Based on the successful programs piloted by TAMU LSAMP, the Regent's Scholars and the Century Scholars programs arose at TAMU.

The Regents' Scholars Program was TAMU's response to the implications of Hopwood and the "Top 10" law, which prohibited incentives based upon racial or ethnic selection. In an effort to increase the number of URM students, the Regent's Scholars Program was formed in 2003 to assist students who will become the first in their families to obtain college degrees. Almost 2,000 Regents' scholars are currently pursuing their college dreams at TAMU, and the program has an 88% two-year retention rate. In addition to financial support, the program provides them with the academic and social assistance vital to the success of a first-generation college student. Regents' Scholars live on campus their freshmen year and participate in a learning community.

The Century Scholars Program (CSP) is a partnership between TAMU and 108 high schools throughout the state of Texas. Established during the 1999-2000 academic year, the Century Scholars Program is an academic scholarship and retention program seeking to increase the number of enrolled and retained students from majority under-represented Texas high schools. The program serves as a four-year learning community where students are prepared for the rigors of academic and professional arenas.

Table 3: Century and Regents' Scholars Program Numbers

	Century*	Regents'**
Total Scholars Matriculated at TAMU	1220	7933
URM Scholars Matriculated at TAMU	949	5631
URM Scholars Matriculated in STEM fields	406	2140
Total Scholars Graduated	481	3337
URM Scholars Graduated	330	2135
URM Scholars Graduated in STEM Fields	183	957

\*Century data is from 2000 to 2014

\*\*Regents' data is from 2003 to 2014

Source: TAMU Office of Scholarships and Financial Aid, December 2015.

### B. Peer Teaching (TAMU)

The TAMUS LSAMP supported a Peer Teacher pilot program which was introduced in specific sections of the first Freshmen Introductory Engineering Course at TAMU during the 2000-2001 academic year, for which LSAMP coordinators advised URM students to enroll. The characteristics of this pilot initiative thought to be successful, include the creation of small communities within classes and with the support of the faculty member; the familiarity of the peer instructor with the students, the faculty instructor, and with the class content; and the "critical mass" of URM students in targeted class sections. The program yielded positive academic outcomes for URM engineering students and enthusiastic reception from freshmen faculty. In 2001-2002 it was institutionalized and instituted across all sections of the first Freshmen Introductory Engineering Courses at TAMU.

### C. Supplemental Instruction (TAMU, PVAMU, TAMUCC)

Supplemental Instruction (SI) is an academic assistance program designed to improve students' academic performance and increase retention. The program is based on the principle that students improve their mastery of a subject through interaction and discussions of difficult principles with other students. The SI program, at the three



primary partner institutions, targets traditionally difficult core curriculum or high risk courses, and provides regularly scheduled, out-of-class, peer-facilitated group study sessions.

SI is focused instruction, outside of class tutoring, offered to students in the traditionally difficult core curriculum or high risk courses in mathematics, chemistry and physics. Offered at the three primary TAMUS LSAMP institutions, SI sessions are held by tutors (i.e., SI leaders) who participate in the class and then share their knowledge of the subject during outside sessions. SI is designed to improve academic performance by providing the opportunity to discuss important concepts, and develop strategies for studying the subject and practice prior to tests.

In order to meet degree production targets, TAMUS LSAMP has designed and implemented a comprehensive network of activities and services that have a positive impact on students and revolve around building an academically supportive URM student community in which retention and individual academic achievement are fostered. TAMUS LSAMP students are exposed to an array of enhanced development activities and services, a few of which include supplemental instruction, peer teaching, skill building seminars, undergraduate research opportunities, and international engagement.

#### **D. Honor Ceremony (TAMUCC)**

In 2011, the TAMUCC LSAMP PI had the idea to honor LSAMP undergraduate research students with gold research honor cords at a small ceremony prior to graduation. This event has grown so much over the years and now includes undergraduate research students throughout the College of Science and Engineering.

## **X. Economic Impact**

The resulting impact that TAMUS LSAMP has had on its students and region over the past 24 years is vast. The economic value of the TAMUS LSAMP institutions is evident in the production of over 14,000 high quality URM STEM bachelor degree graduates. TAMUS LSAMP students are competitive across the labor force, impacting both industry and academia and contributing directly to the economic development of Texas, the United States, and the world through employment, business activity, and capital construction.

A significant number of URM STEM students at TAMUS LSAMP institutions are first generation, emphasizing our role in building educational capacity in STEM and in making a difference in thousands of lives every day. Moreover, we note that by increasing the URM STEM workforce, we offer an important bridge to providing opportunity and equity to a growing URM STEM population. All of this combined, makes up the necessary building blocks of a democratic society.

