

**U.S. Department of Education
Office of Postsecondary Education
Institutional Service
Washington, DC 20006-8517**

Project Abstracts for New Grantees - FY 2011

**Funded under Title III, Part E:
Minority Science and
Engineering Improvement
Program (MSEIP)**

(CFDA Number: 84.120 A)



Minority Science and Engineering Improvement Program (MSEIP)
FY 2011 Project Abstracts
CFDA: 84.120A

	Page
Introduction	3
ABSTRACTS	
CA Charles R. Drew University of Medicine And Science	4
CA California State University, Bakersfield	5
DC University of The District of Columbia	6
FL Miami Dade College – InterAmerican Campus	7
GA Paine College	8
NC Elizabeth City State University	9
PR University of Puerto Rico – Arecibo Campus	10
PR University of Puerto Rico at Humacao	11
TX Texas A & M International University	12
TX Houston Community College	13
TX The University of Texas at Brownsville	14
TX The University of Texas at El Paso	15

Introduction

The purpose of the Minority Science and Engineering Improvement Program (MSEIP) is to effect long-range improvement in science and engineering education at predominantly minority institutions and to increase the flow of underrepresented ethnic minorities, particularly minority women, into scientific and technological careers. MSEIP supports the Federal Government's efforts to improve and expand the scientific and technological capacity of the United States to support its technological and economic competitiveness. This program also addresses President Obama's three overarching priorities for science, technology, engineering, and technology (STEM) education:

1. Increasing STEM literacy so all students can think critically in science, technology, engineering, and math;
2. Improving the quality of math and science teaching so American students are no longer outperformed by students in other nations; and
3. Expanding STEM education and career opportunities for underrepresented groups, including women and minorities.

Additionally, MSEIP supports the Secretary of Education's project activities in areas of greatest educational need.

The specific objectives of MSEIP include the following: (a) to improve access of minority students in undergraduate and graduate science and engineering through community outreach programs conducted through eligible minority institutions; (b) to improve in the quality of preparation of students for careers in science, technology, engineering, and mathematics (STEM) graduate work; (c) to improve the capability of minority institutions for self-assessment, management, and evaluation of their science programs and dissemination of their results; and (d) to improve existing capabilities of minority institutions in the areas of planning and implementation of science and engineering programs, so they will achieve the ability to compete more effectively in assistance programs not specifically intended for minority groups or institutions.

Awards under MSEIP in fiscal year 2011 are for 12 to 36 months to support three types of grants: Institutional; Cooperative; and Special Project. Each grant type is described below. For the fiscal year 2011 MSEIP competition, we announced in the Federal Register Closing Date Notice published on August 3, 2011, that we would not award Design grants, which are planning grants, because applicants may not have funds to execute the plans without receiving additional funds under another fiscal year.

Institutional grants support the implementation of a comprehensive science improvement plan, which may include any combination of activities for improving the preparation of minority students, particularly minority women, for careers in science.

Cooperative grants assist groups of nonprofit accredited colleges and universities working together to conduct a science improvement program. Any nonprofit accredited college or university may participate in a cooperative grant; however, the fiscal agent must be an eligible minority institution.

Special grants are designed to assist minority institutions with activities that improve the quality of training in science and engineering at minority institutions or enhance the minority institution's general scientific research capabilities. A Special grant may be given to any applicant supporting activities that provide a needed service to a group of eligible minority institutions. Special grants may also be used to provide in-service training for project directors, scientists, and engineers from eligible minority institutions.

MSEIP supports pre-college STEM programs (K-12), tutoring for pre-college and college students in STEM fields, faculty development for STEM faculty, STEM curriculum development, renovation of STEM labs/classrooms, stipends for eligible program participants, and a wide range of activities designed to increase minority STEM graduates. As the nation's population becomes more diverse, it is important that the educational and training of all Americans are met so that our nation remains a global technological leader. Increasing the participation of these students in the proposed activities is critical to broadening diversity in the sciences and enhancing the nation's technological and economic competitiveness. **This paper summarizes the abstracts for 12 new awards funded under the fiscal year 2011 appropriation.**

CHARLES R. DREW UNIVERSITY OF MEDICINE AND SCIENCE

State: California
PR Award Number: P120A110091
Grant Type: Institutional

Increasing STEM Success among At-Risk and Foster Youth (I-STEM) Program

Abstract

The **Increasing (Science, Technology, Engineering, and Mathematics) STEM Success among At-Risk and Foster Youth (I-STEM) Program** is a laboratory-based intervention designed specifically for high school students from socially, culturally, economically, or educationally disadvantaged backgrounds (including women) who are at risk for retention with special attention to and preference for foster and minority youth.

