

**Project Abstracts for Fiscal
Year 2022**

**Minority Science and Engineering
Improvement Program**

New Awards

Table of Contents

#1 MS - Alcorn State University	
Lorman, MS	
Institutional Grant	
P120A220062.....	6
#2 LA - Southern University at New Orleans	
New Orleans, LA	
Institutional Grant	
P120A220005.....	7
#3 PR - Inter American University of Puerto Rico - San German Campus	
San Juan, PR	
Institutional Grant	
P120A220029.....	8
#4 NY - Research Foundation CUNY on behalf of NYC College of Technology	
Brooklyn, NY	
Institutional Grant	
P120A220033.....	9
#5 NC - Johnson C. Smith University	
Charlotte, NC	
Institutional Grant	
P120A220051.....	10
#6 NC - North Carolina Central University	
Durham, NC	
Special Projects Grant	
P120A220013.....	11
#7 TX - The University of Texas Rio Grande Valley	
Edinburg, TX	
Institutional Grant	
P120A220056.....	12
#8 TX - Texas A&M University - Corpus Christi	
Corpus Christi, TX	
Institutional Grant	
P120A220040.....	13
#9 SC - Claflin University	
Orangeburg, SC	
Special Projects Grant	
P120A220018.....	14

#10 TX – The University of Texas – El Paso	
El Paso, TX	
Institutional Grant	
P120A210008.....	15
#11 NC - North Carolina A&T State University	
Greensboro, NC	
Institutional Grant	
P120A220019.....	16
#12 TN - Lemoyne-Owen College	
Memphis, TN	
Institutional Grant	
P120A220064.....	17
#13 IL - Dominican University	
River Forest, IL	
Institutional Grant	
P120A220016.....	18
#14 CT - Albertus Magnus College	
New Haven, CT	
Institutional Grant	
P120A220010.....	19
#15 NY - Research Foundation CUNY on behalf of York College CUNY	
Jamaica, NY	
Institutional Grant	
P120A220050.....	21
#16 - TX - Prairie View A&M University	
Prairie View, TX	
Institutional Grant	
P120A210017.....	22
#17 FL - Ana G. Mendez University	
Orlando, FL	
Institutional Grant	
P120A220026.....	24
#18 TX - The University of Houston - Downtown	
Houston, TX	
Institutional Grant	
P120A220015.....	25
#19 - PR - Inter American University of Puerto Rico - Aguadilla	
San Juan, PR	

Institutional Grant	
P120A210060.....	26
#20 AL - Alabama A&M University	
Huntsville, AL	
Institutional	
P120A220023.....	28
#21 TX - Texas A&M University - Kingsville	
Kingsville, TX	
Institutional Grant	
P120A220041.....	29
#22 AL - Alabama State University	
Montgomery, AL	
Institutional Grant	
P120A220003.....	30
#23 NY - Research Foundation of CUNY on behalf of Lehman College	
Bronx, NY	
Institutional Grant	
P120A220038.....	31
#24 MS - Jackson State University	
Jackson, MS	
Special Projects Grant	
P120A220052.....	33
#25 FL - Miami Dade College	
Miami, FL	
Institutional Grant	
P120A220021.....	35
#26 AL - Oakwood University	
Huntsville, AL	
Institutional Grant	
P120A220001.....	36
#27 TN - Tennessee State University	
Nashville, TN	
Special Projects Grant	
P120A220063.....	38
#28 GA - Andrew College	
Cuthbert, GA	
Institutional Grant	
P120A220007.....	39

#29 TX - The University of Texas at El Paso

El Paso, TX

Cooperative Grant

P120A220044.....40

#1 MS - Alcorn State University
Lorman, MS
Institutional Grant
P120A220062

Abstract

Project Design: This application is for an Institutional Project grant. The project will focus on 1) improving college readiness among high school students by exposing high school teachers to a summer STEM workshop that emphasizes inquiry based and cooperative learning, innovative use of technology and interactive course material; and 2) improve retention, persistence, and graduation from Alcorn State University through the development of an internship program with four institutions and six high schools infused with inquiry based learning, cooperative learning, and research opportunities.

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.

Competitive Preference Priorities:

Competitive Preference Priority (a) by utilizing interactive videoconferencing to deliver professional development, student dual credit courses, and summer immersion in STEM via interactive videoconferencing.

Competitive Preference Priority (b) by providing internships at science-based facilities and Institutes of Higher Education research centers that will provide personalized and job-embedded professional learning.

Performance Measure 1.1.1: An improvement of average ACT STEM scores of the participating high school districts by 0.5 percentage points by May 2024.

Performance Measure 1.1.2: A seven percentage point increase in Science Proficiency (Biology End of Course Test) for participating high schools from the 2018-2019 baseline of 32.3 percent by May 2024.

Performance Measure 1.1.3: Increase STEM content and pedagogy knowledge of Teachers by 15 percent as measured by pre-and post-tests and surveys of teacher knowledge after finishing the STEM workshop.

Performance Measure 1.2.1: An 8 percent reduction in the percent of students who require remedial or transitional courses.

Performance Measure 2.1.1: Students have greater retention of academic knowledge as evidenced by a 5 percent increase in GRE scores by September 2024.

Performance Measure 2.1.2: A six 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 2024.

Performance Measure 2.1.3: (MSEIP GPRA Performance Measure 1) A 4 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.

Performance Measure 2.1.4: (MSEIP GPRA Performance Measure 2) 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 2024.

#2 LA - Southern University at New Orleans
New Orleans, LA
Institutional Grant
P120A220005

Abstract

Southern University at New Orleans (SUNO) is proposing Renaissance In STEM Education (**RISE**) grant which we envision to have a long-term and sustainable effect on the quality of STEM education, research, and institutional resources for underrepresented minorities and women undergraduate students. SUNO is a coeducational institution serving 2,309 students (Fall 2019; Undergraduate students 1,894 among which 72 percent female; 83 percent Black or African American; 42 percent non-traditional; and 7 percent formally registered with the office of disabled services. Due to severe lack of underrepresented minorities and women in STEM fields, including biology and mathematics, we recognized the need of integrative, interdisciplinary, and technology-based education and basic research skills (virtual and in-person) for students at SUNO and their fulltime engagement in scientific research projects during summer. The goal of this proposal is to provide post-COVID-19 opportunities for the rebirth and rejuvenation of STEM education and research at SUNO. It is anticipated that the outcome of this project will provide students with a sense of belonging, worth, and competence. The measurable objectives of this project, in agreement with Competitive Preference Priority (Building Capacity for remote Learning a and b), are to: (i) Provide academic and research stipends to Biology and Mathematics majors, (ii) Provide tutoring in gatekeeper STEM courses, (iii) Enhance the participation of undergraduate students by adopting and supporting models that leverage technology (in-person, hybrid and on-line in synchronous or asynchronous modes) in teaching and research by providing high- quality digital competency-based remote learning content, applications, and or tools that are accessible to all including individuals with disabilities, (iv) Continue and expand collaborations with research institutions and user facilities, (v) Conduct webinars with collaborators, (vi) Enhance the participation of STEM students and faculty at scientific conferences (virtual and in-person) to disseminate research findings, (vii) Enhance technical writing skills, (viii) Enhance oral presentation skills, (ix) Participate in outreach activities, and (x) Recapture productivity, zeal, and collaboration that was lost during COVID-19. We are confident that these efforts will rejuvenate and enhance recruitment, enrollment, retention, and completion of B.S. degree programs in biology and mathematics. From our experience, these objectives are expected to result in significantly reduced graduation time (compared to the institutional average of over six years) for students, increase in graduate/professional school admissions, and more career choices for students in STEM fields in post-COVID-19 pandemic era.

In addition to formative and summative evaluations by the Internal Advisory Committee (IAC) at SUNO, program activities will be evaluated annually by a team of independent external evaluators based on performance indicators set forth at the beginning of the project. The main expected outcome of the project will be a marked improvement in academic quality, undergraduate research, improvement in the number of completers, faculty development, and improvement in the long-range departmental infrastructure that will result in advanced training of minority students and increase in the number of women STEM graduates who will pursue advanced STEM degrees or join the STEM workforce. As a direct result of the sound academic foundation, education and research skills they received through this project, graduating scholars will be well-trained and equipped to contribute to society as productive, thoughtful, and capable citizens who can serve effectively in their chosen STEM fields. The proposed MSEIP RISE grant will result in rebirth, rejuvenation, and enrichment of STEM programs on our campus, especially after the negative impact of COVID-19.

