

New Mexico Space Grant Consortium
Lead Institution: New Mexico State University
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Consortium URL: nmspacegrant.com
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PROGRAM DESCRIPTION

The National Space Grant College and Fellowship Program consists of 52 state-based, university-led Space Grant Consortia in each of the 50 states plus the District of Columbia and the Commonwealth of Puerto Rico. Annually, each consortium receives funds to develop and implement student fellowships and scholarships programs; interdisciplinary space-related research infrastructure, education, and public service programs; and cooperative initiatives with industry, research laboratories, and state, local, and other governments. Space Grant operates at the intersection of NASA's interest as implemented by alignment with the Mission Directorates and the state's interests. Although it is primarily a higher education program, Space Grant programs encompass the entire length of the education pipeline, including elementary/secondary and informal education. The New Mexico Space Grant Consortium is a Designated Consortium funded at a level of \$575,000 for fiscal year 2012.

PROGRAM GOALS

Consortium Goals and SMART Objectives from your 2010 base proposal and budget (or as amended in subsequent submissions)

New Mexico Space Grant Consortium (NMSGC) created new goals for our five year contract during the partnership meeting in May 2010. NMSGC Goals 2010-2014 include:

- Goal #1 – Marketing: Communicate unique NMSGC programs to local, state, and national leaders in STEM education and research.
- Goal #2 – Business: Enable commercial space industry development by highlighting NASA and NMSGC programs and capabilities.
- Goal #3 – Education: Take advantage of our unique geographic position and proximity to Spaceport America to provide a link to commercial launch opportunities for students and faculty.
- Goal #4 – Collaboration: Increase our collaboration with STEM education partners.

PROGRAM/PROJECT BENEFIT TO OUTCOME (1,2, & 3)

Provide concise, meaningful highlights or anecdotes (no more than three) that are directly related to work completed in 2012, highlighting student and/or project accomplishments. Specify alignment to an Outcome.

- Outcome 1: Scholarship Program: Scholarship funding enables students to do NASA related research projects with faculty. Requirements:
 - Projects must align with NASA Mission Directorates, the Office of the Chief Technologies and or NASA field centers, students must maintain a 3.0 GPA
 - Students must have full time status at a New Mexico higher education institution
 - US Citizenship
 - Complete 10 hours of public service/service learning
 - Report on progress during the Annual Research Colloquium.

“On December 2012 I graduated with my Bachelors in Aerospace Engineering and minor in Mechanical Engineering. With the help of New Mexico Space Grant I was able to complete my Bachelor’s degree to the fullest with rich experiences directly related to my field of study. I was able to focus on engineering research, which not only let me learn about the topic of aeroelasticity, but helped build the basic skills of performing research. These skills will forever be implanted in my brain, assisting me when I continue to achieve high degrees. I was offered a full position with NASA Marshall Space Flight Center in Huntsville Alabama as an Aerospace Engineer. I will be working in the Propulsion Detailed Design branch, where I will be designing the space propulsion technology of tomorrow. It has been my life dream to work for NASA and now I can finally say that this dream has come true.”

Cory Media

- Outcome 1: Student Launch Program Capstone Design: Research indicates students who work on applications through capstone design classes get a better understanding of how their academic work applies in the “real world.” This proves to be a retention strategy. Employers and recent ABET reviews indicate these experiences make students more competitive in the workplace.

“I can honestly say that programs such as those offered by Space Grant have given students such as myself a unique and valuable opportunity to pursue very practical and hands on research. Space Grant has given the IPAV group a means to simulate microgravity and weightlessness that otherwise is not conceivable in a lab. Such a condition is very necessary for our space related research.” Gerardo Martinez

PROGRAM ACCOMPLISHMENTS

Refer directly to the consortium goals and SMART objectives in your 2010 base proposal when describing your accomplishments.

Outcome 1: *Contribute to the development of the STEM workforce in disciplines needed to achieve NASA’s strategic goals:* (Discussion of achievements and progress related to your Fellowship/Scholarship, Higher Education and Research Infrastructure programs). *(Employ and Educate)*

Scholarship Program:

- SMART Objectives
 - 54.9% under-represented minority students
 - 40% female
 - 50% enrolled in minority serving institutions
 - 100% remain in their major through graduation

- 100% complete 10 hours of community service
- Accomplishments
 - 15% under-represented minority students
 - 33% female
 - 80% enrolled in minority serving institutions
 - 20% enrolled in tribal serving institutions
 - 100% of students receiving scholarships in 2012 are still enrolled
 - 100% completed community service

* We are creating pre-scholarship program for sophomore students in hopes of increasing the number of under-represented minority students and female students that apply.

