**Project Abstracts for Fiscal Year 2021**

**Minority Science and Engineering Improvement Program**

**New Awards**

FY 2021 MSEIP PROJECT ABSTRACTS (ORGANIZED IN STATE ORDER)

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# #1

# AL - Alabama A&M University

## Normal, AL

## Institutional Grant

### P120A210012

**Enhancement of Minority Students’ Learning Outcomes and Success in STEM**

Abstract

Alabama Agricultural and Mechanical University (AAMU), a major HBCU and 1890 land-grant institution, is submitting this **Institutional Project Grant** application entitled “**Enhancement of Minority Students’ Learning Outcomes and Success in STEM**” to the Minority Science and Engineering Improvement Program (MSEIP) of the Department of Education. This application intends to address the **Competitive Preference Priority: Building Capacity for Remote Learning** and address student Mental Health Impact due to COVID-19 pandemic.

As the world is rapidly transitioning to a competitive, knowledge-based, global economy that is largely driven by science, technology and innovation, the success of many industries and business are increasingly dependent upon the employee’s competence in science, engineering and mathematics (STEM), critical thinking and problem solving. However, the traditional lecture-dominated teaching technique is incapable to achieve this need, cannot get students engaged in learning, which results in high failure and drop rates. To tackle this challenge, this project plans to enhance the engineering, technology and science curriculum through engaged student learning, and research integration. The overarching **goal** of this proposed project is to enhance sustainable, evidence-based, engaged student teaching and learning, increase remote learning capability, integrate student research, peer tutoring and career development activities, to improve students’ learning outcomes and success in STEM disciplines at AAMU. Specifically, the project seeks to accomplish this through fulfillment of the following four integrated and **specific objectives** within a three-year period: 1) Facilitate the adaptation of evidence-based pedagogies in STEM courses to improve students’ learning outcomes and critical thinking skills through engaged student learning, and build capacity for remote learning; 2) Study the effect of evidence-based pedagogies in STEM courses on students’ learning outcomes (cognitive and non-cognitive), critical thinking, success, retention, and graduation in STEM for HBCU minority student environment and remote learning; 3) Improve Peer-Tutoring, Career and Professional Development opportunity, and address Mental Health Impact due to COVID-19; and Broaden the undergraduate Student Research Experience in STEM to enhance student learning experience and value.

**Intellectual Merit Highlights:** In this project, evidence-based, student-centered, active instructional practices are employed to reform the traditional lecture-dominated courses to address the high attrition issues. Effectiveness of implemented pedagogies will also be studied. Faculty Development workshops will support the STEM faculties to implement effective pedagogies and build capability for remote teaching and learning. Peer tutoring and cyber-learning will engage students in informal learning environments. Career Development activities, multidisciplinary research and mentoring will further enhance student success. Interventions proposed will minimize student mental health impact.

**Anticipated Impacts:** The proposed project will facilitate to implement effective pedagogies in university-wide STEM disciplines (at least in 24 STEM courses by 12 faculties), enhance career and professional development activities and undergraduate research opportunities, and enhance remote learning capability. As a result, the undergraduate STEM programs at AAMU (having over 3000 STEM students) will be directly impacted through enhancement of student engagement and retention, their critical thinking abilities, self-confidence and motivation, and successful graduation of minority STEM graduates. They can pursue graduate education or join STEM workforce to increase diversity. As more than 50 percent of students at AAMU are minority females, this project also plans to serve as a pilot study on *engaging minority females*, a dismally underrepresented group, into the STEM disciplines with enhanced, student centered, active learning and research integration. New knowledge about effective pedagogies for the HBCU community and remote learning using technology will develop, and the minority STEM student passing rate is expected to increase by 10 percent.

