Minority University Research and Education Programs
(MUREP) Small Programs (MSP)
Administered by (Multiple Grantees)
Type of Agreement (Multiple Grants)
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PROJECT DESCRIPTION

MUREP strives to achieve the full participation of Minority Serving Institutions (MSIs) in the NASA-sponsored research and education community, as well as in enabling academic excellence and outstanding achievements. MUREP Small Projects (MSP) is an umbrella term for minority science, technology, engineering and math (STEM) education initiatives that are part of NASA's MUREP portfolio. MSP funds innovative STEM projects that address NASA's MUREP priorities, with an emphasis of identifying gaps or areas where funding of innovative projects will enhance the Higher Education portfolio and strengthen its ability to meet Agency objectives.

PROJECT GOALS

MSP's goal is to fund innovative STEM projects that address NASA's MUREP priorities. As funding is available (based on HQ budget and existing MSP portfolio of projects), MSP will release solicitations targeting specific MUREP portfolio needs. The objectives to be met by these solicited projects will depend on the identified needs in the MUREP portfolio. MSP solicitations will state the education PART measures to be addressed by the proposals. The proposals will be evaluated and funded based on how effectively they meet these objectives while leveraging and/or contributing to existing NASA education projects. MSP is intended to provide initial funding of these projects for a specified term while they strengthen and transition to other funding sources. Recurring funding of projects is not expected, but may be limited to projects meeting critical Agency needs, exemplary performance assessment, and which successfully re-compete in subsequent solicitations.

PROJECT BENEFIT TO OUTCOME (1, 2, OR 3)

All MSP goals and objectives are designed to support the Agency's Strategic Plan and the NASA Education goals, specifically, Education Outcome 1: Contribute to the development of the STEM workforce in disciplines needed to achieve NASA's strategic goals, through a portfolio of investments.

PROJECT ACCOMPLISHMENTS

In FY 10, a total of seven innovative projects were funded and managed.

Achieving Competence in Computing, Engineering, and Space Science (ACCESS):
ACCESS provides a 10-week paid internship at NASA centers around the United States. It is designed for undergraduate and graduate students with disabilities who have strong backgrounds in science and a desire to pursue technical careers. Undergraduate students are provided a stipend of $5,250 and the graduate students stipend is $6,000. In addition, travel expenses are paid, up to a $1000 allowance. There is a provision for assistive technology and other reasonable accommodations.

Minority Student Education Forum
This forum was piloted by MSP with funds from the MSP FY10 budget. The forum was held July 27-29, 2010 at Kennedy Space Center. MSIs were invited to propose for the cost of bringing students to KSC for the education forum, with student panels and NASA minority role model speakers, and which included a tour of KSC. There were 361 students ranging from fifth grade to high school, from eleven different MSIs across the country. The purpose of the forum was to expose student participants to real-world experiences and examples that will encourage them to become the scientists and engineers of the future, thereby strengthening the nation's future STEM workforce. MSIs were also asked to incorporate education initiatives at their schools based on the forum activity. Eleven proposals representing seven states, DC and Puerto Rico were selected for funding. During the three day event, the activities included a tour of the Kennedy Space Center, a full day forum and a full day to experience the KSC Visitors Complex and the Astronaut Hall of Fame. On July 28, the education forum included opening remarks from NASA management; Legends and Trailblazers panel discussions sharing their education path, their NASA career, NASA's future, and their advice to students, emceed by Star Trek's Nichelle Nichols; a near-peer round table comprised of college student role models and new hires; and hands-on workshops allowing students to participate in hands-on STEM educational activities and learn how they apply to NASA's missions and goals.