### **TAMU**

The below economic impact information for Texas A&M University is taken from an economic impact survey created for Texas A&M University by Economic Modeling Specialists International (EMSI) in Summer 2014, using 2012-2013 data sets.

Texas A&M University improves higher education delivery throughout the state and helps students increase their employability and potential. By facilitating new research and entrepreneurship and drawing student and visitors to Texas, the university also generates new dollars and opportunities for the state.

In FY13, the \$2.5 billion in payroll and operations spending of TAMU, together with spending of its students, visitor's alumni and start up and spin off companies create \$7.8 Billion in added state income. This is equal to approximately 0.6% of the total



Gross State Product of Texas, and is equivalent to creating 120, 499 new jobs.

TAMU spent \$1.3 billion on payroll and benefits for 24,011 full-time and part-time employees, and spent another \$1.2 Billion on goods and services to carry out its day-to-day operations and research.

Texas as a whole will receive a present value of \$25.4 Billion in added state income over the course of the students' working lives.

**\$25.4 Billion**

Added State  
Income over  
Course of  
student's working  
life by TAMU

Communities will also benefit from \$2.5 Billion in present value social savings related to reduced crime, lower unemployment, and increased health and well-being across the state.

For every dollar that society spent on educations at TAMU during the FY13, Texas communities will receive a cumulative value of \$7.90 in benefits. Also, total NSF Research expenditure on Texas A&M in fiscal year 2013 amounts to \$820 Million.

Out of state students attending TAMU spent \$84.7 M in FY13. TAMU attracted out of state visitors which added \$48.4 M to location economy. TAMU alumni employed in Texas contribute \$5.5 B in added state income.

Table 4: Impact Created by TAMU in FY13

<b>Operating &amp; Payroll Spending Impact</b>
\$2.5 Billion
<b>Alumni Impact</b>
\$5.5 Billion
<b>NSF Research spending Impact</b>
\$820 Million

## PVAMU

The below economic impact information for Texas A&M University is taken from a published economic impact analysis in the following paper: *The Economic Impact of Prairie View A&M University on Waller County, the Houston-Baytown-Sugar Land MSA, and the state of Texas.*

Prairie View A&M University plays an important role in the social and economic life of the local economy. The University's short-term and long-term contributions extend throughout the local (Waller County), regional (Houston-Baytown-Sugar Land Metropolitan Statistical Area), and state (Texas) economy.

The total economic impact of PVAMU on the State of Texas is estimated at \$553.57 million annually, which includes \$267.74 million in direct impact, which in turn generates an additional \$285.84 million in secondary effects.

The total economic impact includes \$160.41 million in wages and salaries for faculty and staff, \$167.37 million in other institutional spending, \$135.43 million in spending by undergraduate students, \$65.95 million in spending by graduate students, and \$24.41 million in spending by visitors to the University.

The PVAMU operations support a total of 4,047 full-time jobs in the state of Texas. Of the total, 1,788 jobs are supported by faculty and staff wages and salaries, 912 jobs by other institutional spending, 784 jobs by undergraduate student spending, 412 jobs by



graduate student spending, and 152 jobs by visitor spending.

Based on gains in lifetime earning streams from a university degree, the University contributes \$1.15 billion to additional lifetime earnings of 2012 graduates who reside in Texas. Of this total, \$696.62 million is contributed to graduates with Bachelor's degrees, \$427.40 million to graduates with Master's degrees, and \$30.97 million to graduates with Doctorate degrees.

Table 5: Impact Created by PVAMU in FY12

<b>Operating &amp; Payroll Spending Impact</b>
\$327.7 Million
<b>Alumni Impact</b>
\$1.15 Billion

## TAMUCC

The below economic impact information for Texas A&M University – Corpus Christi is taken from *The Economic Impact of Texas A&M University-Corpus Christi on the Local Community, the Coastal Bend Region, and the State of Texas*.

Texas A&M University-Corpus Christi continues to play a vital role in the social and economic vitality of the South Texas region. With a steadily growing student body, the University has continued to improve its infrastructure and expand its capacity. Its contributions also extend throughout the state of Texas and the rest of the world.

For each dollar of state appropriated funds, Texas A&M University-Corpus Christi generates \$7 in economic activity across Texas communities.

The total benefit of Texas A&M University-Corpus Christi to the Texas economy is estimated at \$410 million annually. This includes \$181 million from University-related expenditures that is directly injected into the Texas economy, along with secondary effects equal to \$228.8 million. The total economic impact generates \$307 million in income among households in Texas.

