Project Abstracts for

Fiscal Year 2018

Minority Science and Engineering Improvement Program

New Awards

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**LA - Baton Rouge Community College**

Baton Rouge, LA

Institutional Grant

P120A180060

Abstract

Baton Rouge Community College’s (BRCC) Minority Science and Engineering Improvement Program (MSEIP) Program is *Improving Undergraduate Education for Minority Students in STEM: Focusing on Research-Based Courses and Summer Research Experiences.* The goals of this program are: increase the number of minority students enrolled as science, technology, engineering, and mathematics (STEM) majors, increase the number of STEM minority students in good standing with an overall average of 2.0 Grade Point Average (GPA) or better, improve retention rates, and execute the comprehensive science improvement plan. The populations to be served are the minority students, especially minority women, who are STEM majors. The main objective is to systematically include more documented best practices such as inquiry based learning in the STEM degree curriculum, ultimately improving students’ academic skills, engagement, critical thinking, and exposure to STEM careers. The activities offered to students through this grant will be developed to address specific barriers that researchers and BRCC student surveys have identified as hindrances to the success of minorities and minority women in STEM. The activities include mentoring through engagement in scientific research work, book stipends to offset financial challenges, community engagement as a means to connect learning and promote focus on learning, specialized orientation and degree auditing, and opportunities to share research work with other students as well as build communication skills.

Researchers have shown that these opportunities increase STEM student retention and success especially those from minority populations. To this end, BRCC has included a subset summer initiative, a Competitive Preference Priority Project titled ASPIRE: *Accelerating Students Participating in Innovative Research Experiences.* This is an 8 week, summer research program that will support 20 students each grant year, with priority placed on minority women students. Students will either participate in research at BRCC or at neighboring 4-year institutions. These students will then present their work at regional or national conferences.

**LA - Southern University – Baton Rouge**

Baton Rouge, LA

Institutional Grant

P120A180012

Abstract

By 2024, the number of science, technology, engineering, and mathematics (STEM) jobs in Louisiana is projected to increase by 16 percent. Yet, the current supply of postsecondary graduates in STEM disciplines is insufficient to meet current and anticipated demand. Across the nation, an overwhelming number of students entering college as a STEM major, fail or switch their major due to a lack of preparation for college level mathematics. Southern University Baton Rouge (SUBR), like universities across the country, has similar challenges with its STEM students. Unfortunately, at SUBR, as with many HBCUs, an ever decreasing budget presents a challenge to creating new initiatives to advance student success. As such, the College of Sciences and Engineering at SUBR is proposing to focus on mathematics preparation and faculty development with the goal of creating Pathways for Advancing Student Success (PASS).

Specific objectives of the PASS project are to:

1. Implement a comprehensive improvement plan to increase the first time passing rate in foundational mathematics courses; and
2. Improve course delivery and instruction to increase the retention rate among STEM students.

Project objectives will be accomplished by: 1) implementing an early-warning system to identify and support at-risk students; 2) strengthening tutoring services for math courses; 3) implementing an academic instruction program to supplement core STEM courses; 4) providing training that enables faculty members to explore active and collaborative teaching and learning strategies; and 5) providing a six-week faculty course redesign and curriculum training. The outcomes of this project are to increase the first time passing rate of STEM students taking foundational math courses and to retain and graduate more students in the STEM discipline.

Overall, this project will strengthen the College’s academic support services and faculty instruction and advisement, thereby laying the foundation for improved student retention efforts over the long term.

**MS - Alcorn State University**

Lorman, MS

Institutional Grant

P120A180049

Abstract

Alcorn State University will improve the pathways to science, technology, engineering, and mathematics (STEM) careers in southwest Mississippi by improving STEM content knowledge and pedagogy of high school science teachers in our primary feeder schools, improve the college readiness of the students in these high schools with summer STEM immersion and dual credit courses. The pathway will include an improved science curriculum at Alcorn State University that focuses on Inquiry-based Learning, mentorships, and additional research opportunities. The project has three goals:

**Goal 1:** To make long-range improvement in the preparation, **recruitment, transition, and enrollment** of underrepresented ethnic minorities, particularly minority women, into matriculation in science and technology studies at Alcorn State University.

**Goal 2:** To make long-range improvement in the **retention, persistence,** academic performance, **and graduation** of underrepresented ethnic minorities, particularly minority women, in science and technology studies at Alcorn State University.