New Three Year Projects for FY10:
A solicitation for FY10 innovative projects generated 39 proposals. Of those, five were selected for implementation starting in FY10. These projects are three year awards, with funding renewals based on project performance and funds availability. Evaluation and sustainability were key criteria in the awards, as well as innovation.
The five new projects are:

New Mexico State University (NMSU): Promoting Access, Retention, & Interest in Astronomy
NMSU will develop an online astronomy course with a set of critical resources adaptable for use in traditional and distance learning undergraduate introductory astronomy courses. These materials will address two key needs in ensuring success at the undergraduate level for traditionally underrepresented students in New Mexico: (1) providing a mechanism for students to review basic math and science and then explore current astronomical research at pace commensurate with their skills, and (2) allowing students whose work and family commitments limit their ability to attend in-class sessions to successfully pursue the accredited laboratory-

based science courses which are mandatory for completion of the state-wide graduate requirements for a college degree. These materials will improve retention rates for students with limited math and science backgrounds and will directly improve the scientific training for pre-service teachers, who comprise 40% of the students within the courses, and thus indirectly improve the K-12 educational experience statewide in the local underrepresented, underserved population. The statewide science credit requirement recently doubled, so increasing access to laboratory science courses in 24/7 mode removes a major barrier to completion of a college degree.

North Carolina Agricultural and Technical State University (NCA&TSU): Integrating NASA Science, Technology and Research in Undergraduate Curriculum and Training

The mission of NASA and its four directorates (Aeronautics, Exploration Systems, Science, and Space Operations) requires STEM content that includes the bio-chemical sciences, physical sciences (earth and atmospheric sciences), engineering and mathematics. This project will develop, implement, evaluate and disseminate innovative pedagogical concepts for integrating the associated NASA STEM content into the related courses at NCA&TSU. The courses that have been chosen for inclusion in the project are large enrollment courses that are critical to undergraduate STEM student success and provide opportunities to incorporate NASA content to motivate student engagement and success. The first year effort focuses on selected sections of specific undergraduate courses taught by an interdisciplinary team of faculty investigators. The second and third years target the replicability and sustainability within NCA&TSU and subsequently to other MSIs. An interdisciplinary team of faculty members will lead and coordinate the integration efforts impacting the undergraduate curriculum in the fields of Biology, Physics, Chemistry, Mathematics and Engineering. The primary targeted audiences are undergraduate students in these disciplines.

Florida A & M University (FAMU): Minority Innovation Challenges Institute (MICI)

FAMU shall seek to mentor students at MSIs across the country, in order to spur their interest in the STEM content offered by technical competitions sponsored by NASA. Unfortunately, the trend has been that there is little participation by MSIs in most of the NASA University challenges and the NASA Centennial Challenges. FAMU proposes to change this trend by establishing MICI. MICI is based upon other innovative 'best practices' NASA has undertaken to deliver content in a virtual format, such as the NASA Astrobiology Institute (NAI) and NASA's Digital Learning Network (DLN). MICI shall be delivered in the format of a year-round virtual conference. Registration shall be free and open to any student currently enrolled in a STEM major at an MSI. The virtual conference will feature live video presentations from technical speakers, PowerPoint presentations, Q&A sessions, chat/networking lounges, a discussion board, exhibit booths, and the ability to view archived content. MICI will focus on a different NASA technical competition each month. During the final year of this grant, those students who participated in MICI would be invited to participate in a virtual job fair hosted within the existing virtual conference infrastructure. NASA, along with NASA Contractors would be invited to make presentations, occupy a virtual expo booth, and could connect with these future workforce candidates via video, audio, or text chat. MICI will be unique because it will repurpose the existing content of NASA's Centennial Challenges, foster further research in technology areas meaningful to NASA, motivate students to become involved in STEM disciplines related to NASA, and hopefully inspire them to seek employment at NASA or a NASA contractor.

Sistema Universitario Ana G. Mendez (SUAGM): Engaging MSI STEM Students Through Space-Based Capstone Design

