

LOUIS STOKES ALLIANCE FOR
MINORITY PARTICIPATION

2011 IMPACT
REPORT

$$\omega_s = \rho_s k_s \beta_s \delta_s (1 + h \beta_s)$$

$$\omega_s = a_0^2 \frac{(\rho_0^2 - 1)(\rho_s - 1)}{4} - \omega_s$$

$$\omega_c = \rho_c k_c \beta_c \delta_c (1 + h \beta_c)$$

$$\omega_c = a_0^2 \left[\frac{(\rho_c^2 + 1)(\rho_c - 1)}{4} - \frac{(\rho_s - 1)}{2} \right] - \omega_c$$

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2011 Impact Report

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EXECUTIVE SUMMARY



“The TAMUS LSAMP program has given interested students motivation, guidance, and support to persist in STEM fields; social and cognitive capital; and put structures and tools in place for students to select what each needs to persist.”

Dr. Karan Watson

TAMUS LSAMP PI

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 TAMUS LSAMP alliance currently includes: 1) Texas A&M University (TAMU), a Tier I research institution, 2) Prairie View A&M University (PVAMU), a Historically Black College and University, and 3) Texas A&M University-Corpus Christi (TAMUCC), a Hispanic Serving Institution. Also, 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 twenty years, the TAMUS LSAMP institutions have produced 11,888 URM STEM graduates and seen an approximate 100% increase in the annual enrollment of URM STEM students.

EXECUTIVE SUMMARY

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 seven 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, 82 students have participated in the TAMUS BD program, and of the 58 who have completed the program, 34 have bridged to PhD programs, 13 have completed the PhD and 6 are faculty at institutions throughout the country.

The TX LSAMP program also demonstrated its impact on a number of other academic success indicators, such as 1st 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 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.

EXECUTIVE SUMMARY

The TAMUS LSAMP advanced undergraduate enrichment, retention, persistence and transfer through:

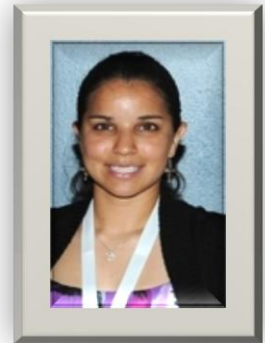
- Implementation of innovative and campus customized variants of academic community building
- Supported instruction and peer teaching
- Peer and faculty mentorship
- Cross-Campus transfer, institutionalization of academically successful strategies, and their universalization. (i.e., generalization at the larger universe including non-URM students)
- Development of databases, and systematic procedures for student tracking and program outcome monitoring
- Research and internship opportunities made available for a broad base of URM STEM undergraduates, including linkages with the NASA-funded TAMUS Space Engineering Institute dedicated to increasing retention of underrepresented engineering students through applied research projects that also provide employment
- International research and study abroad experiences for URM STEM undergraduates
- Partnerships with student organizations such as National Society of Black Engineers (NSBE), Mexican American Engineers and Scientists (MAES), the Society of Hispanic Professional Engineers (SHPE), and the Society for the Advancement of Chicanos/Hispanics and Native Americans in Science (SACNAS)
- Collaborations with other NSF-funded programs such as the Foundation Coalition, Gender Equity Faculty Development program at TAMU, the CREST and CRCO in environmental informatics at Texas A&M University-Kingsville, and the RISE and HBCU-UP, at Prairie View A&M University.

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 to promote the institutionalization and universalization of promising TAMUS LSAMP tactics. The findings of impact evaluation and educational action research studies have been disseminated through publications and presentations at engineering and STEM education conferences, which inform national and international audiences. In addition, the TAMUS LSAMP helped produce a group of academic leaders for the Texas A&M System's community of universities 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 sentiment and in spite of the legal barriers introduced by the 1996 Hopwood Decision.

EXECUTIVE SUMMARY

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 current 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 was recently admitted into the doctoral Microbiology program at UT-Austin. He looks to pursue a career in research and academia.



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.

