

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 these 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, short term and high risk 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 project focuses on recruiting underrepresented and underserved students in STEM disciplines through completion of undergraduate or graduate degrees in support of their entry into the scientific and technical workforce. MSP solicitations will state the education PART/APG measures to be addressed by the proposals. The proposals will be evaluated and funded based on how effectively they meet these objectives while leveraging other existing NASA education projects, external funding sources or external partnerships. 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, and with exemplary performance assessment.

PROJECT BENEFIT TO OUTCOME (1, 2, OR 3) and NASA Annual Performance Goals (APGs)

All MSP goals and objectives are designed to support the Agency's Strategic Plan and the NASA Education goals, specifically, Outcome 1 Higher Education, and map directly to four of the new FY12 APGs. Outcome 1 contributes to the development of the STEM workforce in disciplines needed to achieve NASA's strategic goals, through a portfolio of investments.

PROJECT ACCOMPLISHMENTS

Minority Student Education Forum

This forum was piloted by MSP and was first held July 27-29, 2010 at Kennedy Space Center. For FY11, the forum was sponsored by MSP and hosted at Glenn Research Center. MSIs were invited to propose for the cost of bringing students to the education forum, with student panels, demonstrations and NASA minority role model speakers. KSC conducted the solicitation, with evaluation and selection, as well as the Request for Proposals (RFP) for the hosting facility. 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. Two panel sessions featuring NASA *Legends* and *Trailblazers* were held, with NASA minority role models. These sessions are consistently well received by the students. MSIs were also asked to incorporate education initiatives at their schools based on the forum activity. In FY11, approximately 400 students from grades 5 to 12 attended the forum at GRC. Eleven universities representing seven states, and Puerto Rico were selected for funding, in amounts ranging from \$5K to \$45K. The differences in funding amounts are attributed to the varying number of students supported and the differences in geographical location.

Achieving Competence in Computing, Engineering, and Space Science (ACCESS):

ACCESS provides students 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 student 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. In 2011, ACCESS 19 student interns were placed at NASA centers.

ACCESS has placed 257 student interns with disabilities at NASA since 1997, when NASA awarded the first grant to AAAS in 1997. Follow-up data indicates that 95% of ACCESS alums have pursued graduate studies and/or have found full employment in science, technology, engineering, or mathematics (STEM) fields. In February 2011, ACCESS interns spoke about their education and internship experiences during panel discussions at the AAAS Annual Meeting Luncheon for Students and Scientists with Disabilities at Washington DC. The most recent data shows that, since 1996:

- 257 students have participated in ACCESS internships
- 63 ACCESS alumni identified as African American, Indian, Hispanic, and Asian
- 65 ACCESS alumni have returned to NASA for multiple internships
- 16 ACCESS alumni have been hired at NASA
- 9 ACCESS alumni have done co-ops at NASA
- 3 ACCESS alumni have worked for NASA contractors
- 37 ACCESS alumni are currently pursuing a STEM Master's or Ph.D. degree
- 39 ACCESS alumni are currently pursuing undergraduate degrees.
- 43 ACCESS alumni have earned graduate degrees in STEM fields
- 121 ACCESS alumni have reported they are working in STEM-related fields
- Only 12 ACCESS alumni have reported they are working in non-STEM fields

Current Three Year Projects:

A solicitation in FY09 for new innovative projects generated 39 proposals, with five selected for implementation starting in FY10, with project sunsets in FY12. 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.

New Mexico State University (NMSU): Promoting Access, Retention, & Interest in Astronomy

New Mexico State University (NMSU) is one of the two primary universities in New Mexico and its branch campuses serve fifty percent of the 62,000 undergraduates state wide. NMSU is also a Hispanic-Serving institution, therefore meeting the needs of underrepresented students. NMSU student body is 55% female and about 50% percent ethnic minority therefore resulting in a customer base that is 78% historically underrepresented and underserved students.

The project purpose of NMSU is to develop a set of critical resources for use in traditional and distance learning undergraduate introductory astronomy courses. The NMSU online interactive astronomy material provides students the opportunity to develop their science skills in a private, non-threatening, self-directed learning environment. The new astronomy materials will address two key needs in increasing success for underrepresented students in New Mexico: providing a mechanism for students to review basic math and science and allowing students to explore current astronomy topics at a pace commensurate with their skills. The new materials will also allow students whose work and family commitments limit their ability to attend in-class sessions to successfully pursue an accredited laboratory-based science course and mandatory graduation requirements.