#3 PR - Inter American University of Puerto Rico - San German Campus
San Juan, PR
Institutional Grant
P120A220029

Abstract

The Inter American University of Puerto Rico, San Germán (SGC) and Bayamón Campuses (BYC) propose the integration of Project/Problem-Based-Learning (PBL/PjBL) and STEM research methodologies to augment the hybrid education experiences in STEM labs for Hispanic students. The program aims to improve the wellness, mental health, retention, and self-efficacy in STEM lab skills with academic excellences in the context of a hybrid education. It is based on professional development, collaboration and sharing of best practices by discipline to design curricula and implement in selected courses. The best practices will be available for application on both campuses and for extension to other courses and institutions.

This program addresses problems in STEM education that are both old (success of Hispanic students in STEM degree programs, PBL/PjBL) and new (reduced enrollment and reduced skill level due to learning loss during the pandemic) through innovation and collaboration. Specific goals are: 1) to continue a history of collaboration between SGC and BYC to promote an efficient resource sharing, and improved delivery of a hybrid education to impact STEM courses; 2) to conduct a Summer PBL/PjBL and Hybrid Laboratory Professional Development Meeting (HyLab-INTER) that provides interaction and feedback between experts, faculty and students, to present solutions to the online laboratories challenges; and 3) to design and implement better hybrid laboratory experiences (in-person and online) that leverage the newly gained online instruction skills, simulation tools and hybrid classrooms, founded on pertinent research and learning methodologies connected to the scientific theory, to be shared for the permanent adoption at the University.

#4 NY - Research Foundation CUNY on behalf of NYC College of Technology
Brooklyn, NY
Institutional Grant
P120A220033

Abstract

New York City College of Technology (City Tech) is the designated senior college of technology for the City University of New York (CUNY), the nation's largest urban public university system serving more than 275,000 students across 25 campuses. City Tech's mission is to provide broad access to high quality technological and professional education for a diverse urban population. In fall 2019, it had a total student enrollment of 17,036, with 34 percent of students self-identified as Hispanic, 29 percent as Black (non-Hispanic), 20 percent as Asian, and 10 percent as White; the student body reported 145 different countries of origin.

While City Tech excels at providing inquiry-driven and experiential learning capstone opportunities for advanced STEM students, the college struggles with moving students successfully through foundational STEM courses. Early indicators from the pandemic period are troubling, with fall-to-spring persistence, already a concern, declining steeply. In response, the college has designed "Connect the Dots: Digital Open Tools and Supports for Student Success in STEM," a three-year intervention designed to mitigate students' learning loss in mathematics and help prevent attrition in related STEM fields. The project's objectives are:

- Objective 1: (Overarching Goal): Improve student success in computationally-based courses that are essential for STEM careers.
- Objective 2: Help students connect the dots between mathematics and other STEM disciplines by providing ready access to high quality freely-available digital tools and open educational resources (OER), supported by peer tutoring.
- Objective 3: Institutionalize the adoption of project OER and increase their pedagogical effectiveness by providing synchronous and asynchronous professional development for faculty teaching the courses concerned.

These objectives will be achieved through a set of integrated activities that build on City Tech's expertise in the development of open tools and OER, and the team's extensive experience working with and supporting students and faculty before and during the pandemic. Faculty in Mathematics will work with STEM Liaisons to develop OER that help students "connect the dots" between foundational math concepts and their STEM coursework. The OER will consist of self-paced review modules and STEM applications delivered via WeBWork, a free and open source online STEM assessment platform, and the OpenLab, City Tech's open online community. Two undergraduate research students each year will provide input on the developed materials and study the impact of the OER. Faculty teaching the targeted courses will be introduced to best practices for using the OER with their students via a flexible professional development program consisting of in-person sessions and self-paced modules. Students in the targeted courses will receive peer tutoring on the OER. Our project addresses both priority areas (a) and (b) under the Competitive Preference Priority, *Building Capacity for Remote Learning*.

The project will offer digital tools and supports to more than 1,300 students in four high-enrollment courses in Physics and Computer Systems Technology during the grant period; we anticipate that at least 700 students will use the materials annually thereafter. Because all tools and resources are openly and freely available, they can be used and adapted by others at City Tech and beyond, amplifying the impact of the grant funds.

#5 NC - Johnson C. Smith University
Charlotte, NC
Institutional Grant
P120A220051

Abstract

Over the past decade, the university has made significant progress in addressing the underrepresentation of minorities in the STEM field. In 2014, Johnson C. Smith University was named by HBCU Digest as one of the top performing universities for STEM education. This MSEIP program at Johnson C. Smith University will embed industry-recognized credentials across the STEM College, cultivate students' remote learning/working ability, and strengthen Faculty's capacity to effectively teach online courses.

Through a multi-prong strategy, we will: increase the number of students majoring in STEM by 20 percent, implement STEM experiences to strengthen student's confidence and community around a major, expand STEM students' employability, and support student's mental health.

Proposed Activities:

As part of the MSEIP program at Johnson C. Smith University, we outlined six objectives to achieve our goals and to primarily impact 150 students per year. The program will be targeted towards minority incoming freshman to rising seniors who major or are interested in a STEM. The program objectives are to increase STEM Student attainment of industry-recognized credentials; increase STEM Enrollment; increase number of STEM graduates; increase STEM student retention; increase STEM student employability; and increase STEM online courses. To accomplish these objectives, we propose the follow activities: STEM Immersion program, STEM Faculty Summer Online Teaching Institute, Experiential Learning; in-demand skills training in STEM fields. Additionally, some of the proposed activities such as mental health interventions and preventions benefit all students at JCSU and community night would impact all students interested in STEM.

Anticipated Results:

The MSEIP Program at Johnson C. Smith University will achieve the following results: increased enrollment in STEM majors by 20 percent; online STEM degree program; increased STEM retention from 63 percent to 68 percent; increased STEM six-year graduation from 65 percent to 72 percent.

Competitive Preference Priorities: The MSEIP Program will address both competitive priorities.

#6 NC - North Carolina Central University
Durham, NC
Special Projects Grant
P120A220013

Abstract

The project, “*Promoting Science Entrepreneurship Education at North Carolina Central University*”, is a creative approach to producing highly skilled, innovative STEM graduates from underrepresented minority populations. The goals of the project are:

- Goal 1. Increase enrollment of underrepresented minority students in STEM degree programs.
- Goal 2. Increase persistence rates of underrepresented minority students in STEM degree programs.
- Goal 3. Develop students from underrepresented minority populations into highly skilled STEM professional who can create and innovate.

The primary objectives for realizing project goals are:

- Objective 1. Provide proactive academic advising to freshman and sophomore STEM majors.
- Objective 2. Provide project-based learning (PBL) experiences to freshman STEM majors with authentic, real-world problems to stimulate creative solutions.
- Objective 3. Provide structured undergraduate research training and professional development to STEM majors.
- Objective 4. Create and provide undergraduate science entrepreneurship education program to STEM majors.
- Objective 5. Provide programming that address the impact of COVID-19 pandemic on the mental health and well-being of STEM majors.

The core concept guiding our MSEIP Special Project is that hands-on, practice-based experiences in research and discovery, scientific making, design skills training and entrepreneurial thinking provided to STEM majors engages, motivates, and stimulates them to be creative, to persist, and to become self-directed learners. Key activities that will achieve project objectives are: (I) STEM Recruitment and Proactive Advising; (II) Project- Based Learning (PBL) Engagement; (III) STEM Undergraduate Research (SUR); (IV) Entrepreneurial Thinking & Science Entrepreneurship (ETSE); (V) Mental Health and Well-Being Awareness.

These strategies will directly impact approximately 347 students per year and will improve the enrollment and persistence in the STEM majors at NCCU by: increasing STEM freshman enrollment by 7 percent; increasing first-year STEM retention to 70 percent; increasing persistence to 45 percent into year 3 and 40 percent into year 4; develop science entrepreneurship co-curricular education; and enhances entrepreneurial thinking development of 92 STEM majors.

Competitive preference priority used for this application:
Competitive Preference Priority— *Building Capacity for Remote Learning*.

Priority Area: Adopting and supporting models that leverage technology and provide high-quality digital learning content, applications, and tools.

#7 TX - The University of Texas Rio Grande Valley
Edinburg, TX
Institutional Grant
P120A220056

Abstract

A three-year comprehensive engineering education improvement program is proposed by The University of Texas Rio Grande Valley (UTRGV) to increase the *gender diversity, success rate and graduate study rate* of Electrical and Computer Engineering degrees in the lower Rio Grande Valley region in south Texas. The *main goals* of our MSEIP program are to: 1) increase the graduate study rate (undergraduates that continue their graduate study) of Hispanic engineering graduates from the 14.9 percent average rate of 2014-2018 by 10 percent; 2) to increase by 5 percent the percentage of Hispanic women engineering students in the Electrical and Computer Engineering program from the current 10.1 percent in May 2021, and 3) to improve the electrical and computer engineering graduate success rate (3.0+ accumulated GPA at graduation) by 10 percent in three years. Specifically, the project has proposed strategies to address COVID-19 pandemic impact by building capacity for remote Learning and providing flexible teaching modalities to advance student engagement and learning experience. The program will maintain representation of underrepresented Hispanic students at a rate of no less than 85 percent. Targeted students include both current engineering students and those pending enrollment, and the pro-engineering students in local school districts.