ALLIANCE-WIDE INSTITUTIONAL IMPACT

In the spirit of alliance, TAMUS LSAMP has benefited from a 20-year history of novel strategies, collaborations, leveraged relationships and active influences wielded by TAMUS LSAMP advocates and participants; aimed at enriching the learning experiences of URM STEM students. These efforts made it possible to influence systemic and organizational change for URM STEM students across the alliance. Alliance-wide institutional impact is evident by the adoption of educational program strategies and practices initially seeded and supported by the TAMUS LSAMP program, including peer mentoring, supplemental instruction, financial relief, study skills, clustering/learning communities and academic community building.

Peer Teaching (TAMU)

Peer teachers are undergraduate students who have successfully completed first year courses in mathematics, science and engineering. They are mentors who work to develop community and trusting relationships with students. Peer teachers participate in class and assist during in-class activities; provide outside class support (tutoring, pre-exam review sessions, mentoring, etc); and provide feedback about course-related issues to other members of the instructional team.

The TAMUS LSAMP supported Peer Teacher pilot program 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.

Supplemental Instruction (TAMU, PVAMU, TAMUCC)

Supplemental Instruction (SI) is focused instruction, outside of class tutoring, offered to students in major “gate keeping” courses such as 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, develop strategies for studying the subject and practice prior to tests.

ALLIANCE-WIDE INSTITUTIONAL IMPACT

Regent's Scholars and Century Scholars Programs (TAMU)

Based on the successful programs piloted by TAMU LSAMP which showed that the connection between learning communities and scholarships can effectively retain URM STEM students to graduation, the Regent's Scholars and the Century Scholars programs arose.

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. 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 91 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.

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.

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.

INCREASED ENROLLMENT

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, Texas A&M University (TAMU), Prairie View A&M University (PVAMU) and Texas A&M University – Corpus Christi (TAMUCC), has nearly doubled from 2,782 students in the 1991 baseline year to 5,364 students in Fall 2010. 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.

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.

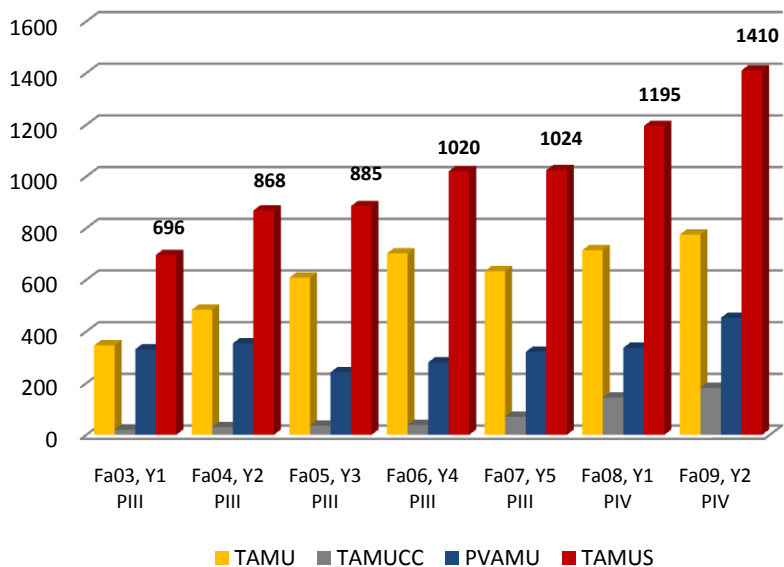


Figure 1. TAMUS LSAMP URM STEM FTFT freshmen enrollment in Phase III

INCREASED ENROLLMENT

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. 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.