The new materials being implemented will directly improve the scientific training for pre-service teachers, who comprise 40% of class membership thus improving the K-12 educational experience in the local underrepresented and underserved population. These new materials will improve retention rates for students with limited math and science backgrounds. The statewide science credit requirement recently doubled, so increasing access to laboratory science courses in a 24/7 mode removes a major barrier to completion of a college degree. The new online materials will also include an instructor analysis tool for reviewing student self-review work, containing trends with topic and time for individuals and groups.

NMSU received additional university funds in FY10, and was therefore able to increase the complexity of the computer simulations and usage of NASA images and spectroscopy in the lab exercises, while reducing their request for FY11 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.

The database has been extremely well received by faculty during beta testing and implementation. It contains instructor analysis tools for reviewing student self-review work, trend data for individuals and groups, and records of each exercise completed by every student. This allows instructors to monitor individual and group progress, tracking every facet of student action including incorrect answers, as well as the global response to individual topics of study.

The program contains four components, based on 26 lecture modules starting with exploration of the solar system and ending with the cosmology of the early universe, in conjunction with online text, and over 5,000 images derived primarily from existing NASA astronomy and space exploration missions. Over 88% of lecture modules contain NASA data, while the remaining 12% of lectures develop basic material congruent with NASA education goals. Seven platform-independent web applications have been constructed for dissemination and use of the materials. In addition, a series of 13 short films highlighting members of underrepresented groups with productive careers in astronomy-related STEM fields are being created, which will reinforce a message of inclusion for underrepresented students in the future STEM generation and combat stereotype bias. These videos are also being requested for use at the National Radio Astronomy Observatory (NRAO) website and the visitor center at Arecibo Observatory in Puerto Rico. Spanish subtitles are also in development.

The Fall 2010 class size increased from 25 to 85 students due to demand for the course. These are undergraduate participants in a general education astronomy course to fulfill requirements for a B.S. degree. Of the 85 Fall 2010 students, 49 (58%) were under-represented or underserved and 50 (59%) were female. The demand for this distance education course was unprecedented, far higher than that for any other astronomy course at the university. All spaces were claimed within two hours of the beginning of general enrollment. The 85 students took a total of 21,000 quizzes, for an average of 285 quizzes per student (versus three to ten quizzes conducted in-class in parallel versions of the course). The success of the course led directly into the creation of a full distance education mode for the course, due to the now very high demand for the course. Enrollment for the full distance course is at full capacity for Fall 2011.

NMSU's five campuses work with every county in New Mexico, and distance education partnerships with Eight Northern Indian Pueblos Council (ENIPC) tribal colleges create yet another pipeline for dissemination to populations statewide. The self-contained, non-proprietary, fully self-explanatory online materials can be used by external instructors without significantly increasing upkeep. It is also currently in use by Humboldt State University, and can easily be implemented at schools nationwide. The program will be promoted at the NASA Center for Astronomy Education (CAE) and American Astronomical Society (AAS) meetings, and has already been presented at various venues and conferences.

NMSU is seeking funds to expand this program to include the general public, via educational applications and the creation of courses specifically to meet the needs of Pre-Service Teachers.

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

The mission of NASA 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. NCA&TSU is the number one producer of African-American BS and PhD graduates in engineering, and ranks number five nationally in the percentage of women awarded Bachelor's degrees in engineering. A total of ten courses will be revised through this project. 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 FY10 effort focused on coursework revision of selected sections of specific undergraduate courses taught by an interdisciplinary team of faculty investigators. Seven courses were ready for implementation in Fall 2010. The second and third years target the replicability and sustainability within NCA&TSU and subsequently to other MSIs. An interdisciplinary team of faculty members are leading and coordinating 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, with the ultimate goal of increasing interest through real world data and examples and thereby increasing the retention of these students in STEM fields. These courses are large enrollment courses that are critical to undergraduate STEM student success.