**Goal 3**: To make long-range improvement in the **transition into careers** of underrepresented ethnic minorities, particularly minority women with science and technology degrees into scientific and technological fields.

Alcorn State University will address the **Competitive Preference Priority** with the redesign of our science curriculum to focus on inquiry-based learning with the expected outcome of higher academic performance on standardized tests. The project has the following expected results:

* A 12 percent reduction in the percent of students who require remedial or transitional courses.
* Improve the ACT composite score of participating high schools by 0.5 percentage points.
* (MSEIP Key Performance Measure: (1) A 8 percent change in the number of full-time, degree-seeking minority undergraduate students at Alcorn State University **enrolled** in the fields of engineering or physical or biological sciences, compared to the average minority enrollment in the same fields in the three-year period immediately prior to the beginning of the current grant.
* Increase STEM content and pedagogy knowledge of teachers as measured by pre-and post- tests and surveys of teacher knowledge.
* (MSEIP Key Performance Measure: (2) A 6 percentage point increase in the persistence of underrepresented ethnic minorities and minority women institutions in the fields of engineering or physical or biological sciences by May 2020.
* (MSEIP Key Performance Measure: (3) Increase the percentage of minority students enrolled at four-year minority institutions in the fields of engineering or physical or biological sciences who graduate within six years of enrollment by eight percentage points by May 2020.
* Achieve an average fidelity of implementation of 88 percent over the three-year span of the project based on the Measures of Fidelity of Implementation.
* Students have greater retention of academic knowledge as evidenced by a 5 percent increase in Graduate Record Examinations (GRE) scores.
* Students have greater retention of academic knowledge as evidenced by a 6 percent increase in Dental Admission Test (DAT) scores.
* Students have greater retention of academic knowledge as evidenced by a 6 percent increase in Medical College Admission Test (MCAT) scores.

**NC - Elizabeth City State University**

Elizabeth City, NC

Institutional Grant

P120A180034

Abstract

**Overarching Goal**: To implement an evidence-based and already piloted, comprehensive academic program at Elizabeth City State University (ECSU) to enhance the retention and graduation of minority (90 undergraduate) students from an economically distressed and rural part of northeastern North Carolina. This is consistent with the goal of enhancing the pool of well-prepared minority students joining the United States’ scientific workforce by tackling critical problems known to affect minority students’ success at ECSU. Our project, therefore, contributes to the Department of Education’s competitive preference priority by implementing steps that enhance retention and persistence of minority student in science, technology, engineering, and mathematics (STEM) fields.

**Rationale:** ECSU has a student population comprised of nearly 80 percent African Americans. A large majority of ECSU students come from the surrounding 21 rural counties and largely lack academic preparedness: their high school Grade Point Average (GPA) is 60 percent or less, most are first generation college students and come from the economically most disadvantaged rural areas of the state. Our assessment of impacting factors shows that these students face major challenges in their first year college life because of the lack of academic preparedness, overall weak high school academic experiences, students’ general perception of college life and academic rigor, very weak scientific literacy, sense of isolation and lack of self-efficacy. Consequently, failure rate in gateway STEM courses at ECSU is as high as 50 to 70 percent. This affects retention and persistence resulting in a historically low graduation rate. To address this serious hurdle we have successfully implemented a pilot intervention program originally developed at Model Institutions for Excellence, and increased retention (20 percent) in the Biological Sciences at ECSU. We seek to build upon the successes we achieved and propose to scale up the pilot program with the goal of increasing retention and graduation in all STEM fields. We propose to implement the tested program to include all STEM fields at ECSU (Department of Mathematics and Computer Science, Department of Natural Sciences, Pharmacy and Health Professions, and Department of Technology).

**We propose to scale up the piloted program:** We will academically support and prepare **90 minority ECSU STEM students in three years** [i.e. 30 students or one section, each year] through a comprehensive program for a successful college experience. We propose in our project to have a summer bridge component and academic year support. These include four of the tested interventions: 1) Precollege Initiatives, 2) Student Support, 3) Undergraduate Research and 4) Graduate School and Science Career Preparation. The summer bridge program modules are well-structured, integrated and comprehensive. They include focus on scientific literacy with activities and discussions that promote cognitive processing of information and problem-solving strategies and enhancing self-efficacy and locus of control. This will be accomplished through an approach that utilizes tested best practices within a framework of close-knit learning communities of students that will be guided by two experienced faculty, trained graduate student mentors and undergraduate peer-tutor/mentors. Academic year tutorials, mentorship and workshops to encourage and prepare for summer research experience will be used to strengthen the sense of learning community and focus on rigor. We consider our project successful if our CASER-ECSU participants’ first year retention is higher by at least 15 percent than the control groups.