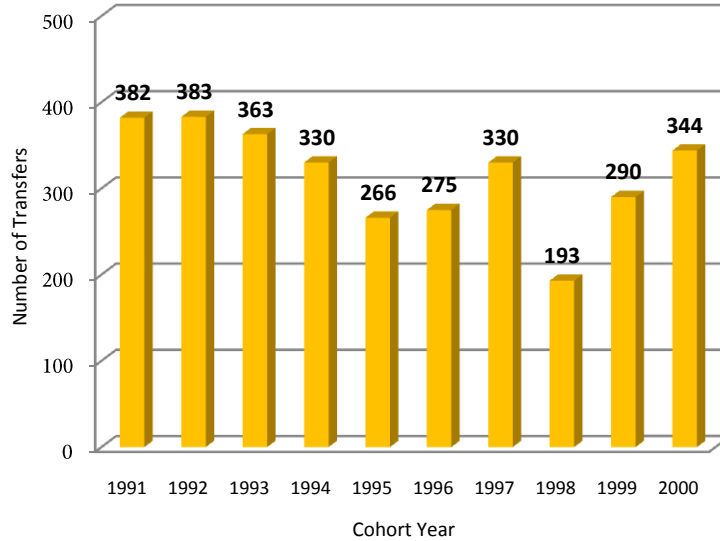


Figure 2. TAMUS LSAMP URM STEM Community College Transfer Enrollment from 1991-2000

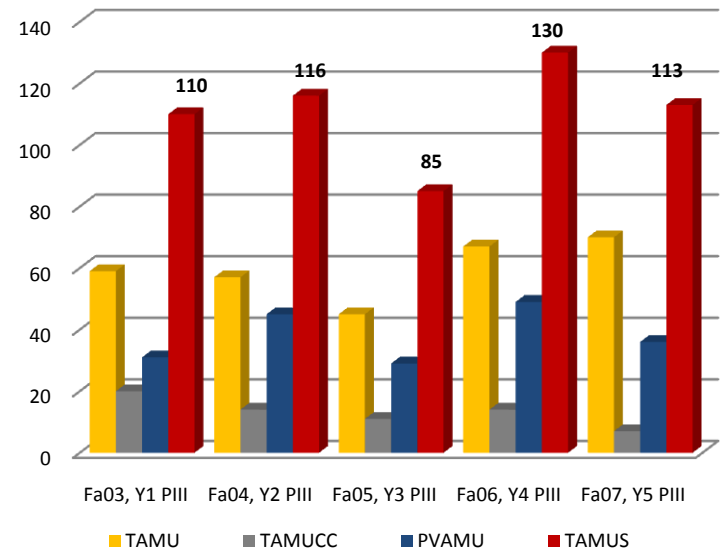


Figure 3. TAMUS LSAMP URM STEM FTFT Transfer Enrollment in Phase III

INCREASED ENROLLMENT

Total enrollment

To sustain gains made during Phases I, II, and III of the TAMUS LSAMP, the current Phase IV efforts are focused on developing strong ties with 5 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, NSF summer REU experiences, and TEES Strategic Initiative Office providing assistance to community colleges throughout the state in writing NSF S-STEM proposals.

In Phase II, URM STEM enrollment at TAMUS LSAMP primary institutions as up by 7.7% in 2001-2002, over 2000-2001 numbers, and by 13.8% over 1999-2000 numbers. During the same period, non-minority STEM enrollment at TAMUS LSAMP primary institutions dropped by 3%. This increase was especially significant given all Texas institutions were struggling to manage the impact of anti-affirmative action policies associated with the Hopwood Decision. 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 enrollment numbers. 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. In the first three years of Phase IV (2008-current), URM STEM enrollment at TAMUS LSAMP primary institutions has seen a net increase of 19%.