Requirements: GPA of 2.3+, declared STEM major. Goal is to reach a 3.0 in the semester of award, not to raise the GPA to 3.0. Students are eligible for 2 semesters, total award of \$4,000. Eligibility requires 3.0 in both semesters of the program.

Internship Program:

- SMART Objectives
 - 54.9% under-represented minority students
 - 40% female
 - 50% enrolled in minority serving institutions
 - 100% remain in their STEM major through graduation
- Accomplishments
 - 0% of participating students are under-represented minority students (students self-reported) these students were selected by NASA Academy and The Langley Aerospace Research Student Scholars (LARSS) Program. We do not have any control on the number of minorities they select
 - 0% female- these students were selected by NASA Academy and The Langley Aerospace Research Student Scholars (LARSS) Program. We do not have any control on the number of females they select
 - 100% enrolled in minority serving institutions
 - 100% are still enrolled

Research Enhancement Program

- SMART Objectives
 - 54.9% under-represented minority students
 - 40% female
 - 50% of awards will be made at minority serving institutions
 - All research funded will align with NASA Mission Directorates (Aeronautics Research, Human Exploration & Operations, and Science), the Office of the Chief Technologist and NASA's ten Centers)
 - All faculty funded will publish at least one article or present their results at a conference
 - All research funded by NMSGC will involve students
 - 100% of students receiving \$5,000 or more to work with faculty will remain in the STEM major through graduation
- Accomplishments
 - 78% under-represented minority students
 - 23% female

- 100% enrolled in minority serving institutions
- All research funded align with NASA Mission Directorates (Aeronautics Research, Human Exploration & Operations, and Science), the Office of the Chief Technologist and NASA's ten Centers)
- All faculty funded did publish at least one article or present their results at a conference
- All research funded by NMSGC involved students
- All funded students are still enrolled
- Funded Projects
 - NMTSAT: New Mexico Tech Nanosatellite, NM Tech
 - Microstructure-Mechanical Property Relations for Cortical Bone and Microstructural Changes Related to Bone Loss, NMSU
 - Ruthenium Oxide Integration on Vertically Grown Graphene for Supercapacitor Applications, UNM
 - How Galaxies Evolve: Testing the Hypotheses of Cold Flows and Stellar Feedback Winds in Early-Epoch Galaxies, NMSU
 - Acquiring Nitrogen in the Subsurface: Implications for Understanding the Potential for Life on Other Solar System Bodies, UNM

Higher Education Programs:

- SMART Objectives
 - 54.9% under-represented minority students
 - 40% female
 - 50% enrolled in minority serving institutions
- Accomplishments
 - 53% under-represented minority
 - 59% female
 - 100% enrolled in minority serving institutions
- Funded Projects
 - Colloquium, NMSU
 - Experimental Sounding Rocket, NM TECH
 - AIAA Airplane Competition, NMSU
 - International Symposium for Personal and Commercial Spaceflight (ISPCS)
 - NM Boosting Engineering, Science, and Technology (BEST), NMSU
 - Student Launch Program Capstone Design
 - SmallSat Ground Station Capstone, NMSU
 - Magellan Capstone Design, NMSU
 - Space Science Payload Capstone, NMSU
 - NMSU Freshman Experience, NMSU ENGR 101
 - NM Tech Freshman Experience, NM Tech ES 189

Education Enhancement Program:

- SMART Objectives
 - 54.9% under-represented minority students
 - 40% female

- All research funded will align with NASA Mission Directorates (Aeronautics Research, Human Exploration & Operations, and Science), the Office of the Chief Technologist and NASA's ten Centers)
- All faculty funded will publish at least one article or present their results at a conference
- 50% of awards will be made at minority serving institutions
- All research funded by NMSGC will involve students
- Accomplishments
 - 64% under-represented minority students
 - 40% female
 - All funded course development will align with NASA Mission Directorates (Aeronautics Research, Human Exploration & Operations, and Science), the Office of the Chief Technologist and NASA's ten Centers)
 - All faculty funded did publish at least one article or present their results at a conference
 - 100% enrolled in minority serving institutions
 - All research funded by NMSGC involved students
- Funded Projects
 - Development of Electronic and Computer Engineering Technology Distance Education Delivery, NMSU; ET 440 Senior Design Project
 - Hands-on aerospace training through suborbital flight experiments, NMSU
 - Electric and Computer Engineering Technology Capstone and Support Course Development Part 2, NMSU; ET 441 Senior Project
 - Development of 6-Component, Strain-Gauge-Based Balance, NMSU; class projects were offered and supported in AE 363 Aerospace Structures and AE 364 Flight Dynamics and Controls
 - Curriculum Development in Exploitation of Earth Observation Systems, NMSU
 - Developing STEM Research Skills Through Undergraduate Astronomy Research, NMSU
 - Fulfilling Laboratory Essentials in a Nanscience and Nanotechnology Training Course, NMSU