Application to our program will be open to all minority STEM majors accepted as freshmen to join ECSU. For selection we will primarily use applicant’s self-reported commitment to a STEM career and supporting recommendations from high school teachers and counselors. Our team has a track record of collaboration: the Project Director (PD), a biologist, is an award winning teacher and seasoned researcher who successfully implemented the pilot, comprehensive federally-funded intervention program at ECSU. He is also a committed mentor who has mentored through research 30 undergraduate and three graduate students in the past ten years, eight of whom co-authored papers. The Co-Project Director, a chemist, has actively participated in the implementation of the successful intervention and has extensive experience in mentoring through research undergraduate students at ECSU of whom many have co-authored research papers.

**OH - Central State University**

Wilberforce, OH

Institutional Grant

P120A180028

Abstract

Central State University (CSU), a Historically Black College and University (HBCU) and 1890 Land-Grant institution, intends to improve the quality of preparation of underrepresented students particularly women for careers in science, technology, engineering, and mathematics (STEM) and graduate work by providing a comprehensive suite of services through this institutional grants proposal.

The STEM Success Center (SSC) is based on the premise that if academically underprepared students receive early additional academic assistance through professional and peer mentoring and are supported by a network that removes non-academic barriers, they will perform better and are more likely to graduate and join the STEM workforce. The three goals of the SSC are:

1. Establish a comprehensive learning system that addresses the deficiencies of STEM majors;
2. Establish a STEM Success Center; and
3. Enhance students’ experiential learning opportunities and professional development.

All three goals address the competitive priority as they are based on the identification of the needs of students and seek to implement instructional strategies, systems, and structures that improve postsecondary learning and retention, resulting in completion of a degree in a STEM field.

Central State will implement a tutoring and supplemental instruction system for ten critical courses that STEM students must pass in their first two years. Faculty members will increase instruction time outside the classroom to provide students with additional learning time. We will also ensure synergy with tutoring and supplemental instruction (SI) by infusing professional and student tutors into these specific courses.

The objectives of the SSC are to: 1) increase passing rate of students in the five first semester freshman STEM classes from 58 percent to 83 percent by the end of the project period; 2) increase passing rate of students in the three second-semester freshman STEM classes from 59 percent to 83 percent by the end of the project period; 3) increase passing rate of students in the three mathematics classes from 49 percent to 72 percent; 4) increase the number of students retained from 122 to 168; 5) increase the number of students persisting from 68 to 82; 5) ensure that all CSU STEM majors receive academic advising from STEM faculty on a timely basis; 6) provide nonacademic counseling including mentoring to STEM majors; 7) pair female STEM students with female STEM faculty and professionals; 8) 24 STEM students will engage in experiential learning opportunities; 30 students will attend and participate in academic related conferences and workshops; and 9) at least 75 percent of CSU STEM students will attend development workshops. As a demonstration of CSU’s commitment to the SSC, faculty will provide tutoring for STEM students in the center at no charge to the project, and one of the co-project directors will provide services in-kind. To ensure successful implementation of the SSC, the center will have two co-project directors.

Successful implementation of this project will have national implications. A majority of underrepresented minorities (URM) are not college ready when they start college therefore they drop out at a higher rate than the majority population after the first year. The lack of preparation is also manifested in upper level classes because URM do not have the foundational knowledge necessary to succeed as STEM majors. A significant increase of graduation of underprepared students, particularly women, will enhance the nations’ competitiveness in the global marketplace.

**SC - Claflin University**

Orangeburg, SC

Special Project Grant

P120A180035

Abstract

Based on the data of past five years, the School of Natural Science and Mathematics of Claflin University (CU) has urgent needs to increase the retention and graduation rate of STEM majors. The low retention rate for STEM majors is directly related to failure rates in freshmen mathematics and science courses. Furthermore, our experience, data, and feedback from students indicated the positive relation between retention rate and hands-on research experience. Thus, the project will target a group of “at-risk” freshmen and junior who major in STEM, but lack the necessary skills in comprehension and mathematics to succeed, and have the intention to switch to non-STEM majors. The goal of the proposed MSEIP project is to increase the retention and graduation rate of STEM students, and better prepare underrepresented minorities for more advanced studies or careers in STEM upon graduation.