# #2

# CA - California State University, Dominguez Hills Foundation

## Carson, CA

## Institutional Grant

### P120A210055

**Improving Undergraduate STEM Education through a Research Learning and Workforce Development Program**

Abstract

California State University, Dominguez Hills, is a minority/Hispanic-serving primarily undergraduate institution with the most diverse student population of the 25 Los Angeles County universities. Yet, the Physics department in the Department of the College of Natural and Behavioral Sciences, enrolls, retains and graduates less students compared to other STEM departments, particularly minority (80 percent minority with <5 percent women and <2 percent African Americans). Also, because Physics lacks an experimental transdisciplinary research curriculum, students and more so minority, too often graduate without having engaged in research. This prevents them from earning higher STEM degrees and be represented in the workforce and academia. Hence the STEM Technological Active Learning Program (STALP), specifically designed to prepare for STEM companies increasingly seeking employees with training in STEM, and to fulfill the following objectives: 1*) Transform* how Physics/Biophysics are taught by fully merging research and curriculum, integrating technology and digital content for students (synchronous and asynchronous VR, virtual labs, smart classrooms) and faculty (integrated remote teaching training/coaching and online tools, smart boards, innovative and equitable grading systems), and by engaging students actively in mentoring, recruiting high schoolers, practicing experimental research and obtaining internships; 2) *Increase* general enrollment, retention and graduation; 3) *Focus* on Objective 2 specifically and intentionally for minority; 4) *Prepare* students for the STEM workforce with collaborations with other departments and local community STEM companies. STALP is actively hands-on, focused on mentorship and advising, face-to-face and online hybrid, fully interdisciplinary and designed to support students more equitably. In this proposal, we intend to address both competitive preference priority areas in relation to our goals. We anticipate higher enrollment from our high school- to-college pipeline, better retention due to the more interactive design of the curriculum, and the representative faculty, and finally higher quality graduation and workforce preparedness thanks to the STEM collaborations and improved supporting structure of STALP.

# #3

# GA - Albany State University

## Albany, GA

## Institutional Grant

### P120A210069

**Enhance the Teaching/Learning Quality in STEM Fields by Computerizing General Physics Labs**

Abstract

Remotely located in the rural areas of southwest Georgia, Albany State University (ASU), as a Historically Black University (HBCU), aspires to excellence in teaching and learning. In order to realize that, some pressing needs such as revitalizing basic science education, particularly, service course-physics, should be addressed appropriately to enhance science learning outcomes for all STEMs students and beyond. Physics curricula will be revamped to stay current in STEM fields by integrating modern sensors, data acquisition technologies and graphing techniques into labs. Upgraded syllabi/redeveloped lab manuals along with virtual labs will be adopted by all physics and physical science faculty on both campuses of the institution to better prepare students with the skills needed for the current workforce. By adopting/supporting models that utilize hybrid and virtual environments and leveraging technology to advance student engagement and learning through effective use of the technology, the competitive preference priority, ‘building capacity for remote learning’ will be addressed. The intended project could lead to:

1. Enhanced quality of science teaching and learning in STEM and beyond;
2. Strengthened underrepresented students’ including women’s science learning outcomes and development of technology proficiency; and
3. Higher academic standards and more qualified professionals in STEM fields to meet the growing national and global workforce of the 21st century.

The project will impact about 1000 undergraduate students per year, the majority whom are underrepresented minorities and women. The proposed project is expected to increase our one-time physics/physical science course passing rate; improve A/B rates and reduce student withdrawal rates. The institution will sustain the successful strategies brought about by this project, beyond the grant period which will continue to positively impact science learning, persistence and success of underrepresented minority students, including women in STEM fields.