Outcome 2: *Attract and retain students in STEM disciplines through a progression of educational opportunities for students, teachers, and faculty: (Discussion of achievements primarily focused on your Higher Education programs not discussed in Outcome 1 and your Precollege programs). (Educate and Engage)*

Pre College Education Programs:

- SMART Objectives
 - 54.9% under-represented minority
 - 40% female
- Accomplishments
 - 50% under-represented minority
 - 50% female
- Funded Projects

- BEST; NMSU
- Student Launch Program
- Education outreach in NASA related Sustainable Energy Technologies, NMSU

Outcome 3: *Build strategic partnerships and linkages between STEM formal and informal education providers that promote STEM literacy and awareness of NASA's mission: (Achievements and progress of Informal Education programs). (Engage and Inspire)*

Informal Education Program

- SMART Objectives
 - Inform the general public on New Mexico's developing space industry
 - All activities must support science, math and technology literacy benchmarks in the state
 - All activities are encouraged to include non-traditional audiences for math, science or technology programs
 - All programs will use standards-based education materials
 - Qualified staff/facilitators will actively work with participants
 - Educational standards and/or learning objectives will play a key role in developing content and/or design
- Accomplishments
 - Astronomical Society will celebrate their grand opening on April 20
 - Presentations to local rotary groups, Mesilla Valley Economic Development Alliance, Lions Club, and NM Museum of Natural History and Science
 - Participated in local talk show New Mexico News (multiple times)
 - Wayne Hale, Former NASA Space Shuttle Program Manager spoke at the Growing Community Partnership Lunch on "Human Voyagers in the Ocean of Space...the Strict Rules. New Mexico will lead the world and open the next era of human spaceflight."
 - Promoted the SOI Solicitation for Proposals to museums statewide. Several museums were selected to participate this last year.
 - Hosted workshop for Cooperative Extension Services (CES) agents
 - Materials were published via the CES and EngrNM websites, NM Stockmen's Journal, the NM Cattlemen's Association newsletter, and the NM Journal of Science and some videos on YouTube
- Funded Projects:
 - Growing Community Partnership Lunch, Statewide
 - Astronomical Society of Las Cruces, in cooperation with NMSU
 - Extension Education Provided Curriculum in Sustainable Energy Technologies, NMSU developed, offered statewide

PROGRAM CONTRIBUTIONS TO NASA EDUCATION PERFORMANCE MEASURES

Student Data and Longitudinal Tracking: Number of program student participants employed by NASA, aerospace contractors, universities, and other educational institutions; Number of undergraduate students who move on to advanced education in NASA-related disciplines; Number of underrepresented and underserved students participating.

(Example: Student Data and Longitudinal Tracking: Total awards= 200; Fellowship/Scholarship= 120, Higher Education/Research Infrastructure= 80; 90 of the total awards are underrepresented minority F/S funding; 10 students have accepted STEM positions in an aerospace industry, while 3 have graduated and are pursuing advanced STEM degrees.)

- Total students tracked = 221 Scholarship awards = 179; Higher education = 42
- 15% of total awards represent under-represented minority F/S funding.
- 61 students accepted STEM positions in an aerospace industry, NASA, or academic fields; 16 students have graduated and are pursuing advanced STEM degrees.
- Diversity:
 - Institutions: 80% of institutions are Hispanic Serving Institutions and 20% are Tribal Colleges
 - Student Participants: 37% are female and 57% are minority

Minority-Serving Institution Collaborations: Summarize interactions. Reference the names of projects with MSI collaborations.

- New Mexico State University (HSI) is the lead institution for NMSGC. NMSU participates in our scholarship program, internship program, Research Enhancement Program, Education Enhancement Program, and Higher Education Programs
- University of New Mexico (HSI) participates in NMSGC scholarship program, internship program, and Research Enhancement Program
- New Mexico Institute of Mining and Technology (HSI) participates in our scholarship program, internship program, Research Enhancement Program, Education Enhancement Program, and Higher Education Program
- Southwest Indian Polytechnic Institute (Tribal College) participates in our scholarship program

NASA Education Priorities: *Accomplishments related to the “Current Areas of Emphasis” stated in the 2010 Space Grant solicitation. Report on areas that apply to work proposed in your proposal and budget.*

- Authentic, hands-on student experiences in science and engineering disciplines – the incorporation of active participation by students in hands-on learning or practice with experiences rooted in NASA-related, STEM-focused questions and issues; the incorporation of real-life problem-solving and needs as the context for activities.
 - Scholarship Program
 - Internship Program
 - Student Launch Program
 - Student Launch Program Capstone Design Courses