The overarching I-STEM objective of increasing the numbers of these students, 10th through 12th grade, who successfully access and complete college in STEM fields drives the five specific goals of the program:

- 1) Build the high school student's skill, interest and knowledge base needed for successful transition from at-risk status into undergraduate status, optimally in a STEM major;
- 2) Provide an environment of high achievement amidst a university culture of scholarship in the life and health sciences;
- 3) Provide a scholastic and research immersion experience, with tutors and mentors in addition to a corps of dedicated program curriculum teachers;
- 4) Develop the students' sense of belonging to an extended and reliable university academic family; and
- 5) Raise expectations and self-efficacy for students' personal and professional achievement.

Over the nine-month academic year, meeting three days per week during non-regular school hours, the program will each year accept 100 at-risk students, in four sections of 25 students each, and immerse them in a carefully crafted and highly structured curriculum composed of three major components: didactic instruction on various scientific topics, hands-on, integrated laboratory experiments, and mathematics instruction and standardized exam practice.

The expected outcomes of the program include enhanced student grasp of scientific concepts and the ability to effectively apply them, pursuit and mastery of California Science Curriculum Standards through practice and practical experience in the laboratory, development of skills in preparing for standardized exams, dedicated interest in higher learning at the college level and beyond, college admission and graduation, and, ultimately, successful pursuit of graduate studies and a career in a STEM field.

CALIFORNIA STATE UNIVERSITY, BAKERSFIELD

State: California
PR Award Number P120A110050
Grant Type: Institutional

Filling Essential Gaps in the High Needs San Joaquin Valley STEM Degree Pathways

Abstract

California State University, Bakersfield (CSUB) currently enrolls over 6,000 undergraduates, over 51 percent are underrepresented minorities and 62 percent are women. CSUB is the only four-year degree granting campus within a 100 mile radius. Its service area includes some of the fastest growing and most economically depressed populations in California. CSUB’s mission includes providing equitable access to high quality, relevant education. However, CSUB faces many challenges in its science, technology, engineering, and mathematics (STEM) education. Retention and graduation rates are lower than other majors at CSUB and, more alarmingly, there are equity gaps in the first year retention rates and graduation rates among STEM students.

This project resulted from a thorough assessment of the gaps in CSUB's much needed engineering pathway that remain after many steps to address the magnitude of need. CSUB faculty members have identified the Calculus sequence as a roadblock in the engineering pathways, particularly since over 40% of incoming freshman in 2008 required mathematic remediation. Additionally, while existing outreach and enrichment activities have begun to attract students, growth has been slow, particularly among underrepresented minorities and women in engineering degrees.

Project Goals and Objectives include:

Goal 1: Develop a new, high-quality Calculus sequence for the engineering programs that is consistent with the principles of modern, more accessible engineering education and meets accreditation standards.

Goal 2: To develop an Engineering Enrichment and Outreach Program to increase the participation and degree completion rates of underrepresented minorities and women.

Objective 1: To increase participation and completion of the Calculus sequence, with underrepresented minorities and women equitably represented relative to total enrollment.

Objective 2: To increase the participation and retention rates among CSUB engineering cohorts participating in the project, with the equity gap 100 percent eliminated. Through focused and targeted programming and services developed through this project, it is believed that this objective is obtainable.

MSEIP Competitive Preference Priorities	How Project Addresses Priorities
<p>(1) Increasing the number and proportion of high-need students who persist in and complete college or other postsecondary education and training.</p> <p>(2) Projects that are designed to collect (or obtain), analyze, and use high-quality and timely data, including data on program participant outcomes, in accordance with privacy requirements, in the following priority area: Improving postsecondary student outcomes relating to enrollment, persistence, and completion and leading to career success.</p> <p>(3) Applications from institutions that have not received a MSEIP grant within five years prior to this competition.</p>	<p>(1) The proposed project contains components which promote the participation and support the retention and degree progress of underrepresented minorities and women. Particularly, the project addresses the roadblock in the Calculus sequence that leads to stalled degree progress and enriches the engineering pathway with engaging, hands-on projects and peer mentoring.</p> <p>(2) Evaluating both objectives 1 and 2 will require extensive quantitative and qualitative data gathering and analysis. Periodic assessment will be conducted to see if the project is improving participation, retention and degree progress, with outcomes for project participants compared to matched peer groups.</p> <p>(3) CSUB has not received a MSEIP grant.</p>