# #4

# LA - Southern University at Shreveport

## Shreveport, LA

## Institutional Grant

### P120A210065

**Department of Engineering and Technology’s (DoET), “Project Engineering and Technology: Broadening Participation and Academic Opportunities for Minorities in Engineering and Technology**

Abstract

Southern University at Shreveport (SUSLA), a public, historically black college, and university (**HBCU**) with 94 percent minority student population, proposes a Minority Science and Engineering Improvement Program Institutional Project (MSEIP) that seeks to reconceptualize and expand academic and career pathways in its engineering and technology program. Program expansion extends to secondary schooling offering engineering and technology credentials from secondary diploma through associate and bachelor degrees. This may be achieved by expanding access to engineering and technology curricula and laboratories for economically disadvantaged, under-represented minorities and rural community students through distance learning technologies and dual-enrollment opportunities, meeting the MSEIP Competitive Preference Priority. In order for the U.S. to remain competitive on the global stage, investments in human capital and an increase in the participation rate of under-represented minorities and rural communities must be centrally-thematic in STEM programs across the nation. The Department of Engineering and Technology’s (DoET), “*Project Engineering and Technology: Broadening Participation and Academic Opportunities for Minorities in Engineering and Technology*” (**Project EaT**), is a three- year project that will implement enhanced recruitment, academic enrichment, matriculation, and completion strategies for under-represented minorities who endeavor to realize their educational and employment goals in the science, technology, engineering, and mathematics (STEM) fields of engineering and technology. Project EaT’s driving force is in direct response to President Joe Biden’s “Build Back Better” initiatives and the STEM Education Coalition’s recommendation to “*expand the capacity and diversity of the STEM workforce pipeline and prepare more students for the best jobs of the future by working to raise achievement in the STEM fields.*” To that end, Project EaT’s overarching goal of strengthening the workforce pipeline with diverse, skilled graduates addresses the Coalition’s recommendation with the following three specific goals:

1. Create a sustainable pipeline of students to HBCU engineering and technology programs through recruitment and engagement of minorities and females; **2)** Build capacity for remote learning by modernizing engineering and technology lectures/labs by providing hybrid learning models and utilizing distance learning technologies to extend program delivery *(Competitive Priority);* and **3)** Improve STEM student achievement, retention, and degree attainment for target populations by cultivating job-embedded professional learning within the professoriate and by creating collaborative co-curricular programs for students.

Project EaT will accomplish the stated goals through the following objectives: (**1**) migration of SUSLA’s engineering and technology course curricula and degree offering to online platforms, (**2**) infuse technology in course offerings by providing an experiential, distance learning lab for problem-solving in the 21st century classroom, (**3**) develop and implement a 2-credit Introduction to Engineering and Technology II course that breaks the barrier to problem-solving in gateway engineering courses by connecting theory with the knowledge, skills, and abilities (KSAs) required by industry employers, and (**4**) increase awareness of education and career opportunities through outreach initiatives and recruitment aimed at improving participation of hard-to-reach, rural students, under-represented minorities, females, and students with disabilities in the engineering and technology sector.

By completing these objectives and realizing each goal, Project EaT addresses both priority areas of the Building Capacity for Remote Learning Competitive Preference Priority and will promote proficiency-based learning, aligning industry-based KSAs with student outcomes from laboratory courses. Project EaT also addresses the opportunity gap experienced by economically- disadvantaged families by affording the options of two-year educational attainment to employer or two to four-year degree attainment.

# #5

# MS - Jackson State University

## Jackson, MS

## Institutional Grant

### P120A210047

**Accelerating Collaboration and Curriculum Excellence for Longitudinal Student Success (ACCelSS)**

Abstract

A question routinely encountered in mentoring talented, intellectually curious Black and underrepresented minority (URM) students, especially those who enter college from under- resourced schools and communities is, “***What*** can I actually *do* with a degree in STEM?” Another is, “***Why*** should I enter a field whose value is unclear, whose courses cost a lot and aren’t what I imagined in high school, and which may take a graduate degree to out-earn a fast food franchise?” As pandemic shutdowns recede, however, industry recruitment drives offering apparently attractive wages and benefits are competing for the attention of potential workers with signing bonuses and other benefits unlikely to go unnoticed by financially strapped or struggling students. Especially given the frustrations many students experienced through online course activities and forfeited research opportunities, HBCU and other minority serving institution (MSI) STEM departments must redouble our efforts to engage talented underrepresented minority students, especially those most financially vulnerable and underprepared in STEM.