Texas A&M University-Corpus Christi boosts employment in Texas by a total of 7,268 full-time-equivalent job positions. Excluding student workers, 3,681 Texas residents are directly employed through the University and another 3,587 jobs are created as a result of economic activity related to the University.

In addition to serving regional workforce needs, a degree from Texas A&M University-Corpus Christi produces a significant boost in its graduates' lifetime earnings. Based on the gains in earning streams from a university education, the University's contribution to additional lifetime earnings of Texas residents is estimated at \$1.4 billion annually.

Table 6: Impact Created by TAMUCC in FY12

<b>Operating &amp; Payroll Spending Impact</b>
\$159 Million
<b>Alumni Impact</b>
\$1.4 Billion
<b>Research spending Impact</b>
\$16 Million

## XI. Student Profiles

### VOICES OF TAMUS LSAMP STUDENTS

The accomplishments of the Texas A&M University System Louis Stokes Alliance for Minority Participation (TAMUS LSAMP), are best captured by the voices of the individuals touched by the many programs and activities funded or enhanced through TAMUS LSAMP efforts.

*"LSAMP has changed my perspective about graduate school. They contacted me when I was still in high school, and at that time, I thought there was no way that I would go to grad school. But through doing research and attending seminars, I have come to realize how important grad school is. I have decided that I want to get a graduate degree."*



*"It was very important for me to see first-hand potential problems that the United States may face in the future. Through LSAMP, I am more aware of my surroundings and that not everyone has the advantages that we have in the United States. I know that I want to be more involved in water projects, green projects. I want to be able to provide water to those people that do not have it."*

*"I was not sure if I wanted to go to grad school, and participating in this program helped me to decide to move on to the next level and get my Master's."*

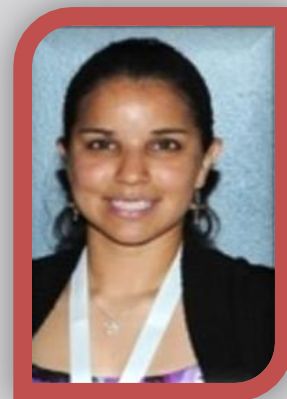
*"One of my favorite things about this program besides the research is how they help you get prepared to be successful in getting into graduate school. I already wanted to go to graduate school, but being in LSAMP is making it easier for that to happen. Having LSAMP on my resume allows me to find other opportunities. Having one opportunity just leads to more opportunities, and these opportunities just keep building on each other which make the possibility of graduate school easier to achieve."*

*"I feel better about doing research when surrounded by other students doing research. A lot of the Electrical Engineering majors want to get out of school and make money. It would be more difficult for me if I didn't get with LSAMP students each month. I might begin to question my decision to get my Master's degree if I didn't have my LSAMP peers."*

*"In engineering you have to take a number of classes that you really don't want to take and study things that you cannot connect, that you don't understand the use of. But doing research has helped me to see where I need to use the things I learn. Getting this hands-on experience in my major compared to just reading the books and being in class has really been great."*

## Student Profiles

**Rebecca Pizano** (TAMUCC) – Rebecca is a recent Biology graduate of Texas A&M University – Corpus Christi. As a two year undergraduate research participant in TAMUCC LSAMP, Rebecca was motivated to pursue a graduate degree. Exposed to the Bridge to Doctorate program at the 2011 TAMUS LSAMP Symposium, Rebecca vividly recalls Dr. Karen Butler-Purry's session where she discussed benefits of the BD program, specifically the "guidance fellows receive while undergoing the journey to graduate school." Rebecca is a recipient of the 2011 Bridge to Doctorate (BD) fellowship, majoring in Wildlife and Fisheries Science at Texas A&M University.



**Yushica Walker** (PVAMU) – Yushica earned a bachelor's degree in Interdisciplinary Studies with a reading specialization in 1996 from Prairie View A&M University. A Houston native, Yushica, has been teaching for more than 14 years, and currently teaches science at El Paso's Morehead Middle School. In 2009, Yushica was named the Texas Teacher of the Year in the secondary division, making her one of only three secondary school finalists to vie for the state competition.



**Alvaro Rodriguez**

(TAMU) – Alvaro graduated in Spring 2011 with a BS in Molecular and Cellular Biology from Texas A&M University. As a result of his undergraduate research participation, Alvaro was selected to perform 8 months of research at the University of Strasbourg in France. Alvaro graduated from the University of Texas-Austin in 2014 with a master's degree in Microbiology.