The proposed activities are to (1) create and develop a summer camp, which will give “at- risk” STEM students of CU focus training in mathematics with new pedagogy; (2) develop a year around research program, which aims to establish a solid and long term relationship between faculty and students and give students hands-on research experience; (3) and develop MSEIP Web-site and Social Networking.

The proposed will definitely address the Competitive Preference Priority since the expected results are: (1) Increasing in the number of STEM majors graduating from CU; (2) Significantly reducing the number of STEM students from leaving the STEM programs after the freshman year; (3) Developing an effective remedial program (Targeted Summer STEM Camp) to support at-risk STEM students, which may become a part of the freshmen program at CU in the near future; and (4) Successfully develop a model “Learning Community for STEM” with support of MSEIP Web-site and Social Networking.

**TN - Meharry Medical College**

Nashville, TN

Special Project Grant

P120A180072

Abstract

The overall **goal** of the proposed project is to improve the percentage of change in the number of African American students and women enrolled full-time in science, technology, engineering, and mathematics (STEM) degree programs and who graduate within six years of enrollment in selected Historically Black Colleges and Universities (HBCUs).

**Methodology**: Establish a Science Consortium of Minority Schools (SCMS) to provide technical support and services to address this issue. Consortium members: Meharry Medical College as Lead and Fisk University as its partner. Members are three institutions located in Tennessee: Tennessee State University, Le Moyne-Owen College, and Lane College; and one institution located in Georgia: Paine College. The Consortium will coordinate and deploy shared resources across schools for improving student achievement, test scores, graduate rates, and selection of science and engineering careers. There are five objectives: **1)** Establish an Executive Steering Committee of 10 representatives from the members of the Consortium to guide the project by Month 1; **2)** Hire and retain one 50 percent part-time Project Manager and one 20 percent STEM Project Coordinator for each of the institution for a total of four (4) coordinators in Months 1 and 2 for each consortium institution in all years of the project; **3)** Establish a web-based science and engineering portal to provide updated current science and engineering data and information geared toward promoting student’s interest in science and engineering by Month 6 of the project; **4)** Develop and implement a science and engineering track by Month 6 of the project within the annual HBCU Empower Conference at Meharry; and **5**) Develop a web-based survey to track 90 percent of African American students who are enrolled/and or select STEM careers by Month 4 of the project and updated in Years 2 and 3 of the project.

**Evaluation:** Each objective will be assessed using both formative and summative assessments and measurements. Additional data from a newly developed and secure web portal and survey will be used to predict retention and graduate rates for African American students and women who choose careers in science and engineering.

**Competitive Preference Priority:** We are requesting the competitive priority for promoting STEM education that will improve student achievement and related outcomes that results in completion of a degree in a STEM field.

**TN - Tennessee State University**

Nashville, TN

Institutional Grant

P120A180087

Abstract

Founded in 1912, Tennessee State University, a Historically Black College and University (HBCU), fosters scholarly inquiry and research, lifelong learning, and a commitment to service. This public, four-year 1890 land-grant institution is Nashville’s only urban, coeducational, and comprehensive public university, as well as Middle Tennessee’s first public Carnegie Doctoral/Research institution. As a HBCU, Tennessee State University has an unusual profile with an urban location and a land-grant mission.

Five science, technology, engineering and mathematics (STEM) pathways in biology, engineering, computer science, agriculture, and chemistry model transfer agreements, collaborative research opportunities for faculty and students, regional research symposium, faculty and staff training, improved data collection; and evaluation.

The proposed activity is SOARS (Student Opportunities for Advancement in Research Skills) Scholars program will create a seamless, articulated pipeline with activities and an integrated support structure among two educational levels to increase the number of students attaining degrees in STEM majors. The goals of the SOARS Scholars program are: 1) Develop a transfer and matriculation pathway model to increase persistence, retention, and graduation of native and transfer students in STEM; 2) Provide support services to strengthen and expand current practices to increase engagement, retention, and graduation of students in STEM, and 3) Provide an engaging and effective STEM learning environment (research, mentoring and enrichment).