Black and URM students investing in a Jackson State University (JSU) education and aspiring to complete STEM degrees know jobs matter, and expect that the costs – including opportunity costs – of an education will yield rewarding careers. Many of these students attended vastly under-resourced K-12 school districts; in fact, half of all Black children in Mississippi now attend a school receiving a D or F, with Black children comprising 86 percent of children in D and 95 percent of children in F schools (Mannie; 2017). These students merit recognition for enrolling in college and aspiring to enter a STEM field. For many of these same students, however, COVID-19 exacerbated their STEM education’s costs.

***ACCelSS***, proposed by the JSU Department of Chemistry, Physics, and Atmospheric Sciences (CPAS), proposes to accelerate the engagement of JSU STEM students adversely impacted by pandemic experiences who might be reassessing their STEM program and career prospects. These students’ health and financial concerns are not exaggerated: Mississippi, has among the nation’s lowest rates of COVID vaccinations and economic opportunities. JSU STEM students deserve effective, strategic, innovative responses, responses worthy of and characterizing STEM.

***ACCelSS*** proposes to respond by a *hybrid framework of support designed to accelerate STEM student engagement throughout gatekeeper-gateway CPAS courses, which serve Biology and Engineering students as well as CPAS and other majors.* This robust system of supports will *build* on faculty efforts to implement inquiry-based pedagogies, *extend* hard-won student and faculty gains across COVID-19 in online teaching-and-learning, and *link* CPAS faculty and undergraduate students through incentivized collaborations in: STEM education research, creation of online support materials, assessment innovations, hybrid STEM outreach events, virtual reality lab immersion experiences, increased research opportunities, and newly implemented CPAS major concentrations that offer visibility, access, and preparation for tangible career pathways and opportunities.

***ACCelSS*** programming seeks, by its framework and the engagement it can generate, to serve both students stalled in gatekeeper courses famed for their ‘rigor’, and to advance the nation’s STEM ecosystem - through their achievements and those they inspire in others – out of its self-imposed enclaves and into unlimited insights and achievements.

# #6

# NY - Research Foundation CUNY on behalf of York College/CUNY

## Jamaica, NY

## Institutional Grant

### P120A210053

**The STEM Academy**

Abstract

The STEM Academy program at York College will serve a large public institution with an incredibly diverse student body, predominantly composed of minorities and women. Our long- term goal is to increase the commitment of underrepresented students to careers in STEM. Given that STEM has become integral to resolving many social and economic issues, we plan on leveraging the strength of STEM programs found at York College and its large number of underrepresented minority students to create a STEM training and research program. The objective of this 3-year proposal is to provide academic support, mentoring activities and research experiences for a yearly cohort of 20 underrepresented students (STEM Academy scholars), enabling them to thrive in their STEM gateway courses and beyond. We will also augment our STEM pedagogical support structure to positively impact non-Academy STEM students. Our rationale for this project is that successful implementation of the proposed plan will provide students with the technical, academic and professional skills necessary to graduate with a STEM degree, thus increasing the flow of underrepresented ethnic minorities, particularly minority women, into scientific and technological careers. We expect to accomplish our objective by pursuing the following three specific aims: **Objective 1: Increase the number of underrepresented minority students pursuing STEM degrees**. The program will provide students with the skills needed to transition easily to college, and provide instruction in basic biology, chemistry, computation and science communication through a summer bridge program and course-based research experience. **Objective 2: Maximize student academic performance in STEM gateway courses and prepare students to successfully graduate with STEM degrees.** To assist our STEM Academy scholars with excelling in their initial STEM courses and thus laying the groundwork for continued academic success, we will use Individual Development Plans to set academic and professional goals, and will assist them by providing support in their core STEM courses. **Objective 3 – Prepare students for successful careers in science and technology through intensive research experience and professional development**. We will guide students in honing the research and personal skills prized by STEM employers, by providing summer research experiences and professional development workshops. Together, this will help York build local capacity and permanent academic infrastructure improvement for serving the needs of STEM majors, including initiatives specifically designed for ethnic minorities, particularly minority women, interested in scientific and technological careers***.***