**The TAMUS BD PhDs**

**Dr. LaToya Anderson** is currently the Mathematics Department Chair at Fort Bend ISD. She received her Bachelor of Science from the Texas A&M University in Applied Math Sciences. She then went on to receive her Master of Science in Industrial Engineering, and PhD in Education and Human Development from Texas A&M University.



**Dr. Joel Barrera** is currently employed with Apple, Inc. After completing the BD program, he was awarded the National Defense Science and Engineering Graduate Fellowship (NDSEG), the Texas A&M Diversity Fellowship, and the Texas A&M Graduate Merit Fellowship. He has published two IEEE transactions articles titled, "Analysis of a Variable SIW Resonator Enabled by Dielectric Material Perturbations and Applications" and "A Fluidic Loading Mechanism in a Polarization Reconfigurable Antenna with a Comparison to Solid-State Approaches." Since receiving his Bachelor of Science, Master of Science, and PhD in Electrical Engineering from Texas A&M University, he has worked at Apple Inc., in Cupertino, CA, as an antenna designer for new upcoming products.



**Dr. Erica Bruce** (TAMU) – Dr. Erica Bruce is an Assistant Professor in the Department of Environmental Science at Baylor University. She received her bachelor of science, master of science, and PhD in Civil/Environmental Engineering from Texas A&M University. With over 12 publication and nine currently pending, Dr. Bruce has a host of honors, awards, and professional affiliations, with one she highly credits to her success, the NSF LSAMP Bridge to Doctorate (BD) fellowship award. Dr. Bruce's research focuses on improving toxicity estimates linking exposure to environmental concentrations of hazardous chemicals to both human health effects and ecosystems.



**Dr. Lindsay Birt** is a Project Engineer at Huff and Huff, Inc. She received her Bachelor of Science in Agricultural Engineering. She then went on to receive her Master of Science, and PhD in Agricultural and Biological Engineering from Texas A&M University.



**Dr. Kevin Gagnon** is currently a Project Scientist at Berkeley National Lab. He received his Bachelor of Science from Worcester Polytechnic Institute as well as his PhD from Texas A&M University in Chemistry.



**Dr. Casie Hilliard** is currently a Senior Chemist at Dow Chemical. She received her Bachelor of Science from the University of Florida as well as his PhD from Texas A&M University in Chemistry.



**Dr. Julianna Camacho** is a Principal Engineering and Owner of CSR Environmental, LLC. She received her Bachelor of Science, Master of Science, and PhD in Civil/Environmental Engineering from Texas A&M University.



**Dr. Tanya Garcia** is currently an Assistant Professor at TAMU Health Sciences Center in the department of Epidemiology and Biostatistics. She received her Bachelor of Science from the University of California at Irvine in Mathematics and her PhD from Texas A&M University in Statistics.



**Dr. Roberto Gamez** is currently a Post Doc at Texas A&M University in Chemistry. He received his Bachelor of Science from the University of Texas Pan American as well as his PhD from Texas A&M University in Chemistry.



**Dr. Rafael Huacuja** is currently employed as a Senior Chemist at Dow Chemical. After the BD program, he was awarded the BASF Summer Fellowship. He is first author on two publications titled: "A terminal palladium fluoride complex supported by an anionic PNP pincer ligand" and "Reactivity of a Pd(I)-Pd(I) dimer with O<sub>2</sub>: monohapto Pd superoxide and dipalladium peroxide in equilibrium". He has presented his research at the American Chemical Society (ACS) national meetings as well as the Center for Chemical Innovations (CCI) retreats. Upon receiving his Bachelor of Science from Cornell University and PhD from Texas A&M University in Chemistry, he has been working at Dow Chemical since August 2013.



**Dr. Alfredo Hernandez**

is currently a Postdoctoral Researcher at Harvard Medical School. He received his Bachelor of Science from University of Texas- Pan American in Biochemistry. He then went on to receive his Master of Science, and PhD in Biochemistry from Texas A&M University.

**Dr. Juan Carlos Juarez**

is currently a researcher at John Hopkins University. He received his Bachelor of Science, Master of Science, and PhD in Electrical Engineering from Texas A&M University.

**Dr. Tiffany Kinnibrugh**

is currently a Post Doc at Argonne National Laboratory. She received her Bachelor of Science from New Mexico University in Mathematics and her PhD from Texas A&M University in Chemistry.