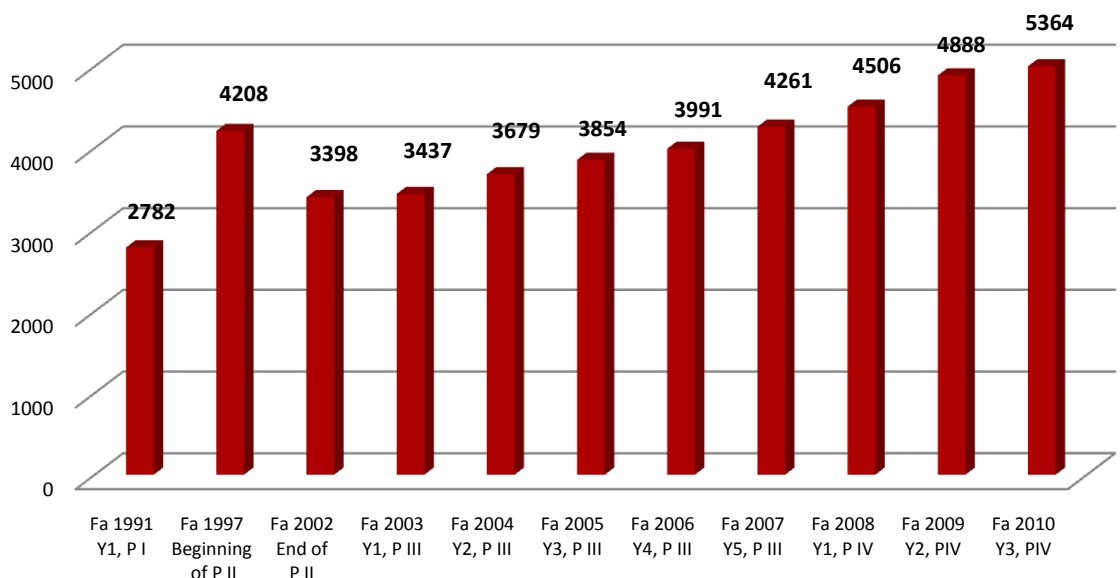


Figure 4. TAMUS LSAMP URM STEM Enrollment from 1991-2010

INCREASED ENROLLMENT

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. The remainder of this section will discuss several of the activities implemented over the 20 years of TAMUS LSAMP that have positively impacted URM STEM enrollment.

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 are to: (1) provide tutorial support to students in core curriculum courses, (2) provide student modeling of successful studying techniques, and (3) encourage group study outside of scheduled sessions.

LEEP (Learning to Excel in Engineering through Preparation) (TAMU) - LEEP is a 5-week summer bridge program that brings incoming freshmen to campus during the 2nd summer session prior to their fall semester. Participants experience life as a student at Texas A&M University through instruction in engineering, math, physics and study skills. LEEP students act as ambassadors to peers who do not participate in the program and are clustered in a design course for credit in the fall.



LEEP Participants

INCREASED ENROLLMENT

ACTIVITIES

Pre-College and Bridge Programs (cont'd)

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.



ESCI Participants

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.

INCREASED ENROLLMENT

ACTIVITIES

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:

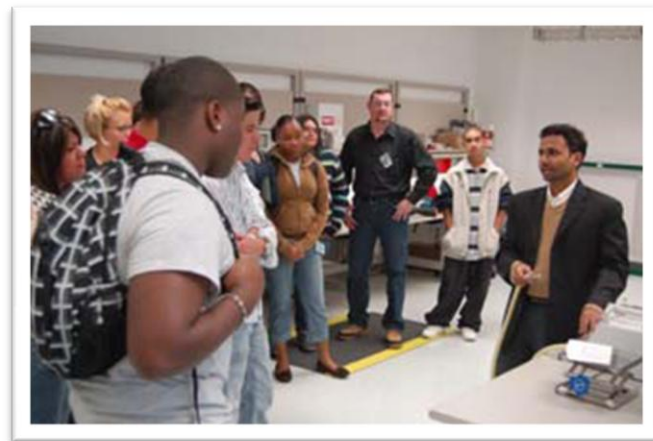
Community College STEM Conferences

(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.

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 on-going 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 Annual Symposium. Past evidence of this collaboration has resulted in a 100% transfer rate into TAMUCC.



Community College STEM conference
@ 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 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.

INCREASED ENROLLMENT

ACTIVITIES

Community College Outreach (cont'd)

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.