This program will contribute to meeting the educational and professional work force needs in south Texas and our nation by training quality STEM degrees in engineering. The program will affect long-range improvement in science and engineering education at predominantly minority institutions in quantity and quality, and increase the flow of underrepresented Hispanic groups, particularly Hispanic women, into scientific and technological careers.

#8 TX - Texas A&M University - Corpus Christi
Corpus Christi, TX
Institutional Grant
P120A220040

Abstract

Texas A&M University-Corpus Christi (TAMUCC)- a federally designated Hispanic-Serving Institution (HSI), located in Southern Texas proposes an MSEIP institutional project ***Developing Evidence-Based Learning Environment for Success in STEM (DEBLES): Increasing the Retention of Minorities and Women***, designed to address the problem of lack of preparedness in mathematics to increase retention and graduation of minorities and women in STEM. Our **aim** is to retain and graduate almost every, if not every, student in STEM. DEBLES has four **specific goals**: (1) Develop theory-informed learning communities that promote active and collaborative learning in the first-year gateway mathematics course for STEM majors; (2) Strengthen capacities of undergraduate and graduate Teaching Assistants; (3) Conduct research to generate knowledge; and (4) Disseminate and promote evidence-based strategies for collaboration and interaction.

The project **activities** include: 1) Transform first-year “gatekeeping” courses to “gateway” courses through the development of student learning communities based on weekly 2-hour workshops for students, integrating designs especially successful at MSIs; 2) Provide mentoring, advising, and other support services to students in STEM; and 3) Develop seminars to support theory-based instruction, a peer-mentoring support system, and a faculty mentoring system to increase student retention and success. The **target population** is around 1000 students per year enrolled in the STEM majors taking the gateway math course precalculus. We **anticipate** an increase in retention rate by ten percent and a decrease in attrition rate by fifteen percent over the period of three years of the proposed effort. The proposed project is expected to **contribute** new knowledge and develop evidence-based and evidence-generating approaches. The proposed program is **highly cost-effective** as the cost per student is only \$101 per student per year serving around 1000 students per year during the project period. This MSEIP Project addresses both Competitive Preference Priority One and Two.

#9 SC - Claflin University
Orangeburg, SC
Special Projects Grant
P120A220018

Abstract

The goal of the proposed project is to better prepare the STEM major students of Claflin University (CU) for more advanced studies or careers upon graduation, and to increase the retention and graduation rates of STEM Curriculum of CU. CU has urgent needs to lesson negative impacts of the COVID-19 pandemic on its students' mental health; and to increase the retention and graduation rate of STEM majors. The low retention rate is directly related to failurerates in the freshmen core courses, and partially related to disruptions to living and learning patterns caused by COVID-19. Furthermore, previous research, experience, data, and feedback from students indicated that amount of mentor-protégé contact was positively correlated with retention rate. According to root cause analysis, the project will target STEM students at CU, andprovide them academic, financial and mental support to meet CU's educational needs.

The proposed project does address the Competitive Preference Priority: (1) a Hybrid Supplemental Instruction (HSI) model will be created and implemented to STEM major core courses. This model will leverage CU's current IT Infrastructure to implement online and hybrid (online and in-classroom synchronously) SI service, which make SI service more accessible. Furthermore, the HSI model will advance competency-based education since this model is student-focused. With a fixed SI-leader-lead study group, the SI leader is required to and able to identify specific learning outcomes, and students have the opportunity to demonstrate their learned knowledge and skills, and attempt a given competency multiple times and receive continuous feedback from SI leader. (2) This project will implement a summer camp. Parts of learning activities will be through a social networking platform established by this project - "CU Learning Community for STEM", where our students are able to learn and communicate with peers and teachers remotely, and the learning contents are accessible for follower students.

#10 TX – The University of Texas – El Paso
El Paso, TX
Institutional Grant
P120A210008

Abstract

The recent boom in computer science [CS] enrollment in higher education is not enough to fill available jobs, and the Bureau of Labor Statistics projects the number of computing-related occupations will continue to grow faster than the current rate of CS graduates. To meet this demand, The University of Texas at El Paso (UTEP) proposes an Institutional Project to increase the capacity of the UTEP Department of Computer Science to support Hispanic students, especially Latinas, who become certified to teach secondary computer science. The objectives to meet this goal are to: (1) design, develop, and implement a Bachelor of Science in Computer Science Education degree plan with a minor in secondary education; (2) recruit and retain a minimum of 40 Hispanic computer science majors who are seeking computer science teacher certification, retaining 85 percent by Year 3; and (3) integrate, into STEM faculty professional development, methods and technology for remote teaching and learning to include remote/hybrid support for Universal Design for Learning and English Learners, which addresses the Competitive Preference Priority: Building capacity for remote learning.

To meet Objective 1, faculty from the College of Education and the Department of Computer Science will define the flow, required courses and relevant content, and elective courses for the proposed degree plan; the finalized degree plan proposal will be submitted to the appropriate university curriculum committees for approval at which time the proposal will be submitted to the Texas Higher Education Coordinating Board for final approval. To meet Objective 2, the project team will develop promotional materials and a recruiting plan to recruit Hispanic undergraduates into the program where they will be supported from their first year through graduation, resulting in the development of a professional learning community. Finally, in coordination with the UTEP Center for Faculty Leadership and Professional Development, a 2-day STEM faculty professional development workshop will be held each year of the grant for up to 25 STEM faculty members each year to support their pedagogical development to provide high quality instruction for remote learning, integrating state-of-the-art technology to fully engage students and specialized instruction in working with English Language Learners and students with special needs.

Expected outcomes include an established Bachelor of Science degree in the UTEP Department of Computer Science with sufficient enrollment to attract more secondary students in computer science, who will seek scientific and technological careers; 40 Hispanic students who will major in the new degree program; a minimum of 34 graduates of the new degree program who will be certified to teach secondary CS; and over 25 STEM faculty who will be prepared to deliver hybrid/blended instruction using state-of-the-art technology to maximize learning. The proposed project is endorsed by the UTEP Provost and deans of the Colleges of Education and Engineering; the project also has the strong support of two national organizations that support computer science education — CSforAll and Microsoft TechSpark.

#11 NC - North Carolina A&T State University
Greensboro, NC
Institutional Grant
P120A220019

Abstract

Increasing the pool of qualified workers in Science, Technology, Engineering, and Mathematics (STEM) areas has become one of the nation's key priorities, as those professions are the backbone of innovation and critical to our country's economic future. According to the US Bureau of Labor Statistics, only 6 percent of U.S. workers are employed in STEM fields, and they are responsible for more than half of our sustained economic expansion. Recognizing the need for greater numbers of students to pursue degrees in STEM disciplines, specifically--robotics, cybersecurity, artificial intelligence, machine learning and data analytics, NC A&T State University's College of Science of Technology propose a strategic initiative that cultivates STEM talent from an under-utilized resource, minority-serving institutions (MSIs). The Advancing Retention through Research Opportunities for Workforce Development in STEM (ARROWS) proposal initiative will bring several programs and faculty experts together to collaborate to improve mentorship, recruitment, retention, career preparation and job placement for these underserved populations. When coordinated, this creates a pipeline that advances students from high school to university, then onto the STEM workforce. Our investigation will build knowledge with respect to STEM education by evaluation the effectiveness of our four objectives:

1. **Recruit:** Grow student's interest in robotics, artificial intelligence, machine learning, cybersecurity, and data analytics. Task associated with achieving this objective included recruiting high school students for our STEM program, Developing and Retaining Talent for STEM (DARTS) summer academy, that exposes them to these majors.
2. **Support:** Impart training in robotics/autonomy, cybersecurity, AI, ML, and data analytics. Task associated with this objective include having students participate in undergraduate research via remote learning or in-person with faculty or Department of Education (DoED) mentors in these designated research areas.
3. **Connect:** Enhancing partnerships between MSIs and DoED. Tasks associated with accomplishing this objective include hosting annual undergraduate research symposiums that showcases student STEM projects. Summer Academy leaders, faculty project mentors and DoED presentations at annual symposiums will disseminate information about DoED STEM opportunities.