# #7

# NY - Research Foundation of CUNY - Medgar Evers College

## Brooklyn, NY

## Institutional Grant

### P120A210054

**Bridging the Gap between STEM and 21st Century Skills: An Interdisciplinary Institutional Project in Biology, Chemistry, Computer Science, Environmental Science, Mathematics and Physics**

Abstract

The Project Goal of ***Bridging the Gap* between STEM and 21st Century Skills: An Interdisciplinary Institutional Project in Biology, Chemistry, Computer Science, Environmental Science, Mathematics and Physics** is to establish a cohesive supporting educational infrastructure across STEM departments in the School of Science Health and Technology at Medgar Evers College (MEC) focused on career development and faculty professional development to enrich the interdisciplinary capacity among our STEM departments and leverages technology to improve distance learning capabilities. The long-term expected outcomes of this institutional improvement are to increase the number and educational preparedness of our minority STEM students, particularly minority women; improve their access to graduate or professional programs leading to rewarding STEM career; and develop an infrastructure for faculty professional development aimed at teaching in STEM. MEC is located in the Crown Heights section of Brooklyn and serves the predominantly African American and other underrepresented minorities (URM) from the surrounding community and other areas of NYC. About 92 percent of the students are minority, with about 82 percent being African American and 75 percent being minority women. The *Bridging the Gap* program is multi-faceted and meets the mission and goals of the MSEIP Program to increase the flow of URM students, particularly minority women, into rewarding STEM careers and decrease the serious disparity that continues to exist in careers in STEM; and is fully congruent with the mission and goals of MEC and our targeted STEM departments: Biology, Chemistry and Environmental Science, Mathematics, and Physics and Computer Science. The program also will address the competitive preference priority area, *Building Capacity for Remote Learning,* in order to decrease barriers impeding success of our URM STEM students and provide STEM faculty development activities to increase their ability to engage in and offer high-quality remote learning mechanisms for the students.

# #8

# PR - Inter American University of Puerto Rico - Metropolitan Campus

## San Juan, PR

## Institutional Grant

### P120A210014

**Advancing Competency-based Courses in E-learning for STEM Success program (ACCESS)**

Abstract

The Inter-American University of Puerto Rico – Metropolitan Campus (IAUPR-MC) proposes *Advancing Competency-based Courses in E-learning for STEM Success program (ACCESS)* will catalyze MC toward becoming a STEM remote learning university that produces equitable outcomes for Hispanic and low-income students. The proposed research-based project is designed to be an exceptional approach to increasing degree completion in STEM. It will build upon Colorado University’s PhET Interactive Simulation design, a nationally recognized design for transforming STEM remote teaching and learning. MC’s STEM ACCESS program will work with faculty and students to increase participation, persistence, and degree completion, through student experience from the first touch to goal attainment. Collaborative activities focus on smoothing and enriching the pathway for Hispanic students through culturally sensitive course design, equity- minded curricular and instructional improvements, and support for mental health activities to reduce non-academic, but equally problematic, barriers to degree completion. In addition, the ACCESS program will serve as a model to guide the complete institutional redesign of accessible STEM remote learning programs. The **goals** of the project are: (G1) Develop a competency-based remote learning STEM program to increase underrepresented minority students into scientific and technological careers; (G2) Strengthen remote learning through the development of culturally sensitive virtual laboratories and STEM course enrichment to increase active participation and readiness for STEM pathway; (G3) Improve and sustain faculty capacity building opportunities to create remote learning experiences that advance student engagement and learning through effective use of technology in a remote learning environment, and (G4) Strengthen students emotional intelligence to overcome the impact of COVID-19 on students’ mental health.