INCREASED DEGREE PRODUCTION & ENHANCED STUDENT DEVELOPMENT

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 doubled from 303 in 1991 to 726 in 2011, a significant contribution to the NSF goal of a diversified STEM national workforce. Over the past twenty years, the TAMUS LSAMP institutions have produced 11,888 URM STEM graduates.

Figure 5 reveals URM STEM bachelor degree production over the history of TAMUS LSAMP for three primary partner institutions which shows an overall doubling of degree production with several peaks and valleys. In Phase II, decreases in degree production were the result of several factors related to the Hopwood Decision, the state's "Top 10" law, and the economy. Despite strong retention, the 1996 Hopwood Decision and the 1997 top 10% guaranteed admission policy negatively impacted first time freshmen URM STEM enrollment, leading to a reduction in the pool of URM STEM students entering TAMUS institutions and depressing the number of students completing BS degrees. During Phase II, BS degrees awarded to URM STEM students declined from a high of 635 in 1998-1999, to a low of 444 in 2001-2002. Also contributing to the decline in degree production was the lure of immediate, lucrative rewards in the form of a ready job market for persons with strong technical skills at almost any post-secondary level.

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.

During Phase III, the TAMUS LSAMP focused on repairing the pipeline that deteriorated due to the aforementioned state policies. As a result, in Phase III, TAMUS LSAMP BS degree production increased to 86% over the original 1991 baseline. In the first three years of Phase IV (2008-current), URM STEM BS degree production has continued to increase, with a net increase of 20%.