**Dr. Jessica Houston**

is an Associate Professor at New Mexico State University. She received her Bachelor of Science in Chemical Engineering from New Mexico State University. She then went on to receive her Masters of Science and PhD in Chemical Engineering from Texas A&M University. The primary focus of her research is to develop and demonstrate the utility of 'time-resolved flow cytometry.' She has received an NSF CAREER Award as well as numerous other awards for her work.



**Dr. Roy Montalvo** is currently a faculty member in the Physics department at the University of Texas at El Paso. He received his Bachelor of Science from Stony Brook University as well as his PhD from Texas A&M University in Physics.

**Dr. Maya Johnson**

is currently a Post Doc in the Department of Statistics at Texas A&M University. She received her Bachelor of Science from Lincoln University in Mathematics. She then went on to receive her Master of Science, and PhD in Mathematics from Texas A&M University.



**Dr. Michelle Myers** is currently employed at Intel. She received her Bachelors of Science from The Ohio State University in Physics and Astronomy and her PhD in Electrical Engineering from Texas A&M University.



**Dr. Justin Jackson** is currently a Manager of Inventory Analytics at Nike. He received his Bachelor of Science, Master of Science, and PhD in Aerospace Engineering from Texas A&M University.



**Dr. Maxine Madison** is an environmental Consultant at Conoco Phillips. She received her Bachelor of Science from Mississippi State in Chemical Engineering. She then went on to receive her Masters and PhD in Chemical Engineering from Texas A&M University.



**Dr. Aracely Rocha** is currently an Intel (Arizona) Reliability Engineer. She received her Bachelor of Science from University of Texas, Pan America in Mechanical Engineering. She then went on to receive her Master of Science, and PhD in Mechanical Engineering from Texas A&M University.



**Dr. Jean Njoroge** is currently a Technology Commercialization Licensing Associate at Texas A&M System. She received her Bachelor of Science from Prairie View A&M University in Chemical Engineering. She then went on to receive her Master of Science, and PhD in Material Science and Engineering from Texas A&M University.



**Dr. Douglas Rodriguez** is currently a Post Doc at the University of Florida. He received his Bachelor of Science, Master of Science, and PhD in Mechanical Engineering from Texas A&M University. He has over 10 publications and has been given many presentations and talks. Dr. Rodriguez has several honors, awards, and professional affiliations.



**Dr. Mayra Mendez Pinero** is currently an assistant Professor in Industrial Engineering at the University of Puerto Rico. She received her Bachelor of Science from the University of Puerto Rico in Industrial Engineering. She then went on to receive her Master of Science, and PhD in Industrial Engineering from Texas A&M University.



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**Dr. Deborah Matilda Santos Roman** received her Bachelor of Science, Master of Science, and PhD in Water Resources from Texas A&M University.



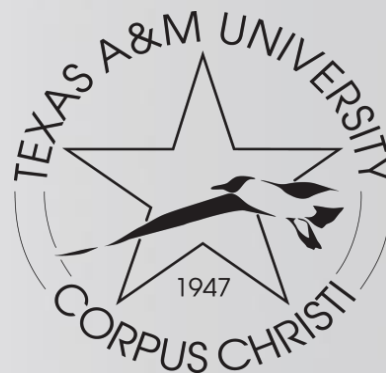
**Dr. Migvia Vidal Vasquez** has been a senior Consultant at ERM since 2013. She received her Bachelor of Science, Master of Science, and PhD in Chemical Engineering from Texas A&M University.



**Dr. Shannon Walton** is the Director for Recruiting and Student Success for the Office of Graduate and Professional Studies at Texas A&M University. She is also the Director of the TAMUS LSAMP Program. She received her Bachelor of Science in Industrial Engineering, Master of Science in Nuclear Safety /Industrial Hygiene and her PhD in Interdisciplinary Engineering from Texas A&M University.

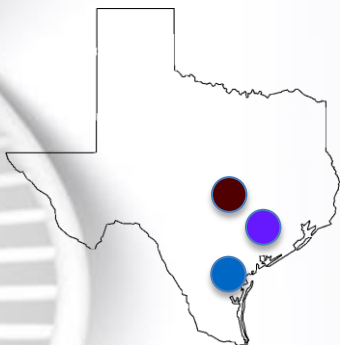


The Texas A&M University System Louis Stokes Alliance for Minority Participation is aimed at increasing the quality and quantity of underrepresented minority students successfully completing STEM bachelor degree programs, and increasing the number of students interested in, academically qualified for and matriculating into programs of graduate study.



### TEXAS A&M UNIVERSITY SYSTEM

*Louis Stokes Alliance for Minority Participation*



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