Completing the objectives will produce the following anticipated outcomes: First, more students from underserved populations will be interested in pursuing artificial intelligence, machine learning, robotics, data analytics and cybersecurity careers. Second, retention and self-efficacy in those disciplines will improve. Third and finally, partnerships between MSI's and DoED have increased. Upon successful completion of this project, we will have established a model for multi-institutional collaborations to simultaneously improve our nation's STEM talent ecosystem. DoED-relevant industry in turn will benefit from having a qualified and more diverse talent pool of current and future ARROWS participants: DoED will be better positioned to diversify its workforce and therefore its backgrounds and perspectives, leading to increased diversity of thought, thus encouraging more effective and successful problem-solving, strategic planning, and innovation. In response to COVID-19, which has moved academia as a whole to implement alternative education platforms; some of our research platforms will adopt Blackboard Collaborator or Zoom for hybrid/blended learning and provide high-quality digital learning content to transfer knowledge and address the competitive preference priority: Building Capacity for Remote Learning.

#12 TN - Lemoyne-Owen College
Memphis, TN
Institutional Grant
P120A220064

Abstract

The overarching goal of this project is in alignment with the purpose of the MSEIP program: ***To contribute to the development and increase the number of African Americans who graduate from LeMoyne-Owen College (LOC) and enter into the STEM workforce.***

The specific and measurable objectives of the project are: 1) Increase student engagement through curricular and co-curricular STEM activities; 2) To increase the competency with which students are able to communicate scientific concepts, and 3) To increase the number of STEM students being retained by 10 percent each year.

LOC is a private HBCU with a student body that is 97+ percent African American and 60+ percent female. This project will specifically target underclass STEM majors by making use of our existing science outreach program, *Science on Wheels (SOW)*, to engage students in the STEM disciplines. Students will serve as STEM Ambassadors in the *SOW* Mobile Lab by leading the modules at elementary school site visits as well as during public events. Engagement opportunities for academically underprepared freshmen are limited, therefore, this project aims to broaden participation of first-year STEM students. We propose that connectedness to the Division early on through increased engagement in STEM activities will increase the STEM student retention rates going forward. This project will also make use of technology to include a 2-week intensive hybrid Biology Bootcamp to address some of the deficits and help students make a successful transition from the expectations of high school to those of college [Competitive Priority 1a]. In addition to providing opportunities for engagement, we propose that this project will nurture soft skill development for students and provide them with an outlet to practice them in a non-threatening environment. Increasingly, employers are searching for applicants who have exceptional soft skill qualities, even above their science expertise.

#13 IL - Dominican University
River Forest, IL
Institutional Grant
P120A220016

Abstract

Dominican University (DU) addresses the competitive preference priority, Building Capacity for Remote Learning, through its project entitled *Building the Digital Bridge to Emerging Careers for Women and Underrepresented Minority Students Through Technology-Driven Instruction*.

Dominican University's overarching project goal is to increase the number and intentional preparation of minority students, particularly women minority students, with majors in mathematics, mathematics and computer science, computer science, engineering, informatics, and data science ("project-focus majors") so that they can enter technical, data-driven fields. DU faculty in the TEM disciplines of STEM fields recognized that few minority students at DU, an HSI, were choosing majors leading to emerging careers in the digital workforce. DU attributes the paucity of majors to 1) lack of student awareness of these career paths; 2) poor mathematical skills upon entry to campus that inhibit students from completing the calculus sequence required for most of the majors in the TEM fields; and 3) students not encountering important computational tools such as MATLAB, R, Python, and others early enough in their studies to gain the skills to be competitive in the emerging job market. DU faculty, depending on their scientific backgrounds, are 1) not always aware of the career opportunities in the emerging digital technology job market; 2) do not necessarily use applied computational tools in their research or teaching; and 3) inconsistently use cutting-edge pedagogical tools as teaching aids.

Funds from this MSEIP project will enable DU to 1) inform students and faculty about career opportunities in technological fields through regular outreach events with industry professionals; improve mathematics course placement for students through the ALEKS system which uses online tutorial modules and remote peer tutoring; 3) develop online course or topic-specific learning modules to improve computational skills appropriate for remote learning environments; and 4) offer summer workshops for students on critical applications such as MATLAB, R, Python, and others. Funds from the MSIEP award also will support faculty development activities to ensure that faculty are 1) confident in creating quality content in learning modules for use in remote learning situations; 2) incorporate pedagogical tools such as Maple (Maplesoft) in calculus courses and hands-on problem-solving activities overall. Learning modules and workshops are ways for DU to pilot new course development and increase its capacity for learning opportunities, including remote opportunities, to serve minority students as they navigate university life as first-generation students. DU strives to broaden students' educational opportunities, expand their career options, ensure their resiliency to academic and non-academic stressors, and promote their social mobility.

#14 CT - Albertus Magnus College
New Haven, CT
Institutional Grant
P120A220010

Abstract

The proposed three-year institutional MSEIP program, **Albertus SAGE: STEM Academy for Growth and Equity**, addresses two identified needs, in four targeted disciplines, biology, chemistry, mathematics, and cybersecurity: 1) Maintain and/or increase the numbers of minority students, particularly minority women; 2) Better prepare, retain, and graduate, Albertus Magnus STEM minority students, particularly minority women. The proposed program activities address the competitive preference priority, “Building Capacity for Remote Learning.” The proposed program activities also incorporate interventions and preventive strategies to address the mental health impact of the COVID-19 pandemic on Albertus Magnus College students.

Goals: The long-term goal is to create and sustain equitable and just policies and activities in STEM for minority students, particularly minority women, in the areas of recruitment, retention, academic achievement, and career success. Medium-term objectives are to increase the percent of full-time, degree-seeking minority undergraduate students, particularly minority women, in the four targeted disciplines who a) enrolled; b) who were in their second year of postsecondary enrollment in the previous year and are enrolled in the current year; and c) who graduate within six years of enrollment. The short-term objectives are to 1) Establish the STEM Academy, a targeted cohort of minority STEM students led by a full-time, dedicated STEM Academy Director; 2) Provide new and ongoing professional development for faculty on strategies shown to improve student academic outcomes; 3) Build institutional capacity for remote learning.

Target Population: Minority students, particularly minority women, in biology, chemistry, mathematics, and cybersecurity. These four disciplines were targeted due to demonstrated strengths in the three years prior to the proposed grant start date—namely, a combined percentage of 41-55 percent minority students, and a combined percentage of women minority students of 80-90 percent. However, enrollment numbers are low in these disciplines, with STEM students (minority and non-minority) representing ~2 percent of the total student body. There is room for growth; in the same period, minority students comprised 51-53 percent of total student enrollment, with minority women being the greater percentage of those minority students.

Proposed Activities: The College will create and sustain a targeted, cohort-based STEM Academy, offer faculty professional development, build institutional capacity for remote learning, and engage in ongoing rigorous program evaluation. To create and sustain a STEM Academy, program personnel will collaborate with feeder high schools from both the Catholic Archdiocese of Hartford and New Haven Public Schools. The College will hire a new, full-time faculty position to act as the STEM Academy Director. In addition to overseeing recruitment, enrollment, and student outcomes, the Director will teach a freshman-level STEM Academy course and expand faculty-mentored summer undergraduate research experiences and career internships. The Director will also foster relationships with industry partners, professional organizations, and Albertus alumni. Albertus STEM faculty will engage in new and ongoing professional training on remote learning (open educational resources, online course development); inquiry-based, active learning methods; mental health first aid; and inclusive teaching strategies.

Anticipated Results: A STEM pipeline focused on minority students, particularly minority women, will be created and sustained. With lessons learned from this MSEIP program, and capacity building that will

persist beyond the three-year program, the College expects growth and improvement for all minority students, particularly minority women, in the areas of recruitment, retention, academic achievement, and career success.