a**. Target Population**: Hispanic, underserved, and low-income, degree-seeking students in Puerto Rico with limited options in pursuing and completing STEM degrees. b. **Services/Proposed Activities**: 1) Develop Competency-based **remote classes and virtual laboratory using active collaborative learning (**NSF “signature” pedagogies) for five gateway STEM courses; 2) Competency-based work experiences for students 3) Job-embedded **Faculty development in remote learning tools,** and 4) Addressing COVID 19 mental health student stress by providing **Telehealth mobile app access.**

c. **Anticipated Results**: *Enrollment*: Increase by 10 percent in each of the STEM pathways (Chemistry, Math, Physics, and Computer Science). *Participation*: at least 1,500 Hispanic students will participate in grant-funded remote learning courses and Telehealth student support activities. *Gateway Success*: Increase the percentage of Hispanic students in STEM Pathways who complete gateway courses in Chemistry, Physics, and Microbiology by 10 points. *Persistence*: Increase persistence in the STEM Pathway by 10 points. *Degree Completion*: increase the percent of Hispanic STEM students graduating by 10 points.

MC’s ACCESS program responds to the **competitive preference priority** Building Capacity for Remote Learning in both areas: 1) Developing technological model for Building Capacity for Remote Learning by developing robust competency-based STEM gateway courses and laboratories; and 2) Providing personalized and job-embedded professional learning to build the capacity of educators to create remote learning experiences to advance student engagement and learning through effective use of technology.

# #9

# PR - The University of Puerto Rico in Ponce

## Ponce, PR

## Institutional Grant

### P120A210068

### GET by STEM III: MSEIP Continuity Cycle (GbS)

Abstract

The University of Puerto Rico in Ponce presents the project GET by STEM III: MSEIP Continuity Cycle (GbS). GET by STEM stands for Girls Engineering Trip by visiting STEM related disciplines industries across the island. According to the U.S. Department of Agriculture’s Animal and Plant Health Information Service, Puerto Rico (PR) is the third leading region in the U.S. for plant biotechnology research. Furthermore, according to the Puerto Rico Industrial and Development Company, PRIDCO, twelve (12) of the top twenty (20) pharmaceuticals and biotechnology companies around the world have manufacturing operations in PR. Seven (7) of the ten (10) selling medications in the world are produced in PR. These major industries are based on STEM foundations like aerospace, pharmaceutical, biotechnology, medical services, information technologies, electric/electronics, knowledge services, and apparel. Taking advantage of these facts, the Department of Engineering (DOE) of the University of Puerto Rico in Ponce (UPRP) has developed the MSEIP project GET by STEM. GbS relies on a group of college female students to visit at least 180 public and private high schools (GbS I and II have already impacted over 15,000) during the project’s period for recruiting not only for the DOE, but all the STEM related disciplines and to participate in the GbS Camp. **These numbers will be achieved by the MSEIP Continuity Cycle, a promoting innovative strategy with wide reaching recruiting technique (Competitive Priority 1)**. Finally, the GbS Camp will provide to high school female students with hands-on experiences in engineering, science, technology by assisting to the scientific intimacy of all of these industries. A road trip visiting STEM related industries across the island (STEM over Wheels), warmly welcomed, and nurtured only by female professionals of these industries. GbS will be the third MSEIP GET by STEM project resulting in a new generation of well-educated Hispanic females to be prepared for sciences, specifically in the engineering, mathematics, physics, biology and biotechnology fields.