UNIVERSITY OF THE DISTRICT OF COLUMBIA

State: District of Columbia
PR Award Number: P120A110052
Grant Type: Institutional

**Pathways to a STEM Baccalaureate and Beyond (STEM Pathways) at the
University of the District of Columbia**

Abstract

The University of the District of Columbia (UDC) is an urban land-grant institution and the only public university in the nation’s capital. The university offers associate, baccalaureate, masters, and professional degrees through its six colleges and schools, including the new UDC Community College. UDC’s serves a student population that is approximately 80 percent underrepresented minorities (this includes approximately 27 percent who did not report) and approximately 60 percent female in a city that is majority underrepresented minority.

Goals: Create inviting science, technology, engineering, and mathematics (STEM) associate’s degree pathways that lead efficiently to a STEM baccalaureate; establish the “STEM Academic Fitness Community” to provide support and developmental activities that invite and enable underprepared students to achieve full academic success in STEM; grow a community of STEM faculty focused on and equipped to improve STEM student learning.

Outcomes: We expect this program will significantly improve minority student success in college level STEM courses; significantly increase student engagement and reduce STEM attrition prior to their sophomore year; and significantly increase the number and proportion of underrepresented minority women and men at UDC who successfully complete STEM baccalaureates in 6 or fewer years, en route to STEM-based careers or graduate study.

Contributions to Practice:

- 1) A model one-year math program that prepares students to thrive in Calculus; and
- 2) A model learning community for under-prepared students that significantly improves college skills, academic success, retention, and graduation in STEM.

MIAMI DADE COLLEGE – INTERAMERICAN CAMPUS

State: Florida
PR Award Number P120A110020
Grant Type: Institutional

Organized Approaches for Success in Science (Science, Technology, Engineering, and Mathematics) STEM OASIS)

Abstract

Miami Dade College (MDC) InterAmerican Campus requests \$645,138 from the U.S. Department of Education, Office of Postsecondary Education, under the Minority Science and Engineering Improvement Program to implement an institutional project: **Organized Approaches for Success in Science (STEM OASIS)**. The goal of this three-year project is to engage high-need minority students in the study of science and improve the critical skills necessary for them to persist and earn a STEM degree, using a variety of strategies. The project will also enable collection of high-quality and timely data for improving postsecondary student outcomes related to persistence in and completion of STEM degree programs.

STEM OASIS focuses on minority students, especially women, assisting them in earning an MDC Associate in Arts degree in a STEM concentration in two years and subsequently transferring to a STEM Bachelor of Science degree program, also at MDC.

The objectives for meeting the goal of *STEM OASIS* project are:

- 1) Faculty development and implementation of science inquiry pedagogy in STEM courses as a strategy to promote student engagement in science;
- 2) A 20 percent increase in retention through incorporation of peer-to-peer STEM learning as a means to develop problem-solving skills, persistence, success, confidence, and leadership skills in STEM courses;
- 3) Engagement of 10 students in targeted undergraduate research in order to build and improve STEM skills critical for advancement; and
- 4) Establishment of a student-led STEM community-building platform through which students can form connections and remain engaged with STEM and successfully transfers to the Bachelor of Science program in a STEM field at MDC.

Funding from the U.S. Department of Education will be used for faculty development, student peer-to-peer learning stipends, project staff salaries, educational materials, and travel. MDC demonstrates its commitment to *STEM OASIS* with institutional contributions in the form of personnel costs, facilities, and administrative resources.

PAINE COLLEGE

State: Georgia
PR Award Number P120A110059
Grant Type: Institutional

**Innovation in Quantitative Literacy for the Improvement of
Science, Technology, Engineering, and Mathematics (STEM)****Abstract**

The overarching goals of this Institutional Project are to: Develop mathematical skills of Paine College students to improve their overall performance in STEM courses; Increase the pass rates of students in College Algebra and other required mathematics courses for STEM majors; Facilitate the progression of STEM majors from the freshman to the sophomore level; Increase students' retention in the STEM majors at Paine College; and Develop students' quantitative and analytical skills so that they are better prepared for pursuing advanced degrees in science and engineering or careers in the STEM workforce.