#15 NY - Research Foundation CUNY on behalf of York College CUNY
Jamaica, NY
Institutional Grant
P120A220050

Abstract

York College proposes to leverage existing and successful strategies and programs, add new activities, introduce an active learning approach, provide access to mentored research and training, and create an integrated, college-wide set of best practices to produce higher retention and graduation rates in the targeted fields of biology, biotechnology, chemistry, environmental science, geology, pharmaceutical science, and physics. We target science, technology, engineering, and mathematics (STEM) majors from these fields of interest as York College recognizes a notable drop in enrollment, retention rates and graduation rates from these disciplines. In many cases, the problem is magnified when considering the numbers for our women, URM and low-income student population. Here we propose a program entitled “Developing STEM Workforce through Career Advisement and Research Engagement” which we refer to as STEM-CARE for short. We will be guided by two tenets: ‘Career Advisement’, delivered in the form of academic tutoring, counseling, career guidance, and mentoring; and ‘Research Engagement’, providing experiential learning through laboratory training or on-field interventions. The proposed STEM-CARE program focuses on the key Minority Science and Engineering Improvement Program (MSEIP) goals of engaging minority students by providing opportunities to build science and technological skills to improve the retention and graduation rates and help develop knowledgeable and responsible students and citizens. The specific objectives STEM-CARE program include: (1) increasing the number of students, particularly URM and women, matriculating in the targeted STEM disciplines; (2) raising the academic achievement of the STEM-CARE student participants by improving their overall grade point average; (3) increasing the number of URM and women graduating with a STEM degree; and (4) contributing to the number of URM and women joining the STEM workforce. Program administrators will be working to achieve these measurable program objectives by: (1) strengthening the academic standings of STEM students through development workshops and in-course learning modules; (2) providing laboratory or on-field intervention opportunities for students pursuing a degree in targeted disciplines that will prepare STEM graduates to either pursue advance degrees or join the workforce; and (3) creating a STEM community where all participants share experiences, challenges, and visions of a career in STEM. The proposed project will exploit existing and future articulation agreements with area high schools and community colleges to not only provide the pool of possible program participants but also to be welcomed contributors in the designed student development workshops, and enhancement activities. STEM-CARE will help develop new approaches and improve existing ones and more importantly consolidate existing college efforts together, so they are applied more synergistically. An advantage of this proposal is that anything introduced through STEM-CARE can be easily absorbed into the fabric of daily college operation. The STEM-CARE program help will lay the foundation from which a STEM initiative develops at York College. We believe that the programmatic activities and commitment from the administration will increase the impact of the STEM-CARE program at York College.

#16 - TX - Prairie View A&M University
Prairie View, TX
Institutional Grant
P120A210017

Abstract

This project seeks to systematically integrate applied thermal and combustion sciences into science and engineering curricula to improve underrepresented minority students' learning experiences and outcomes at Prairie View A&M University (PVAMU), a Historically Black College and University (HBCU). This educational component will be strongly supported by the proposed research in biofuel combustion, and students' participation in research will be used as an effective teaching practice to support the proposed curricula enhancement. Research results will be incorporated into science and engineering curricula by engaging in-class demonstrations, lab experiments, and independent capstone projects. These integrated research and educational efforts will establish a new research capability in the state-of-the-art biofuel combustion at PVAMU, improve the quality of preparation of students for careers in STEM fields, promote opportunities for recruiting and retaining PVAMU's minority students through technologically enhanced curricula, and increase the flow of minority students into STEM careers.

This project is proposed by diverse team members that include three faculty from Mechanical Engineering in the College of Engineering (COE), one female faculty from Chemical Engineering (COE), and one female faculty from Physics in the College of Arts and Sciences (COAS). The *target populations* include not only undergraduate and graduate students in Mechanical Engineering, Chemical Engineering, and Physics, but also those majoring in other Science and Engineering majors such as Civil Engineering and Electrical Engineering.

The proposed multidisciplinary project *addresses the Competitive Preference Priority* of building capacity for remote learning. The *overarching goals* of the proposed work are to (1) address challenging energy issues by investigating new combustion systems that have the potential to improve combustion efficiency and reduce emissions for alleviating greenhouse effects and global warming, (2) enhance PVAMU's institutional research capabilities by engaging faculty and students in leading-edge research, and (3) integrate applied thermal and combustion sciences into undergraduate curricula through a systematic preparation approach from freshman-level all the way to advanced senior and graduate levels.

Current biofuel research has been focusing on production technologies without a deep understanding of combustion performance. Therefore, the proposed *research activities* are to bridge this gap by evaluating the combustion performance of emerging biofuels and their mixtures with fossil fuels. Results obtained will be used to evaluate biofuels' potential to reduce the consumption of petroleum-based fuels, improve combustion efficiency, and reduce emissions. Numerous research opportunities will be provided to minority students, especially minority female students, as an effective teaching practice to improve their learning experience.

Educational activities of this project also include incorporating applied thermal and combustion sciences into nine undergraduate courses and two graduate courses to systematically prepare students for direct entry into a variety of STEM career options. Furthermore, a new senior-level technical elective course and a graduate-level course will be developed to better prepare students for a career in applied thermal and combustion sciences. Engaging in-class demonstrations, lab experiments, and hands-on projects will be developed and incorporated into these courses to enhance students' learning experiences and outcomes.

Anticipated results of the proposed project include (1) a new research capacity of combustion in microgravity that will be self-sustained to attract more external funding, (2) increased number of scientific publications by faculty and students, (3) improved student knowledge in thermal and combustion sciences, (4) increased number of minority students who are interested in pursuing careers and/or graduate work in thermal science, and (5) increased number of minority and women students who persist in science and engineering curricula.

#17 FL - Ana G. Mendez University
Orlando, FL
Institutional Grant
P120A220026

Abstract

Project goals for our *Cybersecurity Forensic Research Lab for UAGM USA Hybrid Programs* are: Develop and launch a hybrid cybersecurity forensic research laboratory to support cybersecurity, forensic science and criminal justice programs and develop an institutional cyber-security awareness program. Develop and pilot test the cybersecurity forensic research lab policies, standards, and procedures in support of undergraduate and graduate academic programs and research. Increase student's enrollment & retention/attrition control by integrating technology and applied exercises through the hybrid research laboratory to support instructional design and delivery, user awareness training to foster an improved and secure learning experience. Continue developing cybersecurity, risk management, and forensic science curriculum aligned with the knowledge areas towards getting our Cybersecurity Forensic Research Lab certified as a Center for Academic Excellence in Cyber Defense (CAE-CDE) and continue offering trainings and workshops.

The target population to be served will be Hispanic students' residents in the USA, in the Florida area and abroad who are pursuing a post- secondary education. The main objective will be to improve the quality of preparation of students for careers in science, technology, engineering, and mathematics (STEM) and graduate work. The competitive preference priority for this project is Adopting and supporting models that leverage technology (e.g., universal design for learning, competency-based education (as defined in this notice), or hybrid/blended learning) and provide high-quality digital learning content, applications, and tools.

#18 TX - The University of Houston - Downtown
Houston, TX
Institutional Grant
P120A220015

Abstract

Competitive Preferences Targeted: 1) Building Capacity for Remote Learning; 2) Adopting and supporting models that leverage technology and provide high-quality digital learning content, applications, and tools; and 3) Providing personalized and job-embedded professional learning to build the capacity of educators to create remote learning experiences that advance student engagement and learning through effective use of technology.

The *UHD Boosting STEM Student Success In Computer Science/Data Science/Mathematics Through Robotics-Neural Networks-Big Data-Human Computer Interface (HCI)-Machine Learning* project aims to increase the four-year undergraduate college experience through interactive and intentional support systems primarily for first-time-in-college (FTIC) freshman undergraduates and transfer community college students majoring in science, technology, engineering, and mathematics (STEM). Further, an intentional target of increasing females/minority females within these STEM areas is a primary objective as well. This project also aims to build interactive, long-term capacity at UHD (an HSI and MSI institution) in support of males and especially females in first, second, and third year computer science, mathematics, and data science interactivity impacting retention, persistence leading to increased graduation rates within at the six-years.

Historically, STEM majors, particularly minorities and females, have demonstrated barriers upon entering STEM education, such as difficult transitions into the rigors of university study, low levels of assimilation associated with non-completion, costs of education, and building relationships early in their collegiate career (Kuh, 2008). By using a curricular and co-curricular approach of student support strategies, the project will address many of the barriers through a variety of categorical support strategies including: 1) Freshman/Transfer Summer Bridge research program where application of the methods will focus learning; 2) Peer to Peer Academic Monitoring and Mentoring-PhD (expert) to undergraduate & Peer-to-Peer; 3) Robotics as a foundation for a) AI, b) Big datasets; c) Neural networks, and d) Human-Computer-Interface development as well as smartphone applications; 3A) Career Industry Just In Time Activities; 4) Development of Job-Embedded Professional Learning Libraries- synchronous and asynchronous availability for in and out of classroom learning; and 5) Leadership and Career Development supporting greater understanding of the workforce demands for the targeted areas and continuous application of universal design for synchronous environments (Zoom, FaceBook Groups, Instagram) and asynchronous (Youtube).

A special focus on recruitment, increasing enrollment, and mentoring of females/female minorities and all minorities majoring in STEM is a critical project objective. The project strives to support all STEM but especially females and minorities across the mathematics, data science, robotics, and computer science.