Measurable Objectives:

* Strengthen student knowledge through research experiences and professional development activities annually
* Maintain a 90 percent program participates between the junior and senior year and 80 percent pursuing STEM graduate/career pathways
* Provide faculty research mentoring that will result in an 85 percent program satisfaction rate

The proposed project consists of the implementation of two activities specifically identified and carefully designed to achieve the objectives of increased enrollment representation and degree completion transfer and native students in STEM disciplines. Both activities will be informed through the collection and analysis of high quality and timely data in direct response to the program goals.

This proposal will provide support to prepare STEM students for the 21st century workforce by conducting formalized research and professional development programs. The research experience will allow junior, senior, and master’s level students to perform research activities in state-of-the art facilities. The professional development program will provide students with mentoring, research experiences, and career ready skills.

**TX - Prairie View Agricultural and Mechanical University**

Prairie View

Institutional Grant

P120A180114

Abstract

Prairie View Agricultural and Mechanical University (PVAMU), a Historically Black College and University (HBCU), seeks funding for a MSEIP (Minority Science and Engineering Improvement Program) institutional project entitled: *Enhancing Evidence-Based Pedagogies with Maker Culture in Science, Technology, Engineering, and Mathematics (STEM) Education.*

**The goal** of this project is to investigate the effectiveness of evidence-based learning and the integration of the Maker Culture into curriculum in a minority serving institution, through undergraduate courses designed to motivate students’ interests in hands-on and strengthen the aptitude of problem solving and life-long learning skills for the future United States STEM workforce.

**The target population** is the undergraduate students from PVAMU College of Engineering. The two participating departments, Engineering Technology and Electrical and Computer Engineering departments, have over 300 enrollment with 81 percent African Americans and 25 percent females.

**Proposed Activities** can be grouped into three categories: 1) design evidence based pedagogies with maker culture for in-classroom courses; 2) foster Maker Culture for out-classroom students clubs; and 3) promote faculty collaboration between minority serving institution and major institution. Through these activities, STEM teaching/learning quality and efficiency will be enhanced, and with faculty actively updating their pedagogies, this enhancement will be sustainable.

**Anticipated Results** include**:** (1) STEM faculty’s awareness of evidence-based pedagogies and willingness of using these pedagogies are increased; (2) Evidence-based maker culture teaching modules are developed and tested, which can be used in other STEM courses; (3) Students’ learning, interest, and retention in specific subjects are improved; and (4) The number of minority students, particularly minority women, in STEM fields are increased.

**Competitive Preference Priority**: The proposed project addresses the Competitive Preference Priority: Promoting Science, Technology, Engineering, and Mathematics (STEM) Education.

**TX - The University of Texas at El Paso**

El Paso, TX

Cooperative Grant

P120A180101

Abstract

The University of Texas at El Paso (UTEP) is currently seeking to increase the number of minority and woman students attaining green Science, Technology, Engineering, and Mathematics (STEM) degrees through network-curriculum-based efforts. Leveraging the expertise of Drexel University (DU) in Cyber Learning and Sustainability, UTEP and DU in this proposal collaboratively aim to increase the number of students entering STEM fields and successfully retain them by augmenting their interest towards STEM through tailored student centric activities addressing student comprehension and factors related to their educational experience.

The goals of the current project include: (1) developing cyber enabled courses and laboratories with Drexel University for enhancing green STEM learning; (2) encouraging students to engage in green STEM disciplines; (3) developing world-class online green STEM workforce best practices; (4) attracting and retaining STEM talent through a joint education environment; and (5) delivering coordinated and cohesive green STEM education programs through the **M**inority **IN**novation **E**ngineering **R**esearch for **S**tudent **S**uccess (**MINERSS**) Laboratory.

In order to meet these goals, the proposed work will develop a student-centric green STEM program tailored for augmenting student interest in STEM, establish mentor-mentee relationships among the students at the various institutions, launch a 3-D online learning community equipped with internet of things technologies, build an online learning community and repository for students, provide stipends and incentives to students to encourage continuity in degrees in STEM, create a university-high school student partnership, and building workshops and educational sessions every semester to inform the potential student community and parents to establish the importance of encouraging students to pursue careers in STEM.