Proposed objectives and activities to achieve these goals are arranged in three components:

- 1) Pre-matriculation activities (Summer Enrichment Program);
- 2) Curriculum revision; and
- 3) Student retention and development.

The overall objective of the summer enrichment program is to give the program participants (incoming Paine College freshmen) opportunities to develop mathematical skills with the goal of improving their preparedness for college algebra and other core mathematics courses. The second component of this project involves the restructuring of STEM curriculum. In order to enhance and update the content, activities, laboratory exercises and pedagogical methods, particularly in mathematics courses, in order to create a learning environment that is stimulating, interactive, hands-on, as well as meaningful and useful for students at Paine. Retention activities (the third component) involve a mentoring program (Learning Communities) and opportunities to conduct summer and academic year laboratory research with STEM faculty, and present findings at scientific conferences.

The intellectual merit of the proposed project is that it allows the various components described to be integrated into a comprehensive collaborative effort that improves and increases retention and graduation rates of underrepresented minorities in STEM disciplines.

The broader impact of the proposed project is at least three-fold:

- 1) Data collected from project participants could be used by the institution and others to inform future STEM curriculum and infrastructure decisions;
- 2) Strategies implemented in this project could be duplicated in other non-STEM disciplines on campus; and
- 3) Successes of this project can be disseminated to and used by other HBCUs and minority serving institutions to enhance their STEM programs and increase STEM graduation rates.

ELIZABETH CITY STATE UNIVERSITY

State: North Carolina
PR Award Number P120A110105
Grant Type: Cooperative

Critical Thinking Through Technology

Abstract

The proposed three-year MSEIP Project will recruit faculty from a total of twelve institutions, consisting of eight Historically Black Colleges and Universities/Minority Institutions, one community college, one women’s college, and two tribal colleges for faculty development and training in the use of “Critical Thinking Through Technology” (CTTT) strategies in teaching STEM courses.

The proposed project will address the growing shortage of qualified and competent STEM majors by strengthening course curricula through the infusion of critical thinking through technology. The partnering institutions are: Hampton University, Virginia; Virginia Union University, Virginia; Fayetteville State University, North Carolina; University of North Carolina at Pembroke, North Carolina; Dillard University, Louisiana; Bluefield State College, West Virginia; Medgar Evers College (CUNY), New York; Lincoln University, Missouri; Bennett College for Women, North Carolina; College of the Albemarle, North Carolina; College of the Menominee Nation, Wisconsin; and Haskell Indian Nations University, Kansas.

UNIVERSITY OF PUERTO RICO – ARECIBO CAMPUS

State: Puerto Rico
PR Award Number: P120A110098
Grant Type: Institutional

Enhancement of STEM Programs through Integration of Mentoring and Undergraduate Research Experiences

Abstract

University of Puerto Rico–Arecibo Campus (UPRA) is a public, Hispanic-Serving Institution which serves a predominantly low-income and first-generation student population. In this proposal, UPRA proposes to reinforce the knowledge base of science, technology, engineering, and mathematics (STEM) faculty in effective technologies and strategies in the teaching-learning process, mentoring, and integration of undergraduate research into course curricula; to enhance STEM student learning outcomes in Developmental Education (basic skills mathematics) and STEM core courses through intrusive peer mentor/tutoring to be offered in the STEM Learning Center and faculty research mentoring; and to renovate existing facilities into a state-of-the-art STEM Interdisciplinary Research Laboratory to enhance the experiential learning process and improve students' basic quantitative, critical thinking and scientific reasoning skills by providing enriched hands on and technologically-oriented, active learning experiences.

Anticipated student outcomes improvements include: the freshmen to sophomore retention rates of students participating will increase at least five percent on an annual basis after the second year as measured against previous years' baseline data; targeted STEM students passing rates and grades in developmental education math courses and core courses will be at least five percent higher than non-participants and similar cohorts in previous years; and the persistence to graduation rate of the 2012 STEM freshmen cohort impacted will demonstrate an increase of at least five percent.