#19 - PR - Inter American University of Puerto Rico - Aguadilla
San Juan, PR
Institutional Grant
P120A210060

Abstract

The Inter-American University of Puerto Rico, Aguadilla Campus (IAUPR-A) is a private, non-profit, four-year Hispanic Serving Institution (HSI) located in the furthest north-western of Puerto Rico, in Aguadilla. This town was founded in 1775 with a current population of 60,265, about 81 miles west of the island's capital, San Juan. According to the Bureau of Labour Statistics (2019), Aguadilla's median household income is \$16,821, with a per capita income of \$10,872, and with 51.6 percent of people living under poverty. The Inter-American University of Puerto Rico, Aguadilla Campus (IAUPR-A), is geographically located between different companies and institutions directly related to technology, computing, and engineering such as HP, Honeywell, Amgen, Microsoft, Stryker, Pratt & Whitney.

Our campus offers different programs related to humanities and education, administrative sciences, health sciences, human behavior sciences, technology, and natural sciences. One of the most robust, both student and program-wise, is the Department of Sciences and Technology, directly related to STEM careers and courses. This Department includes programs like Biotechnology, Microbiology, Biology, Toxicology, Forensic Science, Natural Science, Environmental Science, Computer Technology Science, Technical Electric Engineer, and Computer Science. Mathematics courses form part of every associate and baccalaureate program, and the programs under the Science and Technology Department are no exception. In the past faculty members and administrators have developed projects and allocated funds to improve the sciences courses of each program mentioned above, but no concerted effort has focused purely on the core mathematics component. Currently, math courses on this area face retention problems, and low academic rates when measured based on passing rates and mathematical dexterity in core and specialty courses. Thus, most first-year students must take algebra and pre-calculus in the first two terms; only 45 percent of students finish these gateway courses, impacting the retention in STEM-related programs offered on our campus. Hence, as the Science and Technology Department is the largest on campus with 30 percent of enrolled undergraduates, and the average amount of math courses required in these programs are at least two (average of six credits), it is imperative that the math curricula, tools, and services provided to our students are strengthened.

Moreover, due to COVID 19, the problems in mathematics courses have intensified, and it is expected that in the subsequent terms, the retention and passing rates will decrease even more because of the forced remote education and lack of support that students from the public education system suffered throughout the past academic year. For the reasons mentioned above IAUPR-A proposes a project to enhance the mathematical component and consequently the science programs through the development of three components.

The project will develop:

- the revision of math courses to include content and activities that promote individualized learning

through the modality of blended learning.

- the creation of a remedial mathematics courses to alleviate the lack of the first year (FY) students' knowledge in basic math content.
- invest in renovation and equipment of the existing tutoring facilities with tools that allow the services to be provided in the face-to-face modality, hybrid, and remotely.
- the incorporation of the services offered by the institution's psychological clinic to the courses to identify students' disorders caused by the courses and COVID 19.

This proposal responds to competent priority *Building Capacity for Remote Learning* by providing students with access to tools for hybrid/blended learning, and by training educators through supporting models, use of technology, and coaching.

#20 AL - Alabama A&M University
Huntsville, AL
Institutional
P120A220023

Abstract

Alabama A&M University (AAMU), an 1890 HBCU land grant institution, is recognized for its comprehensive curricula in STEM disciplines at the undergraduate and graduate levels. Within AAMU, our main focus is the Animal Bio-Health Sciences (ABHS) program that is housed in the Department of Food and Animal Sciences. The ABHS program was implemented in 2014 and even in its nascent state, it has attained tremendous success in terms of the number of students enrolled. Despite the success in ABHS enrollment (over 100 students/year), the retention and graduation rates are marginal. Although financial issues are a major challenge for students leaving AAMU, a common concern of ABHS students is the insufficient “hands-on” activities in their major area. Therefore, the goal of this application is to prepare well-trained underrepresented STEM graduates in ABHS at BS and MS levels. To accomplish our goal, we propose to enhance the undergraduate program by improved mentoring and by including a variety of hands-on activities in selected courses. In anticipation of a still uncertain post-COVID-19 situation, we also propose to develop remote learning education materials and courses.

We also propose to explore the feasibility of a Master’s Degree in ABHS and take steps to implement such a degree program. Students majoring in ABHS are African Americans (97 percent) composed of a 74 percent:26 percent Female: Male gender ratio. Therefore, the proposed AAMU grant will continue to serve priority areas of underrepresented ethnic minorities, particularly minority women, into scientific, biotechnological and agricultural related careers. Taken together, we anticipate that the proposed activities will enhance retention and graduation rates in the ABHS program. We also foresee that by the end of the three-year grant period, we would have established the basis for the development of the graduate program in an area in which African Americans are disproportionately underrepresented. These areas include animal science research, animal health and welfare, pre-harvest food and feed production.

#21 TX - Texas A&M University - Kingsville
Kingsville, TX
Institutional Grant
P120A220041

Abstract

Texas A&M University-Kingsville (TAMUK), a public, Minority Serving Institution with more than 80 percent Hispanic students, proposes a transformative project focused on growing the capacity of online teaching, improving quality of remote learning, providing engaged research, and increasing mental wellness and readiness for engineering and science minority students, especially Hispanics and women. The proposed project is centered on improving faculty and students' quality of work in STEM curricula and mental wellness and readiness through three core activities: **Online Learning and Teaching Enhancement (OLTE)**, **Hybrid Summer Research Bridge (HSRB)**, and **Mental Wellness and Readiness Preparation (MWRP)** programs. The **goals** of this project are to: 1) Increase engineering and science student enrollment and retention at TAMUK through high quality remote learning and streamlined education, and 2) Improve the awareness and readiness of mental wellness for both remote and in-person learning environments among TAMUK students and faculty.

This project will enhance the capacity of current online programs and courses in engineering and science by promoting Quality Matters and providing highly needed support to students and faculty to be much more successful on remote teaching and learning at TAMUK. The HSRB program will target dual enrollment high school students and inspire and prepare them for college studies in STEM majors. The MWRP program will be seamlessly integrated with OLTE and HSRB programs to help TAMUK students and faculty to become informed, thoughtful, and emotional and behavioral healthy individuals in both remote and in-person learning environments. This project will directly impact at least 1500 minority students and 48 faculty in STEM. Strong institutional support and a plan for sustainability will guarantee a long-lasting impact at TAMUK. This project is responsive to the Competitive Preference Priority by addressing both priority areas.

#22 AL - Alabama State University
Montgomery, AL
Institutional Grant
P120A220003

Abstract

Alabama State University is a Historically Black College and University founded in 1867, which has ~4100 undergraduates, 935 faculty/staff and has conferred over 40,000 degrees since its founding. Degree programs in Biology, Mathematics, Chemistry, Physical Sciences, Computer Science and a Ph.D. program in Microbiology are offered in the College of Science, Technology, Engineering and Mathematics (C-STEM). ASU seeks funding to increase minority participation in Bioengineering Sciences by implementing an institutional project titled, “Building Excellence in Bioengineering, Emerging Science and Technology in Alabama (BESTA)” and intends to address the competitive preference priority. Bioengineering is gaining usage in medical technologies and holds a lot of promise to attract new generations of students to STEM fields.

The proposed MSEIP program is structured to meet the following measurable outcome objectives: 1. To increase students’ understanding of Bioengineering/modern technology applications through “hands on” training by 25 percent; 2. To increase entry of URM students into STEM majors by 30 percent; 3. To improve the understanding of contemporary science applications among faculty at a minority institution by 15 percent; and 4. To increase the overall contribution of minority science institutions to improving STEM education. Undergraduates(12/semester) and pre-freshman (8/summer) (total 60/3 years) will be hosted. STEM faculty, administrators, internal/external advisory committees will monitor/review the program outcomes. An external evaluator will design evaluation tools and conduct annual evaluation, for formative/summative reports to assess program effectiveness. The program will strengthen ASU’s undergraduate curricula, research, recruitment/retention emphasizing scientific education and skills across the STEM departments. Concepts learned through this multidisciplinary initiative will be a determining factor for students choosing their future career paths and graduate studies.

#23 NY - Research Foundation of CUNY on behalf of Lehman College
Bronx, NY
Institutional Grant
P120A220038

Abstract

Lehman College proposal entitled *STEM-IN – Increasing Student Access and Success in STEM with Remote Instructional Elements* builds upon concepts of deeper learning, high impact remote learning research, and impact of the use of six or more learning resources by students. It addresses the failures of the unexpected transition to fully online learning during COVID-19 and the impact on students and faculty. The creation of learning objects for remote and in-person learning uses rubrics created by Achieve and Quality Matters for evaluation of online learning resources and delivery. The impact of use of six or more learning resources by students builds on the work of Boone, A., Sandler, C., & Coppola, B.P. (2018), Chen, P., Ong, D.C., Ng, J. C., & Coppola, B.P. (2021), and Coppola, B.P., & Pontrello, J.K. (2021). The work on learning objects builds upon both deeper learning theories LE Hernández, L Darling-Hammond, L. & J Adams, J. (2019) and Harris, C.J., JS Krajcik, J.S., & JW Pellegrino, J.W. (2019) and impact of learning objects on student achievement Brian, E.O. (2020), Koh, J.H.L. (2017), Mourão, A.B, & Netto, J.F.M. (2017) and Onofrei, G., & Ferry, P. (2020).