# #10

# PR - The University of Puerto Rico - Rio Piedras Campus

## San Juan, PR

## Institutional Grant

### P120A210035

**Center for the Advancement of Hybrid Research Experiences for Underrepresented Students**

**(CAHREUS)**

Abstract

The Department of Chemistry, University of Puerto Rico, Rio Piedras Campus, requests a three-year Special Project to establish the **Center for the Advancement of Hybrid Research Experiences for Underrepresented Students (CAHREUS)**, in collaboration with researchers from the Molecular Sciences Research Center and the Materials Characterization Center**. *Target population:*** Integrating the Center into ongoing education and research efforts will establish a sustainable pipeline that will implement diverse professional skill sets into our undergraduate and graduate natural science students’ education. These skills will allow them to tackle fundamental problems of local communities and society at large while also preparing them for the future STEM workforce. The Center will facilitate the creation of hybrid learning environments that afford students with opportunities to make discoveries in nanotechnology. The project will engage undergraduate students in iterative research projects in which they will build upon aspects of their own and peers’ investigations to generate meaningful scientific contributions. ***Project goals:*** The main goals of MSEIP-CAHREUS are building capacity for remote learning and research and contribute to the diversity of the national workforce in Nanotechnology. The project's primary objective’s include improving student retention and success in STEM areas, making research accessible to a diverse group of students, and integrating them into first-class hybrid teaching and research efforts. The Center’s operation will leverage technology and hybrid/blended learning and enable high-quality digital learning content, applications, and tools. The Center’s approach will incorporate inquiry-based nanotechnology laboratory experiments and research experiences in the General, Bio-, Inorganic, Analytical, and Physical Chemistry laboratory curricula. More advanced students will serve as mentors to the teams of apprentice researchers. All students will develop a sense of the scientific method in a peer-mentored and "safe" collaborative setting where their progress will be supervised and supported by graduate students and faculty. ***Proposed activities:*** In collaboration with their faculty research mentors, graduate students will design modules to describe, initiate, and guide specific research projects in nanotechnology applications, such as public health, alternative energy, electronics, understanding nature, and developing intelligent materials. Since research projects will be shared at different levels by targeted courses, strict guidelines will be defined and implemented for data processing, notebook and report writing, and presentation of results. An Open Instrument Laboratory and a Resource and Learning Facility with online platforms will support the research teams. ***Anticipated results:*** Students will have access to the research modules, supplementary materials, computer-based activities to support method development, literature revision, data analysis, and scientific communication. CAHREUS will offer monthly webinars with scientist role models and underrepresented populations. Annual STEAM career orientations and job opportunities will be celebrated. Student teams will present their research findings at an annual symposium open to the science community and the general public. This project will establish a more robust network between the chemistry graduate and undergraduate programs. It will increase the number of students who can "access" authentic research in nanotechnology early in their baccalaureate, while promoting the excitement, practice, and rigor of scientific research laboratories.

# #11

# SC - Benedict College

## Columbia, SC

## Institutional Grant

### P120A210048

**Enhancing STEM Curriculum and Research in Intelligent Cyber- Physical Systems for Smart Cities (Intelligent CPS Cities)**

Abstract

Benedict College, a leader in STEM education amongst HBCU’s in South Carolina, request funding to strengthen our STEM curriculum and provide contemporary research experience in cybersecurity and pipeline to professional and graduate education in critical STEM areas. The main objectives of our program includes:

* Acquisition of instrumentation to strengthen our STEM programs;
* Curriculum Revision and Integration of these instrumentation into the curriculum to enhance student learning outcomes of Research into Cyber - Physical-Systems for Smart Cities (Intelligent CPS); and
* Collaborative Research Experience for Benedict College students and pipeline for graduate education pipeline at Clemson University and other collaborative institutions.

The curriculum revision of STEM programs and research in Cyber-Physical Stems are consistent with our institutional mission of enhancing our STEM education to increase minority retention, graduation and graduate education in STEM. We will leverage existing research-driven and industry-supported pedagogy models that utilize our expanding smart city-related research infrastructure at Benedict College, supported by the Center for Connected Multimodal Mobility (C2M2) at Clemson University. We will engage qualifying students as peer mentors to provide academic support to low performing students, to increase our retention and graduation rates. Results obtained from successful implementation of this program will be shared amongst other HBCU's and in professional conferences.