UNIVERSITY OF PUERTO RICO AT HUMACAO

State: Puerto Rico
PR Award Number: P120A110068
Grant Type: Institutional

STEM Institute: Opening doors for High School Hispanic Students from the Puerto Rico Easter Region

Abstract

Could the introduction of an intense, innovative and advanced STEM experience alert and motivate students from the high schools in the Puerto Rico Eastern Region? This answer will arrive with this project that proposes the creation of a (science, technology, engineering, and mathematics) STEM Institute in the University of Puerto Rico at Humacao (UPRH) for the 2011 to 2014 periods to demonstrate its success rate with high school students (11th graders) from the Puerto Rico Eastern Region.

The main goal of the **STEM Institute: Opening doors for High School Hispanic Students from the Puerto Rico Easter Region** is to better prepare high school students and particularly females and students with special needs, for future learning in science and technology careers while creating awareness of their talent pipeline as the main resource for the STEM-related industries which provide employment in the Puerto Rico Eastern Central Region. The urgent need to prepare these high school students is demonstrated with the results from the Academic Performance in Science Test, administered yearly to the students by the Puerto Rico Department of Education, as a request from the U.S. Department of Education. The tests results show (“less than acceptable”) the urgent need to prepare the Puerto Rican students in science related fields. The intellectual merit of this project arises from the student exposure to hands-on for the innovative STEM curriculum. The implementation of this project will increase the percent of “Proficient” and/ or “Advanced” students in science matters and subsequently, their admission to college science programs.

The Chemistry Department proposes to serve and expose 144 Hispanics, low-income and special needs students to Science educational and research activities. A detailed and comprehensive budget is presented according with the science activities organized by the director and his colleagues who are committed to provide all necessary resources in order to successfully implement and institutionalize the educational activities of the project. This project will be delivered in collaboration with the Puerto Rico Regional Education Office, the Eastern Region schools, the industries in the UPRH service area, and the community. The Dean of Academic Affairs will supervise the project’s implementation and will provide the necessary support for its success.

The Assessment Plan will include formative and summative evaluations; the annual and final performance reports for the Dean’s approval and the submission to the U.S. Department of Education with the collaboration of the UPRH Assessment Office, in coordination with the assistance of the external evaluator.

HOUSTON COMMUNITY COLLEGE

State: Texas
PR Award Number: P120A110109
Grant Type: Cooperative

Astra STEM Project**Abstract**

The Astra science, technology, engineering, and mathematics (STEM) Project provides a year-round continuum of mathematics and science-focused academic programs and supportive activities to high-need students from sixth grade through baccalaureate level with the goal of increasing enrollment and persistence in (STEM) fields of study. With the ultimate objective of increasing the number of minority women achieving STEM degrees and entering science and engineering careers, the project will follow each participant through the program in initial and subsequent years, offering support and tracking progress to evaluate impact and to enhance the program for improved results. The Astra STEM Project is an expansion of the cooperative's recently established STEM improvement initiatives. Already forging ahead with innovative programs to increase the numbers of minorities enrolling and persisting in STEM-related fields, Houston Community College (HCC) and the University of St. Thomas (UST) will continue to build upon these goals by developing this project with a focus on minority female recruitment, retention and degree achievement in the STEM fields.

The Astra STEM Project will directly serve 100 students in its initial year, tracking each student's performance through subsequent years. HCC and UST track enrollment, course completions and student scores each academic term, therefore the evaluation of the success of the program is built into system infrastructure. HCC and UST will report on the change in all minority students, especially females, enrolled in engineering, technology, physical and biological sciences three years prior to and after the first year of this program's implementation. The cooperative will also work with other local four-year institutions to report numbers of minority students who graduate in a STEM-related field within six years from the date of the program implementation.

TEXAS A & M INTERNATIONAL UNIVERSITY

State: Texas
PR Award Number P120A110067
Grant Type: Institutional

STEM-Minority Outreach and Retention Enhancement (STEM-MORE)

Abstract

Texas A & M International University (TAMIU), a Hispanic-Serving Institution, proposes a Minority Science and Engineering Improvement Program Institutional project to establish innovative outreach and retention programs to increase the number of minority students, attaining science, technology, engineering, and mathematics (STEM) degrees.

The proposed project, STEM-Minority Outreach and Retention Enhancement, has three specific objectives:

- 1) Increase the number of students entering STEM majors by 20 percent each year of the program;
- 2) Achieve an 85 percent retention rate for project participants; and
- 3) Increase the five-year graduation rate for STEM majors, currently below 30 percent, to 46 percent.