A team of three (3) Hispanic-serving Institutions (HSIs), namely Universidad del Turabo (UT), the lead institution, Universidad Interamericana-Bayamon (UIAPR), and Universidad Politecnica de Puerto Rico (UPPR), in collaboration with Michigan Technological University (MTU), will implement systems engineering based multi-disciplinary capstone design programs. The courses will incorporate NASA-sponsored projects, as well as non-space-based projects to generate and maintain interest in STEM programs and better prepare students for careers in the design of complex systems. The program will be initially developed at the three Puerto Rican HSIs, and then project results will be disseminated to MSIs nationwide. The project will entail the implementation of a NASA Exploration System Mission Directorate (ESMD) course in systems engineering-based, multi-disciplinary capstone design; a summer program to develop student project team leaders; support for NASA capstone projects as one way to achieve the goals of ABET-accredited capstone design programs; advocating and supporting proposals for NASA summer opportunities for students as a means to gain real world experience; the development of university cohorts to gain efficiencies in curricular planning and faculty training, as well as to foster long term collaboration; and the development and dissemination of a capstone design assessment process that is grounded in best practices.

Navajo Technical College (NTC): Laser Scanning for Digital Manufacturing

The Engineering Directorate at several NASA facilities needs rapid prototyping skills and internship opportunities exist at Marshall space flight center, specifically in the National Center for Advanced Manufacturing's Rapid Prototyping Lab. NTC will revise six courses to incorporate laser scanning technology, improving the ability to provide NASA with the current level of skills needed by the NASA digital manufacturing team. The courses have a relationship to digital manufacturing, manufacturing engineering, quality control, statistical comparison, engineering and design. While creating simulations of the manufacturing process, the team needs as-built models of facilities, which are most efficiently and accurately captured by laser scanning, which Marshall Space Flight Center does not currently have the capability to conduct. NTC will integrate the capturing and processing of the digitally captured data within the various courses mentioned above which will allow students to gain the hands-on knowledge highly valued by NASA.

PROJECT CONTRIBUTIONS TO PART MEASURES

MSP projects support Outcome 1 of the NASA education portfolio:

- **Outcome 1 (Higher Education):** Contribute to the development of the STEM workforce in disciplines needed to achieve NASA's strategic goal through a portfolio of investments.

ACCESS supports 20 internships each year for students with disabilities who are seeking a STEM major. ACCESS is currently the only project in the NASA education portfolio directly serving disabled students.

The Minority Student Education Forum hosted 351 students from grades five to twelve. These students were included in the Summer of Innovation initiative for FY10.

The other five new MSP projects were in a development phase for their first year during FY10. However, due to student support for project development, there were 42 students with significant involvement, and a total of 121 students impacted. This number will be significantly higher for FY11, when the projects are in their implementation and testing phase.

Several of the projects are involved in course revision, with different planned outcomes, based on their project objectives. The total number of courses revised/developed in FY10 is 34 across the five new projects. This includes 25 course revisions and nine new courses developed. This is a significant accomplishment for a minimal amount of funding. There were only originally 19 courses planned for revision/development. This is a significant increase, with no additional funding requested for FY10.

SIGNIFICANT ACCOMPLISHMENTS

- All MSP projects are on budget and on schedule, some have increased scope with no additional funds request.
- Including the Minority Student Education Forum, a total of 492 students impacted in FY10.
- Starting in FY10, a total of 34 courses being revised/developed (original plan for FY10 was 19 courses).
- Navajo Technical College created 8 new courses, and is revising 5 courses. The MSP funding has led to additional grants, which is now allowing them to fully develop into a 4 year university. There are now plans for a 4-year Industrial Engineering degree and a 4-year Digital Manufacturing curriculum (IT BS degree). The new IT degree has received recommendation for accreditation and will be offered in spring of 2011. They are also actively working on developing revenue for the school from the design center, enabled through the first year of MSP funding. This design center, the NTC Center for Laser Scanning and Digital Manufacturing, has attracted an advisory board of industry pioneers and leaders, and has several possible commercial projects. The six member Advisory Board consists of industry experts in the fields of laser scanning, rapid prototyping and digital manufacturing.
- The Minority Innovation Challenges Institute (MICI) fully developed their online infrastructure in FY10 and opened their online conference platform in May 2010. In only the first 7 months of operation, the registrants include: 275 students, 141 faculty members, and 60 others (NASA employees and other VIPs). The students and faculty come from 40 different states and represent 190 different colleges/universities. Approximately 40% of these colleges/universities were Minority Serving Institutions. There have already been two teams, a tribal college and a Historically Black College, accepted into University Student Launch Initiative (USLI). The project is actively seeking ways to partner with NASA challenges and increase its scope and reach, with no additional funding. They are on schedule with planned presentations for challenges.
- New Mexico State University received additional NMSU funds, and was therefore able to increase the complexity of the computer simulations and usage of NASA images and spectroscopy in the lab exercises. This also reduced their request for year 2 funds. They have also increased the number of lecture modules to be created. Students with English as a second language have cited the database as a productive tool for strengthening their