In FY10 and FY11, seven courses were revised, and opened to student enrollment starting in Fall 2010. The integration of NASA content into the chosen courses has impacted approximately 300 students through enrollment in the classes, with a large segment of underrepresented students. In addition, direct support of \$68K was provided to students in the form of stipend payments for project development work, from their \$335K grant, approximately 20%. To facilitate wide dissemination of the materials developed, module booklets and modern educational technologies are being utilized. NCA&TSU conducted a NASA-INSTRUCT workshop on June 13-17, 2011. It was attended by 9 faculty members from 9 different HBCU/MI institutions and was very well received. All the participants were trained in various STEM modules developed at NCA&TSU. These modules included materials, physics, chemistry, biology and atmospheric sciences. Two guest lecturers made presentations, including one from NIA at Langley Research Center. In addition, the INSTRUCT project was presented at the American Society for Engineering Education, in March 2011 at Vancouver, B.C., Canada. This is a major engineering education conference and provided great visibility to the NCA&TSU INSTRUCT project. The ASEE Annual Conference & Exposition hosts over 400 technical sessions, with peer-reviewed papers spanning all disciplines of engineering education.

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

MICI, operated by FAMU, mentors students at MSIs across the country by providing technical sessions to generate participants in the STEM technical competitions sponsored by NASA. Unfortunately, the trend has been that there is little participation by MSIs in most of the NASA challenges. In less than 2 years, FAMU has significantly changed this trend. MICI is delivered in the format of a year-round virtual conference. Registration is free and open to any student currently enrolled in a STEM major. The virtual conference features live video presentations from technical speakers, powerpoint presentations, Q&A sessions, a discussion board, exhibit booths, and the ability to view archived content. MICI focuses on a different NASA technical competition each month. During the final year of this grant, those students who participated in MICI will 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.

FAMU launched its first broadcast on May 24, 2010. Since then, as of summer 2011, 712 students from 307 different universities have registered in MICI. Student registration in MICI is approximately 65% underrepresented and underserved. MICI has produced over 50 content sessions, including a video message from NASA Administrator, Charles Bolden, NASA internships, and grants for technical competitions. Some of the different competitions and challenges include: Space Elevator Competition, Strong Tether Competition, Lunabotics University Student Launch Initiative, The Great Moon Buggy Race, ESMD Systems Engineering Paper Contest, SpaceTech Engineering Design Contest, the Green Aviation Engineering Challenge, and the Reduced Gravity Education Flight Program.

FAMU created a one hour course for a team of FAMU students recruited to participate in the University Student Launch Initiative (USLI) in Huntsville, AL, April 2011. The team was not eligible to launch their rocket during the competition because their recovery system did not work. However, they participated in the other USLI activities such as the rocket fair, tours, etc. Although they didn't launch, their USLI participation was a great learning experience and the students are excited about participating again next year.

In FY11, MICI generated the participation of 13 Minority Serving Institutions (MSIs) in three different NASA competitions for FY12. MICI sponsored and conducted a competition for mini-grants providing \$40,000 for ten grants, and all ten institutions have been confirmed as registered in three different NASA sponsored competitions. This will be the first time these ten MSIs have competed in these NASA challenges. The list represents Hispanic Serving Institutions (HSIs), Historically Black Colleges and Universities (HBCUs), and Tribal Colleges and Universities (TCUs) across seven states. The schools participating in Lunabotics are: Texas A&M University, Corpus Christi (HSI); Florida International University (HSI); Texas A&M International University (HSI); and Morgan State University (HBCU). The schools participating in USLI are: Haskell Indian Nations University (TCU); New Mexico State University (HSI); California State Polytechnic University, Pomona (HSI). The schools participating in the Experimental Sounding Rocket Competition are: Navajo Technical College (TCU); Howard University (HBCU); Virginia State University (HBCU). MICI also generated three first time MSIs who participated in NASA challenges in FY11. All three of these schools will compete again in FY12, which includes Oakton Community College in Lunabotics, and FAMU and Northwest Tribal College in USLI.

In addition, MICI went above scope to test out other initiatives and sessions, such as the NASA SOLAR internship application instructional session. In this session, there were a record number of 155 students participating online. Of those 155 students, there were completed applications submitted from 54 students in 33 different states. This is an impressive percentage, with approximately 35% direct participation generated.

A HQ initiative that MICI supported was the flight week for the Reduced Gravity flight operations, targeted for Minority Serving Institutions (MSIs) and community colleges, which took place on June 15 to June 25, 2011. The Minority University Research and Education Programs (MUREP) project managers worked with the Reduced Gravity team to help define and promote this opportunity to MSIs, who have had historically very little participation in the program. A limited amount of team funding was provided for qualified teams, which was

disbursed by MSP grantee FAMU, at no cost to NASA. Training sessions were also conducted through the MICI conference website. An online chat session with Leland Melvin was conducted on August 31, 2011 with the RGEFP students, through a beta version of an online mentoring system developed by FAMU MICI.