The primary outcomes are: (1) A percentage increase in the number of full-time, degree-seeking minority undergraduate students at Lehman 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; and (2) A percentage increase of minority students enrolled at Lehman in the fields of physical or biological sciences who graduate within six years. Additional questions include: What is the effect of project activities on faculty and STEM course outcomes? What is the effect of project activities on student outcomes? To what extent are STEM In activities sustainable after completion of the project? We expect that students in courses that use learning objects and students who are consistently reminded to use learning resources will increase grades in the target course and in the next course in sequence. Also, students who are consistently reminded to use at least six learning resources will continue to use these learning resources throughout their STEM major courses.

The study design includes over 7600 students enrolled in STEM gateway courses over the period of the project. These students will be randomized at the class level and all classes will be given a list of learning resources, but the treatment classes will regularly be reminded to use them in studying while the control group will only have the list. The dependent variable will be course grades in the treatment or control course and grades in the next course in sequence.

Quantitative and qualitative data will be combined, using a complementarity approach (Green, Caracelli, & Graham, 1989), to answer evaluation questions. Cobblestone will document and analyze quantitative and qualitative implementation data to describe changes in STEM programming and technological upgrades during the grant. In addition, Cobblestone will review other quantitative data collected by participating faculty as part of the action research projects related to student outcomes. Finally, long-term outcomes related to pass rates will be compared to articulated goals. Analysis of qualitative data will include the thematic coding of focus group and individual interviews and observations. Conventional content analysis will be used to analyze focus group data (Hsieh, & Shannon, 2005). The goal of a conventional content analysis is to describe a phenomenon, making it ideal for answering evaluation questions related to program implementation, unintended effects, and sustainability. Focus group transcripts will be searched for inductive themes, which will be used to code the transcript in an iterative

process – recoding each time a new theme emerges. Findings from qualitative analyses will be useful in implementation monitoring and identifying program strengths and areas for improvement.

#24 MS - Jackson State University
Jackson, MS
Special Projects Grant
P120A220052

Abstract

A 2020 National Science Foundation (NSF) National Science Board report states that Black scientists and engineers comprise only 5.6 percent of the United States (US) STEM workforce, despite 11.9 percent of the population being Black. Under-represented minorities (URM), which as a group comprises 28.1 percent of the US population, represent only 13.3 percent of US scientists and engineers (US Census Bureau, 2012; National Science Board, 2020). As these and other statistics on underserved minority participation in STEM show, the reality facing the US STEM ecosystem is one of vast disparities by race and ethnicity, as well as gender, for completing degrees and entering STEM professions (NSCG, 2015; NSF SESTAT 2018). In 2021, we continue to see STEM completion and participation rates for non-White, non-Asian, and women students - particularly for Black men and women - noted a decade ago (Committee, 2011).

Jackson State University, among the nation's leaders in producing Black scientists and STEM graduates who later complete graduate degrees in a STEM discipline, actively recruits and welcomes Black and other URM students from Mississippi public school to its STEM programs. However, well before the incursions of the Corona Virus Disease of 2019 (COVID-19), many of these students have contended with obstacles long in the making and still only tepidly addressed. Arriving from counties with high poverty rates, and school districts that lack STEM and other resources, these students' aspirations for STEM careers are beset by frustration and challenges deriving from K-12 experiences often marked by teacher and administrator flight.

The proposed program, *Inclusive Strategies: Pedagogies and Learning for Underrepresented minority students using novel Tools in Online STEM Education (PLUTO-STEM)*, is designed to help counter the frustration that Mississippi STEM teachers share with their students experience, reduce discrepancies arising from inadequate STEM teacher training, and increase STEM materials, capacity, and opportunity in under-resourced Mississippi schools, as well as online and face-to-face mentor-model STEM experience with JSU STEM students.

Specifically, PLUTO-STEM will provide expert-led teaching development (TD) workshops for teachers in under-resourced, high-poverty, underperforming school districts to help teachers learn, engage, and redesign curricula to include hands-on, differentiated STEM teaching and learning strategies through both face-to-face and online delivery platforms. The Department of Chemistry, Physics & Atmospheric Sciences (CPAS), which has for decades provided incentivized K-12 TD to improve Mississippi teacher satisfaction and students' STEM education, now proposes PLUTO-STEM. CPAS has long deemed increasing access to technology for teachers and students in Mississippi schools an important component of K-12 TD. However, the shift to online pedagogy from March 2020 through the 2020-2021 academic year spotlighted the urgency of including evidence-based *online and hybrid* teaching and learning as a priority.

PLUTO-STEM will work closely with the state's teachers to cultivate expertise, facilitate access to materials and resources, support the implementation of evidence-based online, face-to-face, and hybrid strategies, reduce turnover, and so address the needs of middle and secondary teachers and students as they strive to meet state standards.

PLUTO-STEM's support for Mississippi STEM teacher retention, better classroom resources, and robust mentoring opportunities with JSU STEM students will deploy TD, educational technology, and differentiated instruction to improve the teacher achievements and cultivate the STEM talent of Black and other URM students in Mississippi's under-resourced public schools.

#25 FL - Miami Dade College
Miami, FL
Institutional Grant
P120A220021

Abstract

Miami Dade College Homestead Honors College's Njema project will enhance its position to prepare, engage, and improve retention among minority students and women in STEM programs of study. The *Minority Science and Engineering Improvement Program* three-year **institutional project** will target Honors College (HC) freshman and minority student groups including females, Hispanics/LatinX, Blacks/African Americans, first time in college students, and those from low-income households. The project has identified three crucial goals: (1) strengthen first attempt pass/completion rates of incoming freshman for introductory gateway STEM courses, (2) develop learning strategies and support programs to address structural and motivational barriers of first-generation, low-income Honors College students, and (3) create a supportive and inclusive environment for applicable technical learning modalities.¹

Given The Honors College (HC) at MDC's promotion of holistic student achievement techniques, the project seeks to expand its outreach by providing accessible support services, STEM faculty involvement and mentorship, and experiential technical teaching platforms to maximize comprehension of STEM concepts. The Honors Technology and Learning Center (HTLC) will identify each student's cognitive and non-cognitive needs through the Honors College Summer Academy. Students who exhibit college placement below their peers will participate in activities and training to accelerate their academic proficiency.

Additionally, the Njema project will systematically measure the instruction efficacy of Honors College Summer Academy developmental courses and teaching methodologies to contribute to timely degree completion.

Project Objectives include: (1) Increase first-year pass rates of Honors College students enrolled in STEM science and math gateway courses, (MAC 1105-College Algebra and CHEM 1025- General Chemistry) completion to 60 percent by the third year of the project, (2) improve student engagement and academic support for summer math, and science enrichment activities before the first fall semester, (3) Increase first-year to first-year STEM retention of female students by 20 percent, (4) Attain, recruit, and retain Black male STEM Honors college students by 40 percent by the third year of the project. (5) improve online pedagogy, learning support, and professional development for faculty and students by creating the Honors Technology and Learning Center. These objectives will occur through the following activities: peer tutoring/mentoring, outreach and engaging STEM support activities, Honors College Summer Academy, renovation of academic facilities, student life skills/training, student cohort learning communities, departmental advising, curriculum enrichment, and success coaching.

Njema will address the **Competitive Preference Priority** - Building Capacity for Remote Learning (a) Adopting and supporting models that leverage technology (e.g., universal design for learning, competency-based education, or hybrid/blended learning) and provide high-quality digital learning content, applications, and tools.