The project's goal will be realized through the implementation of a number of vigorous and cost-effective outreach and retention activities, including outreach and enrichment workshops, experiential training, undergraduate research experiences, student mentoring, and faculty professional development.

Performance measures will include:

- 1) Increases in the number of undergraduate STEM students;
- 2) Increases in the retention of STEM students; and
- 3) Increases in the percentage of STEM students graduating within five years.

Some of the other annual key measurable outcomes include:

- a) Introducing more than 4,100 minority middle and high school students to STEM career opportunities;
- b) Providing STEM workshops to 120 minority students;
- c) Providing 5 internships and 10 research assistantships to minority STEM students;
- d) Developing a transfer agreement that builds on our current articulation agreement with the local community college to increase the transfer of minority students into systems engineering at TAMIU;
- e) Providing summer engineering design workshops to 25 minority students.

Increasing the participation of these students in the proposed activities is critical to broadening diversity in the sciences and enhancing the nation's technological and economic competitiveness.

THE UNIVERSITY OF TEXAS AT BROWNSVILLE

State: Texas
PR Award Number P120A110083
Grant Type: Institutional

**Readiness, Recruitment, Retention, Graduation –
Four Dimensions for Achieving Hispanic Student STEM Success ($R^3G=HS^3$)**

Abstract

The goal of this proposal is to increase by 15 percent over three years the number of graduates from the College of Science, Mathematics and Technology (CSMT) at the University of Texas at Brownsville (UTB). To achieve this goal, we are planning to increase the retention and graduation rate of active science, technology, engineering, and mathematics (STEM) majors by 15 percent per year, and at the end of the project period to have 60 percent of students in CSMT programs graduate within four years. The results will be disseminated through conferences and publications, and the proposed strategies can be replicated in other minority-serving institutions.

The proposal is based on our initiative $R^3G=HS^3$ focused on improving **Readiness** for college-level STEM courses, **Recruitment** of local students into STEM majors, and **Retention** of enrolled STEM students, assisting them to **Graduate** in a timely manner, resulting in **Hispanic Students STEM Success ($R^3G=HS^3$)**. Key components of the Initiative are to: Assist area high schools to identify and address curriculum issues that leave the students ill-prepared for college STEM courses; Institute region-wide outreach to community and technical college STEM students; Identify and remove barriers for smooth transfer from these colleges into STEM degree programs; Develop innovative and focused math courses to facilitate acquisition of those skills necessary for a STEM degree; and Implement college-wide academic support systems including student mentoring and family support programs.

These are all proven educational needs of our growing population of primarily first generation, low-income Hispanic students who are entering UTB at the developmental level and dropping out at a rate of approximately 50 percent each semester. Thus, $R^3G=HS^3$ will address the challenges for STEM education among minority institutions and among underrepresented populations.

THE UNIVERSITY OF TEXAS AT EL PASO

State: Texas
PR Award Number P120A110086
Grant Type: Institutional

**The Hispanic Engineering Leadership Institute (HELI):
A Model for 21st Century Engineering Education**

Abstract

With rapid growth of the Hispanic population, projected to become the minority majority (U.S. Census Bureau, 2011), the need to tap into this underrepresented segment of the population, particularly Hispanic women and English Learners (ELs), is vital and calls for an innovative framework to broaden participation.

The proposed **Hispanic Engineering Leadership Institute (HELI)** provides such framework and The University of Texas at El Paso (UTEP), a minority institution serving a largely Hispanic population in a region of Texas with the lowest median income, commits to an institutional project increasing the number of Hispanics, particularly Hispanic women and English Learners (ELs), persisting to timely graduation from undergraduate engineering programs and who obtain 21st century professional skills needed for a globalized workforce. Establishing the comprehensive HELI is informed and underpinned by established research and grounded theories, providing the framework for student academic and professional development, with integrated concurrent faculty development to improve teaching and learning.

The HELI project:

- 1) Engages equal gender numbers and EL learners;
- 2) Implements Problem Based Learning (PBL) for developing student professional skills; and
- 3) Integrates internal and external evaluation as a feedback mechanism for improving programmatic institutionalization.

The project meets the clamoring demand by industry and the National Academy of Engineering (NAE) for 21st Century engineers. Importantly, it advances participation of minorities and especially women in the engineering workforce. Finally, the HELI project serves as an effective MSEIP STEM education model for increasing graduation of minority engineers who embody leadership skills and ingenuity to assume leadership roles in the nation's workforce.

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