background knowledge of the sciences, which is a critical need in New Mexico. Results of beta testing are quite good so far. The database has been well received by faculty involved in beta testing.

- The team of 3 Puerto Rico Universities has had an overwhelming response from their faculty for the systems engineering based, multi-disciplinary capstone design workshops offered through this project. A minimum of 12 courses are planned for revision. Their original plan was to train six faculty in FY10, however, in their first workshop, 18 faculty members participated. There are plans for another workshop and 15 more faculty in FY11. Faculty will have distinct courses that meet the needs of their institutions and their students, but there are many elements of Capstone Design that are fundamental and will be common across the implementations. The SUAGM project includes leadership workshops for the students, and reserved internship slots at Michigan Tech. Students also applied to NASA internships, but were not selected in FY10.
- At NCA&TSU, the courses chosen for revision are large enrollment courses that are critical to undergraduate STEM student success. NCA&TSU is the #1 producer of African-American BS and PhD graduates in engineering, and ranks #5 nationally in the percentage of women awarded Bachelor's degrees in engineering. Ten courses will be revised through this project. Seven are ready for initial implementation in Fall 2010. The integration of NASA content into the chosen courses is therefore expected to impact a large segment of underrepresented students; the anticipated enrollment for Fall 2010 is more than 200 undergraduate students. An interdisciplinary team approach is being utilized to impact biology, atmospheric science and engineering courses. Module booklets and modern educational technologies are being utilized to facilitate wide dissemination of the materials developed.

IMPROVEMENTS MADE IN THE PAST YEAR

Sustainability as well as evaluation plans are considered and captured within all of the five new projects implemented in FY10. Dissemination of results or project work is also planned. The five new projects funded for implementation in FY10 offer a diverse blend of universities with projects that are cross cutting and enhance the Outcome 1 portfolio in the following ways: innovative methods, approaches, and/or concepts; total of 34 courses developed/enhanced; significant leveraging of NASA content and resources; serves pre-service teachers and STEM students; supports the involvement of MSIs in NASA sponsored challenges (current lack of MSI involvement is clearly evidenced). Projects are being closely monitored during implementation with a strict rigor of reporting and open communication. All of the projects are on budget and on schedule, with several projects ahead of scope with no additional funding. Project sunsets are also planned, with no significant funding requirements expected after the initial three-year development. Additional funding requirements beyond the three-year development may include impact assessment and data collection, which is expected to require minimal funding.

PROJECT PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

For FY10, the following is a list of project partners in the implementation of the MSP projects:

- ACCESS: Principle Investigator: The American Association for the Advancement of Science (AAAS), responsible for student recruitment, selection, reasonable accommodations and stipend payment.
- Sustaining Partnerships through Rapid Prototyping & Laser Scanning Technology: Principle Investigator: The Navajo Technical College (NTC), overall responsibility of the curriculum development project. Advisory Board members include National Center for Advanced Manufacturing – Louisiana Partnership (NCAM-LP); Navajo Tribal Utility Authority; Sandia National Labs; SPAR Point Group, Diversified Business Communications, SPAR, LLC; WHPacific, Inc.
- FAMU MICI: Secor Strategies, LLC, managing day-to-day operations for project implementation.
- SUAGM: Michigan Technological University (MTU) was previously funded to develop a Capstone Senior Design course for the Exploration Systems Mission Directorate. SUAGM is leveraging this experience and utilizing it for the development of their capstone courses. In addition, plans for dissemination include the National Space Grant Consortium, which will also be facilitated by MTU.