- Research Enhancement
 - Education Enhancement
- Diversity of institutions, faculty, and student participants (gender, underrepresented, underserved).
 - Outcome 1: Scholarship Program: 15% under-represented minority and 33% female
 - Outcome 1: Research Enhancement Program: 78% under-represented minority and 23% female
 - Outcome 1: Higher Education Programs: 53% under-represented minority and 59% female
 - Outcome 1: Education Enhancement Programs: 64% under-represented minority and 40% female
 - Outcome 2: Pre-College Programs: 50% under-represented minority and 50% female
 - 80% universities are minority serving institutions
 - 20% universities are tribal serving institutions
- Engage middle school teachers in hands-on curriculum enhancement capabilities through exposure to NASA scientific and technical expertise. Capabilities for teachers to provide authentic, hands-on middle school student experiences in science and engineering disciplines (see above).
 - BEST- is a program designed specifically to interested middle and high school students in the areas of engineering, science, and technology and to go on and pursue careers in these areas
- Summer opportunities for secondary students on college campuses with the objective of increased enrollment in STEM disciplines or interest in STEM careers
 - BEST- is a program designed specifically to interested middle and high school students in the areas of engineering, science, and technology and to go on and pursue careers in these areas
- Community Colleges – develop new relationships as well as sustain and strengthen existing institutional relationships with community colleges.
 - Nothing was offered to community colleges this last year. In part because they did not have money to fly experiments on this flight campaign. We hope to engage them through their participating in Project Lead the Way.
- Aeronautics research – research in traditional aeronautics disciplines; research in areas that are appropriate to NASA's unique capabilities; directly address the fundamental research needs of the Next Generation Air Transportation System (NextGen).
 - We are doing research in collaboration with the FAA on NextGen transportation systems. We will fly an ADSB instrument on the SL7 flight. Students will be involved in tracking of the flight and post flight data analysis.
- Environmental Science and Global Climate Change – research and activities to better understand Earth's environments. – NMSGC does not currently have any projects
- Enhance the capacity of institutions to support innovative research infrastructure activities to enable early career faculty to focus their research toward NASA priorities.

- NMSGC made five awards to faculty to help focus their research toward NASA priorities in the areas of biology, electrical engineering, and mechanical engineering at New Mexico Institute of Mining and Technology; physics, mechanical engineering, and astronomy at New Mexico State University; and biology and chemical and nuclear engineering at the University of New Mexico.

IMPROVEMENTS MADE IN THE PAST YEAR

Succinctly describe improvements and/or adjustments made last year that demonstrate significant change(s) within the consortium. The improvements and/or adjustments that brought about change may have been in management, resource allocation, project design, project evaluation, etc.

- Award scholarships twice a year to monitor more closely participation across the state of students in STEM disciplines, as well as women and minorities. As we noticed in 2011, a steep decline in proposed NASA related projects led to fewer awards to all students.
2011- 45 applications received, 11 women applied, 9 minorities applied
2012- 54 applications received, 17 women applied, 10 minorities applied
- Updated undergraduate and graduate scholarships applications to include Research priorities for each of the Mission Directorates (includes Centers) and the Office of the Chief Technologist
- Highlighted the importance of aligning the research plan to a NASA mission program or project. We prefer a relationship exist among student/faculty and a funded NASA program or minimally a relationship with a NASA researcher.
- Met with and discuss the importance of the project relationship to NASA with Directors of Minority and Women's studies programs, and their Directors. We have met twice this semester already.
- Worked directly with female and minority programs at affiliate campuses to understand their changing landscapes regarding funding and university relations.
- Partnered with NMSU and NM Tech on two new freshman experience classes for STEM majors. These classes are designed to increase recruitment and retention of women and minorities into STEM fields at both universities. They are both new classes being piloted at the universities starting in Fall 2013.

PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

List the institutions that comprise the consortium; include the name, type of institution, key characteristics, and role.

- Research Universities: New Mexico State University (HSI); University of New Mexico (HSI); New Mexico Institute of Mining & Technology (HSI)
- Comprehensive University: Eastern New Mexico (HSI); New Mexico Highlands University (HSI); Southwest Indian Polytechnic Institute (Tribal College); Northern New Mexico College (HSI); Navajo Technical College (Tribal College); Western New Mexico College (HSI)

- Partners publicize student opportunities, teach courses for the Student Launch Program Capstone program and offer higher education programs/workshops and offer educational programs through the Education Enhancement Program. Faculty also provide research programs and serve as reviewers on the Research Enhancement Program.

The National Space Grant Office requires two annual reports, this Annual Performance Data Report (APD) and the Office of Education Performance Measurement System (OEPM) report. The former is primarily narrative and the latter data intensive. Because the reporting timeline cycles are different, data in the two reports may not necessarily agree at the time of report submission. OEPM data are used for official reporting.