Due to all that success, MICI also conducted live sessions for NASA's Student Career Experience Program (SCEP), also known as cooperative education (co-op). These sessions were led by Human Resource personnel, who fielded numerous questions at the end of the session. The Q&A session alone ran for 45 minutes. The SCEP sessions generated approximately 160 new registrants in MICI, with 89 students interested in applying to the NASA SCEP program. MICI is also supporting the students during the application process. The demographic breakdown of the 89 students is 65 minority students from 29 states, 20 MSIs and 40 Non-MSIs. The SCEP session is part of their beta testing, as an initiative to expand MICI's services and capabilities in serving the needs of NASA Higher Education and the MUREP portfolio.

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

Three Hispanic-Serving Institutions (HSI) in Puerto Rico, namely Universidad del Turabo (UT), the lead institution, Universidad Interamericana-Bayamon (UIAPR), and Universidad Politecnica de Puerto Rico (UPPR), have collaborated with Michigan Technological University (MTU) to develop Systems Engineering based multi-disciplinary capstone design courses. This will impact a minimum of twelve engineering programs (four per institution), incorporating NASA sponsored research and projects. This project leverages expertise from an existing NASA Exploration Systems Mission Directorate (ESMD) funded senior design course developed by MTU and addresses a key NASA need for engineering graduates with design knowledge and experience using a systems engineering approach. The main goal of the project is to develop new capstone design curricula that better prepares students to be successful in multi-disciplinary teams performing complex systems design projects. The systems engineering approach and the capstone design class are becoming fundamental to senior students to improve their potential of a successful engineering career. The new capstone design curriculum will enable students at each institution a richer design experience that better prepares them for the systems-based design teams employed by NASA and the aerospace industry. This project targets students in many departments at these HSIs with nearly 100% underrepresented and underserved Hispanic students in STEM disciplines. The program will be initially developed at the three HSIs, and then project results will be disseminated to MSIs nationwide.

The project entails a multi-prong approach, including the implementation of a NASA 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 across the universities; and the development and dissemination of a capstone design assessment process that is grounded in best practices.

In FY11, a total of 25 students are receiving significant support from the project, totaling \$78K of their \$304K award, for a total of approximately 25% student support. According to the current enrollment figures, this program will impact between 150 and 200 senior students per year during the final two years of implementation. Students selected for Michigan Tech summer research internships spend eight weeks working within existing research groups and existing research projects that match well with their abilities. Student activity includes the following:

- 23 students participated in the Leadership Workshop at Michigan Tech, four more than FY10
- Two additional students participated in summer internships at the HSIs
- Project funds will sponsor student participation in commercial design team competitions for FY12
- ABET program outcomes are being used in the project's assessment of student learning
- Assessment tools were developed and are used to evaluate the students' capstone projects

Faculty workshops training faculty to deliver these classes has exceeded all expectations. Initially planned for 12 faculty, the workshops had to be expanded to meet the demand, at no additional cost to NASA.

- 18 faculty members completed the Systems-based, multi-disciplinary Capstone Design workshop offered by Dr. Gershenson, Michigan Tech University January 2011
- At least one faculty member per program is working on course syllabus development
- Fourteen faculty members completed the Syllabi and Assessment workshop offered May 2011, including 12 who attended the workshop offered in January and two new faculty members
- 20 distinct faculty members participated in the workshops offered during FY11
- Faculty are also trained in designing, implementing, and assessing these courses
- For FY12, only one workshop will be offered and will be open to all the faculty members who want to attend regardless of the program they support

Of particular note is the fact that improvements made to UIAPR's capstone courses helped the UIAPR's engineering programs during ABET accreditation visit last fall. Previous visits had noted that improvements were needed to maintain accreditation.

In FY12, materials developed for this project will be posted on a dedicated project web site. This is currently planned to be operational by the end of FY12. A special project dissemination planning meeting will take place at the beginning of FY12 to plan out particular methods and venues of dissemination.

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

Rapid prototyping skills are needed by the engineering directorate at several NASA facilities and internship opportunities were required at Marshall Space Flight Center (MSFC), specifically in the National Center for Advanced Manufacturing's Rapid Prototyping Lab.