#26 AL - Oakwood University
Huntsville, AL
Institutional Grant
P120A220001

Abstract

Project Goals: The goal of **Oakwood University's (OU) Initiative for STEM Continued Advancement through Research and Experimentation (iSTEM-CARE)** is to develop a program that will lead to improvements in minority STEM student matriculation, retention, persistence, and participation in STEM programs and careers. This proposed study will have immediate impacts on middle and high school students, STEM undergraduate students, college online instructors, and research scientist through intervention strategies. We developed three goals or focus areas for the proposed iSTEM-CARE program:

- Goal 1. Implement an OU Science, Math, and Reading Virtual Intervention Program
- Goal 2. Establish an Early Online STEM College Transition Program for high school students
- Goal 3. Improve scientific reasoning and research competencies in underrepresented STEM students

Program Overall Objectives: The overall objectives of this proposed study are to 1) increase access and participation of minority students in STEM through outreach programs and pipelines, 2) improve the quality of preparation of students for STEM graduate programs and careers through informal and formal innovative strategies, 3) improve research-based curricula and program outcomes for undergraduate STEM student, and 4) develop a sense of leadership and service in undergraduate STEM students to prepare better future STEM leaders.

Target Population: Minority (including minority females) middle school and high school students interested in STEM, undergraduate minority STEM (biology, biochemistry, chemistry, math, engineering, computer science) majors, online teaching faculty, and OU STEM research faculty. At least 60 percent of participants of this program will be minority females.

Proposed Activities: Several activities will be implemented to achieve these goals. To ensure that we address achievement gaps, we will implement an early intervention outreach STEM student-led program for minority middle school students that will improve the achievement gaps in math and reading caused by COVID-19. To address the matriculation, retention, and 4-year graduation rate of STEM students, we will implement an online(remote-learning) STEM dual enrollment program for minority high school students interested in enrolling as STEM majors in college. This unique dual enrollment program for potential STEM students will provide college courses at no cost to the students, free virtual tutorial services, pre-college STEM advisement, and research-based certifications. To improve the quality and preparation of STEM students, we will revamp the capstone research courses for undergraduate biology majors (and other STEM students) by providing a series of active workshops to improve scientific reasoning and research-based competencies. We propose to increase research participation in underrepresented students by implementing a multi-level research mentorship system where a) STEM research faculty will be supported to mentor undergraduate STEM students in research, b) STEM undergraduate research mentees will serve as research mentors for minority high school students interested in STEM, c) the research high school students will then take what they learned in research to improve science labs and introduce research into their high school science curricula.

Anticipated Results/Outcomes: We anticipate that the outcomes of this program will a) increase the interest in underrepresented minority students in STEM disciplines and careers, b) improve scientific literacy and research competency skills among minority high school and undergraduate STEM student participants, c) increase the participation of underrepresented students in innovative STEM research, d) assist teaching and research faculty in continued development, e) improve math and reading achievement gaps in the minority community, and f) improved initiatives to address mental, emotional, and stress created by

COVID-19 and a variety of life challenges among minority STEM students.

Competitive Priority: OU iSTEM-CARE will address **both aspects of the Competitive Priority Preference** of a) adopting and supporting models that leverage technology through implementation of a virtual academic intervention program and b) providing professional learning to build capacity for remote learning experiences and student engagement by use of technology, workshops, and certification which will be implemented in the Online STEM College Transition Program. This proposed program also integrates mental health awareness and care initiatives throughout the program.

#27 TN - Tennessee State University
Nashville, TN
Special Projects Grant
P120A220063

Abstract

The All-Star Mathematics Institute (ASMI) is a free year-round program with an intensive two-week non-residential summer component. The All-Star Mathematics Institute will assist students in critical Mathematical skills and provide support with mathematics courses necessary to persist in STEM disciplines. The Institute will engage one hundred (100) students: 50 high school students (rising 10th, 11th) from Metropolitan Nashville and surrounding areas, and 50 college freshman and sophomore student from Tennessee State University (TSU). The ASMI seeks to increase the retention of minority students interested in pursuing STEM degree programs, particularly those in Mathematics, Science and Engineering.

The goal of the ASMI program is to demystify self-imposed fears, enhance student attitudes toward mathematics and related mathematics fields, and strengthen the reasoning skills necessary to perform well in mathematics courses and the mathematics sections of college entrance aptitude examinations.

The objectives that support the goal of the ASMI program include:

- 1) Increase access for minority students to explore mathematics and envision themselves as future STEM professionals.
Outcome: 100 high school and college students will participate in the ASMI program, each year.
- 2) Develop students' STEM related interest and goals by incorporating academic and social activities.
Outcome: 95 percent of the participants will demonstrate goal clarity by explaining the intersection/connection between their personal, academic, and career goals and interests in STEM.
- 3) Strengthen Mathematical reasoning skills and knowledge necessary to perform well in high school and college level Mathematics courses.
Outcome: The Mathematical reasoning skills and knowledge score will increase by 5 points as measured by a TSU Mathematics performance assessment tool.
- 4) Ensure program accountability and efficiency in administering the ASMI program.
Outcome: Obtain a 95 percent program satisfaction rate each year.

The competitive preference priority area(s) the ASMI will address is Building Capacity for Remote Learning (a) Adopting and supporting models that leverage technology (e.g., universal design for learning, competency-based education (as defined in this notice), or hybrid/blended learning) and provide high-quality digital learning content, applications, and tools.

#28 GA - Andrew College
Cuthbert, GA
Institutional Grant
P120A220007

Abstract

Research shows that overall, females are more likely to attend college than males; however, the percentage of incoming freshmen men that pursue STEM based degree programs is double that of women, 29 percent to 15 percent. This becomes more apparent when biological sciences are removed, dropping the rate to only 5 percent of incoming freshmen females that plan to study other STEM fields (Swafford and Anderson, 2020). The national need for STEM based majors is apparent and well documented in the United States. The earlier barriers to having females involved in STEM programs, such as lower scores in Science and Mathematics than their male counterparts, has significantly decreased in recent years (Swafford and Anderson, 2020). The potential growth of females within these fields in the local area surrounding Andrew College is exponential and should be fostered.

The goals of this grant opportunity are to focus on low-income minority females in STEM programs through recruitment, academic success, increased retention and graduation rates, and increased career opportunities and placement upon successful completion. The Competitive Preference Priority of competency-based instruction and remote-learning delivery are addressed in this grant.

Objectives:

1. Increase the enrollment of low-income minority female students to STEM majors from 1 student to 14 students as a result of STEM summer programs and specialized recruiting.
2. Increase the retention of low-income minority female STEM students from 1 student to 14 students.
3. Increase the number of low-income minority female STEM students completing STEM degrees in 150 percent time from 0 students to 8 students.
4. Increase pass rate of low-income minority female STEM students by 30 percent.

Swafford, M. and Ryan Anderson. 2020. Addressing the gender gap: Women's perceived barriers to pursuing STEM careers. *Journal of Research in Technical Careers*, 4(1). Retrieved from <https://files.eric.ed.gov/fulltext/EJ1254004.pdf>

#29 TX - The University of Texas at El Paso
El Paso, TX
Cooperative Grant
P120A220044

Abstract

In the wake of the COVID-19 pandemic, a growing number of tertiary institutions have shut down face-to-face classes globally. It is becoming increasingly evident that society needs flexible and resilient education systems as we face unpredictable events in the future. The experience with handling the COVID-19 crisis highlights different challenges that have to be overcome to develop new methodologies and pedagogical approaches, infrastructure and platforms specifically designed for online/remote learning. This project attempts to address these challenges by building capacity for effective remote learning environment in the field of STEM education, specifically in Intelligent Manufacturing (IM). As many companies are embracing IM technologies, the traditional skillsets of industrial, mechanical, manufacturing, electrical, and systems engineers need to be expanded to support the interdisciplinary collaboration IM mandates. IM is the future paradigm for manufacturing, providing greater flexibility and control of interconnected manufacturing processes and is estimated to generate \$371 billion in net global value over the next few years by streamlining design and manufacturing processes and managing supply chain risks.

Based on the above-identified need assessment, this UTEP-DU collaborative project proposes to develop and establish a remote **Accelerated Center for Engineering Student Success (Remote- ACCESS)** aligned with the purpose of MSEIP as follows: (1) **IM and IT-based engineering curriculum will be developed** to provide state-of-the-art instruction and experience to enhance student career pathways; (2) The Remote-ACCESS will be a hub for **research-oriented activities in the area of IM** to support and enhance hands-on instruction by developing and providing comprehensive laboratory experimental activities and teaching/learning modules; (3) It will build a student-centric environment with a focus on **capacity building for remote learning**; (4) The center will help **enhance students career pathways** in the field of IM, and (5) The center will provide **student success support** (e.g., to address mental stress) **under various unprecedented situations such as COVID-19 pandemic** or other emergencies to broaden diversity of students and instructors and increase the retention level of minority students, especially among Hispanic and Women engineering majors at UTEP and DU.

The short-term impacts are identified to be improved student success in graduation, enhanced student career pathways, student technical readiness in IM, and accelerated remote learning capability. In the long run, the project will stimulate students' interest in STEM education among the minorities, especially Hispanics and women engineering students.