# #12

# TN – Fisk University

## Nashville, TN

## Institutional Grant

### P120A210067

**Science Technology Engineering and Mathematics through Rocketry, Electronics, Engagement, and Coding (STEM-TREEC) Program**

Abstract

The proposed MSEIP project is an **Institutional Project Grant**. The goal of this **Institutional Project** is the creation of the Fisk University Science Technology Engineering and Mathematics through Rocketry, Electronics, Engagement, and Coding (STEM-TREEC) Program. The STEM- TREEC program will increase retention of Mathematics intensive STEM majors by leveraging Course Cased Research classes, expanded use of modern technology in Physics education Laboratories, student/peer tutoring, and project-based learning. STEM-TREEC will expand upon the capabilities of the Fisk Altitude Achievement Missile Team (FAAMT), a solid propellant rocket program formed in 2006 to compete in the NASA University Student Launch Initiative (USLI) competition. Fisk will bring value-added by creating an Applied Physics concentration within the physics major, which is analogous to an engineering program. Fisk will develop two applied science courses, one freshman level and one upper level for would-be STEM majors who are undeclared, and an upper-level Applied Physics course for Physics, Chemistry, Mathematics, and Computer Programming majors. With Physics being a required science course for all STEM majors, this will allow the STEM-TREEC program the opportunity to impact the largest number of STEM majors. Research suggests such a program should result in an increased number of students continuing to graduation. The applied physics courses and FAAMT will allow participants to work on relevant projects including solid/liquid propellant rockets, avionics, and sensor integration, terrestrial rover development, high altitude balloon atmospheric studies, and extraterrestrial resource utilization. Fisk will also host an eight-week summer research program for rising sophomore students including a math boot camp as part of its curriculum to strengthen participants' comprehension and application of mathematics principles salient in STEM careers. STEM-TREEC will also enhance Fisk’s Distance Learning capabilities by creating the Fisk Faculty Online Resource Center for online instruction.

# #13

# TX - The University of Texas at El Paso

## El Paso, TX

## Institutional Grant

### P120A210030

**STEMSHINE: Closing the Skills Gap in STEM Education**

Abstract

A minority-serving institution located in far west Texas proposes an MSEIP institutional project entitled **STEMSHINE: Closing the Skills Gap in STEM Education***,* focusing on innovations to improve Hispanic students' success. Hispanic graduates, especially women, are highly underrepresented in the STEM workforce, making up only 8 percent of STEM workers compared with 17 percent of total employment across all occupations. As a nation, only 29 percent of women are in the STEM workforce; and UTEP's number of undergraduate female STEM student graduates is a tawdry 19 percent, markedly lower than the national average of women in STEM careers. The need for change is readily apparent to support the US industry's acuity that diversity drives innovation. With this in mind, the STEMSHINE project has five goals: 1) To increase minority student enrollment in STEM; 2) To increase participating minority students’ interest and academic success in STEM; 3) To improve STEM content, applications and tools leveraging technology [Competitive Priority (a)]; 4) To expand and strengthen engaging remote learning experiences, through providing personalized and job-embedded development [Competitive Priority (b)]); and 5) To offer interventions and preventive strategies addressing the mental health impact of the COVID-19 pandemic. These goals are to be achieved through building capacity for remote learning, incorporating digital content, applications and tools, STEM mentoring and student support services, tutoring, and local and online learning communities to build academic and professional skills needed for 21st century [Industry 4.0] STEM workforce competencies. Moreover, the STEMSHINE project provides research-based universal game design models that leverage technology, furnishing high-quality tools, applications, and blended competency-based education, which have broad application for minority-serving institutions.