In order to create simulations of the manufacturing process, the MSFC team needs as-built models of facilities which are most efficiently and accurately captured by laser scanning, which MSFC does not currently have the capability to create. NTC will integrate the capturing and processing of the digitally captured data as a part of coursework, which will allow students to gain the hands-on knowledge highly valued by NASA. NTC has revised numerous courses (greater scope than anticipated) to incorporate rapid prototyping and 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.

There has been an extensive increase in NTC student enrollment in CAD/Digital manufacturing by offering a limited number of student internships to advanced students. In FY11, 15 new students have enrolled for a total of 25 students in CAD at NTC, approximately a 250% increase.

Of their \$200K FY11 MSP grant funds, \$31K, approximately 15%, was used for direct student support. Student stipends and internships were provided, with 15 students receiving direct student support. Six students participated in the eight week summer internship. These Navajo Tech Center for Digital Technologies students will participate in three NASA internships this summer:

- 3 students will work on a continuing project for Marshall Space Flight Center (MSFC) Composite Room
- 2 students will work with AMES Research Center personnel to reverse engineer the LADEE satellite and create computer models and hard copy models for use in education by AMES.
- Halliday will supervise one student who will create a detailed model of the large 18 foot autoclave door and the autoclave for MSFC.

Directly as a result of the MSP funding, NTC is now able to offer a new Bachelor's of Applied Sciences (BAS) degree, successfully converting them from a 2 year community college to a 4 year university. Spring 2011 was the first semester that enrollment was opened to students. The degree was developed by NASA funding and is a IT based degree, with three focuses for students to chose from including; Computer Science, Digital Manufacturing, and New Media. Beginning enrollment for each was ten students on the Computer Science track, nine students on the Digital Manufacturing, and five students on the New Media track. All of these students except for one are from the underserved and underrepresented student groups.

Student interest and retention in the program has increased dramatically because of the internships, hands-on-projects, and student support available by NASA funded opportunities. By the end of the MSP grant period, enrollment at NTC as a whole is expected to increase by 300%. NTC is currently ranked in the top 120 community colleges in nation by Aspen Institute.

Additionally, NTC has initiated a new four-year Digital Manufacturing degree program based upon DELMIA digital manufacturing and production software training by Dassault Systems (DS), a world leader in three dimensional and Product Lifecycle Management (PLM) solutions. NTC has received a recommendation for board approval of the ABET accreditation for the 4-year degree tracks, which is on track for approval in 2012.

NTC's principal investigator, Scott Halliday, is collaborating with the National Institute for Standard and Technology (NIST), the Physics Institute, and also various labs including Advanced Manufacturing and Laser Science, Laser Science and Measurement, Digital Technology, Nano Technology, and Industrial Engineering. The visit to NIST is a step in exploration of the CAD Center becoming a center for non-destructive evaluation with optical measurements and advanced digital manufacturing.

The phenomenal success of the changes due to MSP funding led directly to the development of the Navajo Tech Center for Digital Technologies. This Center is building a foundation for economic development using the CAD/Digital Manufacturing abilities at Navajo Tech in a manner that provides industry-standard knowledge, skills, attributes, and values to students so that they can work on sub-contracts with NASA contractors. The CAD program is collaborating with Boeing Directed Energy Systems on a potential contract. The NIST visit anticipates the State of New Mexico becoming a high quality manufacturing hub, using advanced quality control measurement techniques to attract jobs and economic development opportunities. The NTC PI is working with NTC Outreach and Marketing Director to secure Digital Technology contracts for Center, and has currently secured a commitment of \$130K for FY12. The strategic plan for the NTC Computer-Aided Drafting/Digital Manufacturing Program has a top priority of outreach and dissemination of research, education, and partnership best practices.

The success of the NASA funding also led directly to the award of a \$2Million grant from the National Science Foundation. This grant will continue to provide the support needed for the Navajo Tech Center for Digital Technologies.

A NASA CIPAIR grant was awarded that will lend further support towards developing the full educational program. Curriculum development that supports integrating entrepreneurship into classroom activities by linking student projects to real-life industry needs is underway.