INCREASED DEGREE PRODUCTION & ENHANCED STUDENT DEVELOPMENT

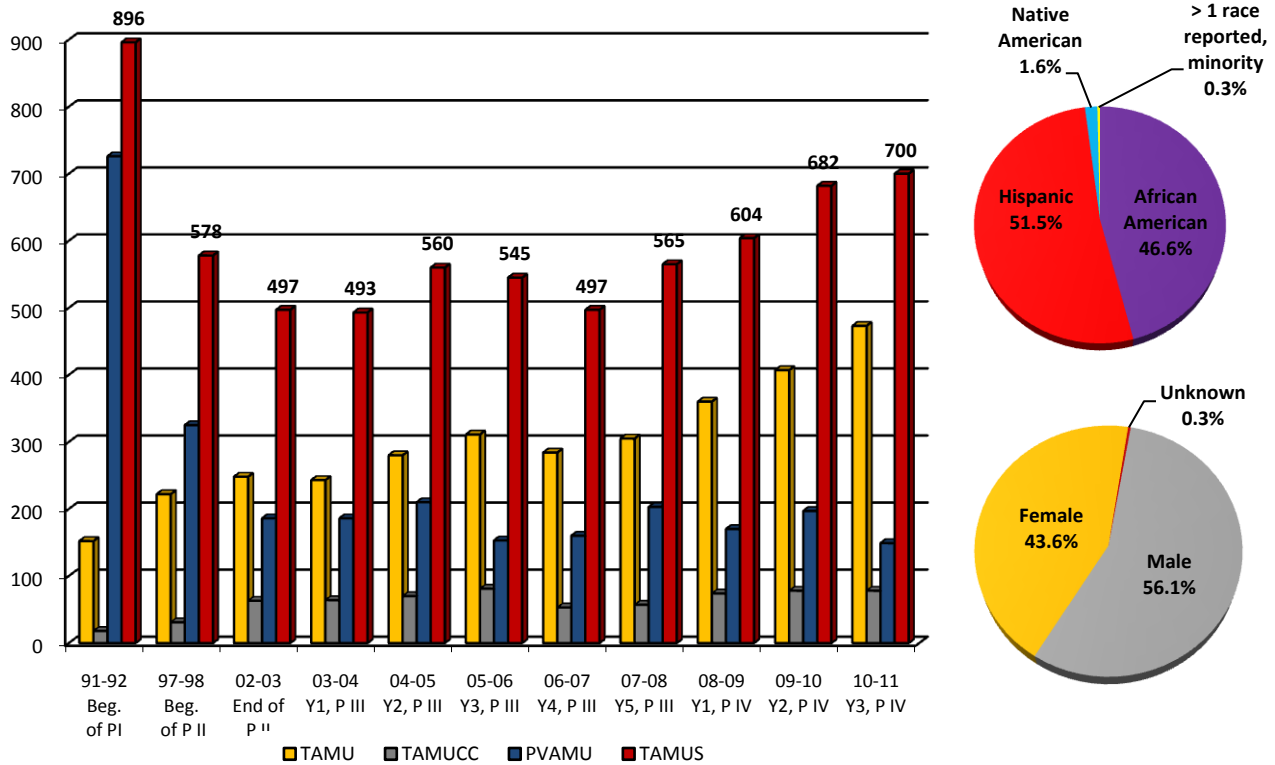


Figure 5. TAMUS LSAMP URM STEM BS Degrees for 3 primary partner institutions from 1991-2010

ACTIVITIES

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.

Supplemental Instruction (TAMU, PVAMU, TAMUCC)

Supplemental instruction is an academic assistance program designed to improve student’s 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.

INCREASED DEGREE PRODUCTION & ENHANCED STUDENT DEVELOPMENT

ACTIVITIES (cont'd)

Peer Teaching (TAMU)

The peer teaching program is comprised of undergraduate students who have successfully completed first year courses in mathematics, science and engineering. Each semester peer teachers are provided for freshmen level engineering courses. They participate in the class and share the value of what the students are learning and the reasonableness of the workload with the faculty teaching the course. They work to build strong and trusting relationships with students by mentoring and help expose students to a broader perspective of their learning processes. This is accomplished by assisting students during in-class activities, providing outside class support (tutoring, pre-exam review sessions, mentoring, etc.) and providing feedback about course related issues to other members of the instructional team.

The TAMUS LSAMP program strategy was piloted in freshmen engineering courses in 2000 at TAMU. Yielding impressive results, the program was institutionalized at TAMU and instituted across all sections of the first freshmen introduction to engineering courses in 2001.

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.

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 Annual Symposium and other student conferences such as NSBE, SHPE, MAES and SACNAS.

INCREASED DEGREE PRODUCTION & ENHANCED STUDENT DEVELOPMENT

ACTIVITIES (cont'd)

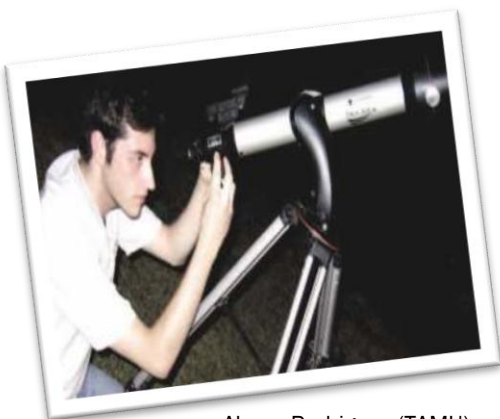
International Engagement (TAMU, PVAMU, TAMUCC)

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.

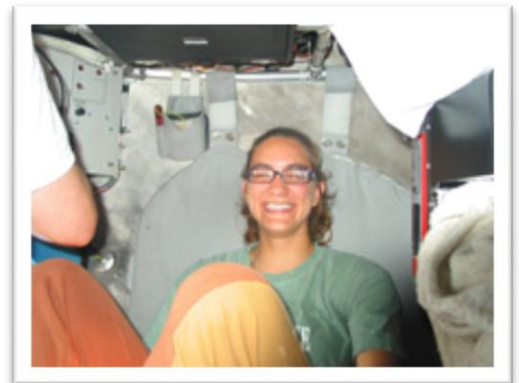
In 2008, TAMUCC LSAMP participant, Adriana Leiva, participated in an international research experience in Mexico. Adriana's research investigated strategies to save a critically endangered species of marine mammal, vaquita, from extinction caused by anthropogenic effects. This experience led to her return 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 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.



Alvaro Rodriguez (TAMU)
2009 NSF LSAMP-INT
Europe



Andriana Leiva (TAMUCC)
2009 International Research Experience
Mexico

INCREASED DEGREE PRODUCTION & ENHANCED STUDENT DEVELOPMENT

TEACHER PREPARATION

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) is a Texas A&M University System partnership focused on critical issues facing math and science preparation and committed to statewide reform. NSF funded, TxCEPT was configured to address the critical issues of demographics, diversity, and integration within the statewide systemic reform environment. The goals of TxCETP include (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 (E³) Teacher Summer Research Program

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 Texas A&M University. 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.

INCREASED DEGREE PRODUCTION & ENHANCED STUDENT DEVELOPMENT

TEACHER PREPARATION (cont'd)

Workshops at the TAMUS LSAMP Annual Symposium

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.

TAMUS LSAMP SYMPOSIUM

The TAMUS LSAMP Annual 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.



BRIDGE TO DOCTORATE INITIATIVE

TAMUS LSAMP has been the recipient of seven LSAMP Bridge to Doctorate (BD) awards. Since its inception in 2003, the TAMUS LSAMP BD program has attracted 81 BD fellows from 34 institutions, majoring in 28 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 and other national graduate fellowships. These strategies have resulted in BD fellows receipt of two NSF GRFP fellowships, one GEM fellowship, and one Ford Foundation fellowship. Out of the thirteen completed PhDs, 46% have entered academia and one has entered professional school.

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. Ninety percent of BD Cohort I fellows completed PhDs. Cohort II had a 33% matriculation rate to the PhD, of which two 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 five are in the final phases of the master's program. Fifty-eight percent of Cohort IV fellows are actively pursuing their PhD, with 1 completed degree to date. One-hundred percent of Cohort V fellows, fall 2008, matriculated into PhD programs, with one fast-tracked PhD completion. Cohorts VI and VII are progressing well in their first and second academic year of the BD program, respectively.



BTD III Fellows



BTD VI Fellows

BRIDGE TO DOCTORATE INITIATIVE

Cohort	Fellows	Matriculation to PhD after BD Program		Matriculation to PhD SCIENCE		Matriculation to PhD ENGINEERING		Still Matriculating		Completed	
		#	%	#	%	#	%	#	%	#	%
I (AY/03-05)	10-E	10	100	-	-	10	100	1	10	9	90
II (AY/04-06)	4-E 9-S	4	31	2	15.5	2	15.5	2	15.5	2	15.5
III (AY/05-07)	10-E 2-S	2	16.6	1	8.3	1	8.3	2	16.6	-	-
IV (AY/06-08)	11-E 1-S	7	58	1	8	6	50	6	50	1	8
V (AY/08-10)	2-E 9-S	11	100	9	82	2	18	10	91	1	9
VI (AY/10-12)	4-E 4-S 4-A	-	-	-	-	-	-	12	100	-	-
VII (AY/11-13)	4-E 4-S 4-A	-	-	-	-	-	-	12	100	-	-

Table 1. TAMUS LSAMP BD Matriculation | E – Engineering, S-Science, A-Ag and Life Sciences Cohort I, II, IV, V, VI and VII – Texas A&M University Cohort III – Prairie View A&M University