Currently, the following outreach activities are underway:

- Student recruiting and retention will remain top priorities through dual enrollment to engage high school students in CAD and the fundamentals of engineering to recruit for the 4 year digital manufacturing program offered at NTC.
- A strong effort through visiting high schools will be made to let the Navajo Nation High Schools and the Navajo Nation know what NTC has to offer in STEM opportunities.
- Presentations on Laser Scanning have been made to middle school students at Fort Defiance and to high school students at Crownpoint High School.

Navajo Technical College (NTC) was invited to sit on a panel on laser scanning and education at the SPAR conference in Houston, TX, March 21-24, 2011. Many contacts were made at the conference. Students had an opportunity to see new hardware and software solutions and to talk with perspective employees. They also manned a booth for the school and attended many presentations.

In May 2011, two NTC teams competed in the 3rd Annual First Nations Rocket Competition in Milwaukee, WI. The students utilized digital manufacturing techniques to create assembly jigs and simulations. They designed parts, ran iterations and problem solved utilizing the software and hardware provided by the NASA MSP grant, creating custom rocket parts for the College of

Menominee Nation as well. NTC attempted a world record for altitude with a J-rocket engine. NTC earned a second place finish, a very commendable showing for the school's first year of competition.

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.
 - Achieve 40% participation of underserved and underrepresented (in race and/or ethnicity) in NASA higher education projects.
 - Achieve 45% participation of women in NASA high education projects.
 - 75,000 educators participate in NASA education programs.
 - 25,000 undergraduate and graduate students participate in NASA education opportunities.

ACCESS provided 19 internships in FY11 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.

NMSU – Enrollment is at full capacity for the course, for a total of 85 students for FY11.

SUAGM - Student stipends and internships were provided for 25 students, for a total of \$78K out of \$304K, approximately 25%. In addition, a total of approximately 150 students were enrolled in the senior design capstone courses.

NCA&TSU - Student stipends totaled \$68K out of \$335, which is 20% of the grant, for 25 students. There are approximately 300 students enrolled in the revised courses.

NTC - Student stipends and internships were provided for 15 students, for a total of \$31K out of the \$200K grant, approximately 15%. A total of 25 students were enrolled in the revised courses, which is an increased enrollment of 250%.

FAMU – A total of \$12.5K was provided for direct student support for 5 students. A total of over 700 students are registered in MICI, with 152 students having significant involvement via MICI or involvement with a NASA competition. Mini-grants for participation in NASA competitions totaling \$40K were awarded to 10 MSIs.

Minority Student Education Forum - provided grants to 11 MSIs, enabling approximately 400 students in grades 5-12 to attend the forum at GRC.

SIGNIFICANT ACCOMPLISHMENTS

- All MSP projects are on budget and on schedule; some have increased scope with no additional funds request.
- Excluding the Minority Student Education Forum, a total of approximately 800 higher education students impacted in FY11, with 81 students receiving direct student support.
- In FY11, a total of seven innovative projects were funded and managed by the MSP project manager. In addition, MSP supported various HQ initiatives, such as the MSI and Community College week for Reduced Gravity Education Flight Program (RGEFP), executing the procurement process for the HENAAC conference funding, providing input and leading the compilation of agency input for the Education Opportunities In NASA STEM (EONS) solicitation, and conducting the solicitation for *Transformational Performance in STEM Using Innovative Solutions (Transformations)*.

The *Transformations* solicitation, released as an appendix in the EONS solicitation, closed on April 11, 2011 and 29 proposals were submitted. Each proposal was reviewed by 4 external evaluators. The selection panel review to determine recommendations for funding was conducted June 27 to July 1, 2011. The selection panel included NASA personnel from four different field centers. The *Transformations* solicitation was completed, including support of 2 EONS workshops, conducting external reviews, conducting the panel review and completing the panel selection for proposals recommended to be funded, unfortunately, due to external HQ budget constraints, the proposals were unable to be funded.