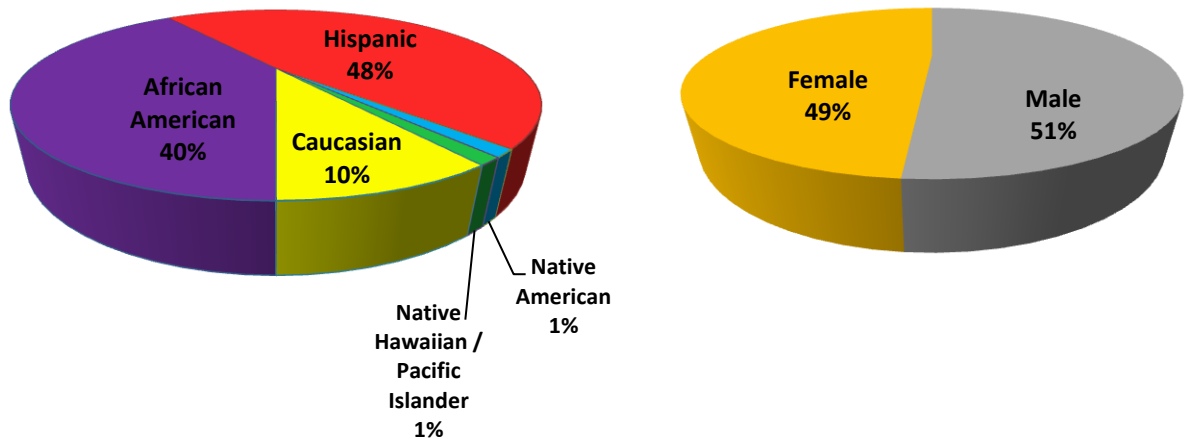


Figure 6. Ethnicity and Gender Demographics for BTM Cohorts I-VII

BRIDGE TO DOCTORATE INITIATIVE

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 Studies (OGS), graduate development activities and events are offered to the fellows. For example, one series of hosted seminars covers graduate school 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:

- “Graduate School is a Different Ballgame: A Day in the Life of a Grad Student”
- “Academia is a Business & Graduate Student is the Job Title: Transitioning from Passive to Active Learning”
- “Choosing an Advisor: The Advisor-Advisee Relationship”
- “Exposing yourself to Research: How to Choose a Research Topic”
- “The Writing Process: How to Minimize the Pain of Writing”

National Fellowship Application Preparation

BD Fellows are required to prepare 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. As a result of the workshop series, two fellows received NSF GRFP fellowships, one received a GEM fellowship, and one received a Ford Foundation fellowship.

ECONOMIC IMPACT

The resulting impact that TAMUS LSAMP has had on its students and region over the past 20 years is vast. The economic value of the TAMUS LSAMP institutions is evident in the production of 11,888 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 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 everyday. 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.

Distinguishing TAMUS LSAMP from traditional scholarship programs is its cultivation of cognitive and social capital. The result is the production of highly competent URM STEM professionals with enhanced individual learning power and self-reliance.

Social capital inheres in the structure of relationships. It has been shown to predict a number of academic and career outcomes, including academic performance and occupational attainment. For TAMUS LSAMP students, social capital is apparent in the fostering of student engagement, peer groups, mentorship, social interaction, and a sense of belonging. URM STEM students know that they are welcomed and supported in the TAMUS LSAMP environment, leading to a greater connection to both their academic programs and their university.

The concept of cognitive capital focuses on the acquisition of knowledge. Within the context of TAMUS LSAMP, cognitive capital is portrayed through student preparation, attainment of knowledge and skills and the opportunity to put them into practice, and academic support to persist to BS degrees, graduate degrees, and academia.

For URM students with an interest in STEM, the TAMUS LSAMP model has impacted student's motivation, program momentum, accessibility, and affordability associated with obtaining STEM degrees. All of which contribute to education and training that is vital to a healthy STEM workforce.

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.”

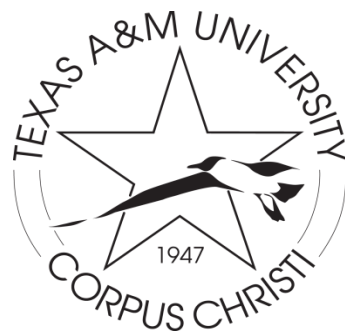
The Texas A&M University System Louis Stokes Alliance for Minority Participation is aimed at increasing the quality and quantity of underrepresented minority students successfully completing STEM bachelor degree programs, and increasing the number of students interested in, academically qualified for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



Texas A&M University



Prairie View A&M University



Texas A&M University - Corpus Christi

TEXAS A&M UNIVERSITY SYSTEM

Louis Stokes Alliance for Minority Participation



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