- The MSP Working Group meeting was held in June 2011. This is a mandatory yearly meeting for all MSP Principle Investigators. During that meeting, training on all current or new NASA education requirements is covered. Individual project meetings are also conducted, to ensure that projects are on target, and within budget, scope and schedule.
- The MSP project manager also attended an educational experience on the Navajo Nation in October 2011, sponsored by Ames Research Center and the Science Mission Directorate. The intent is to educate NASA education personnel about the particular needs of Tribal Colleges and Universities and the hardships existing within a reservation. A site visit of Navajo Technical College was also included in this trip.
- ACCESS placed 19 student interns at NASA centers in FY11. Longitudinal data indicates a 95% retention rate in STEM careers or STEM graduate studies. Additionally, at least 19 students were hired by NASA or NASA contractors since the inception of the project.
- FAMU MICI went above scope at no additional cost during FY11 by supporting various NASA initiatives, such as the MSI and Community College flight week for Reduced Gravity Education Flight Program (RGEFP), a chat with Leland Melvin and the RGEFP students utilizing a beta version of FAMU MICI online mentoring software, co-op instructional sessions, and NASA Student On-Line Application for Recruiting (SOLAR)

instructional sessions. These sessions were all extremely successful, both in direct results to the projects, and in drawing in new registrants for MICI.

- The use of a mini-grant competition for FAMU MICI exceeded all expectations, generating 10 brand new MSIs participating in NASA challenges for FY12. The three new MSI participants from FY11 will also compete again in FY12. There has historically been little participation by MSIs in the NASA challenges.
- NCA&TSU has secured additional funding from the state of \$100K per year, in addition to the NASA funds.
- NMSU secured an additional \$95K of funding from the university, enabling them to increase the scope of the project. The incredible success of the curriculum led directly to a full online class being developed, at no additional cost to NASA. A partnership with another university has clearly shown the scalability of the project. In addition, a series of 13 short films highlighting astronomy-related STEM fields are being created, reinforcing a message of inclusion for underrepresented students, with requests for use of the films by external partners.
- SUAGM is performing above scope at no additional cost to NASA. This includes the training of more faculty than anticipated, more course revisions than expected, and funds availability for student competitions to reinforce the concepts learned in the classroom. In addition, improvements made to UIAPR's capstone courses helped the UIAPR's engineering programs during ABET accreditation visit last fall.
- NTC is phenomenally above scope with an anticipated 600% increase in enrollment for the courses directly impacted by the end of the third year, and an overall 300% increase in NTC enrollment. This is directly due to MSP funds, which initiated the change from a 2 year college to a 4 year university. In addition, Navajo Tech Center for Digital Technologies was created, generating the development of economic funds through contract work, including a \$130K contract agreement for FY12.

IMPROVEMENTS MADE IN THE PAST YEAR

Sustainability as well as evaluation plans are considered and captured within all of the projects implemented in FY11. Dissemination of results or project work is also planned and is currently being successfully implemented. The MSP projects funded for implementation in FY11 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; numerous 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 resulting in a significant change in that critical metric. Projects continue to be closely monitored during implementation with a strict rigor of reporting and open communication.

For FY12, project sunset is in a critical stage for most currently funded MSP projects. All of the projects are on budget and on schedule, with several projects ahead of scope with no additional funding. Additional funding requirements beyond the three year development may include impact assessment and data collection, which is expected to require minimal funding. Expansion of several projects due to exemplary performance has been requested. FAMU MICI is currently

at a critical stage with sustainability, and may require additional support to reach full sustainability.

Data gathering methods for OEPM have been implemented and are continually updated by MSP project management. MSP has worked closely with HQ during the new solicitation process, due to the new process of utilizing an omni-bus solicitation. MSP fully supports this process and will continue to provide the support needed for all new HQ initiatives.

PROJECT PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

For FY11, 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.
- For Navajo Technical College (NTC), partnerships have been created with Marshall Space Flight Center (MSFC) and Ames Research Center (ARC). 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. NTC is also working closely with the National Institute for Standards and Technology (NIST), to implement the development of the CAD Center as a center for non-destructive evaluation with optical measurements and advanced digital manufacturing. To ensure sustainability through economic opportunities, a variety of partners (Boeing, Sandia National Laboratories, and NIST) have become involved with the education, the projects, and the research.
- FAMU MICI: Secor Strategies, LLC, managing day to day operations for project implementation. FAMU has developed working relationships with many NASA centers in support of the technical sessions for MICI.
- 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.
- NMSU developed a partnership with Humboldt State University, who is using the NMSU astronomy coursework for 55 students. The series of 13 short films highlighting members of underrepresented groups with productive careers in astronomy-related STEM fields are also being requested for use at the National Radio Astronomy Observatory (NRAO) website and the visitor center at Arecibo Observatory in Puerto Rico, with Spanish subtitles.
- NCA&TSU has secured additional funds from the state, for an additional \$100K per year, for every year of NASA funding.