

New Mexico Space Grant Consortium  
New Mexico State University  
Pat Hynes, Director  
575-646-6414  
<http://www.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 Consortium is a Designated Consortium funded at a level of \$845,000 for fiscal year 2010.

## PROGRAM GOALS

New Mexico Space Grant Consortium (NMSGC) created new goals for our new 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 & proximity to Spaceport America to provide a link to commercial launch opportunities for students & faculty.
- Goal #4 – Collaboration: Increase our collaboration with STEM education partners.

## PROGRAM/PROJECT BENEFIT TO OUTCOME

- NASA's Education Design Team recommends higher education programs provide experiential opportunities for students. NMSGC programs focused on experiential opportunities including:
  - Scholarship Program: Scholarship funding allows students to do NASA related research with faculty. The scholarship program supports students with observatory time, conference attendance, and allows them to publish their work. Students agree to 10 hours of community service when receiving their scholarship. The purpose of the service is to get students into the habit of giving back and to promote STEM recruitment, retention, and awareness. Travis McIntyre, scholarship recipient said "Receiving the NMSGC scholarships has allowed me the freedom to spend my time conducting astronomical research. I recently discovered a nearby galaxy that was hidden behind the disc of our own Milky Way Galaxy. I have since applied for and received time on the EVLA

telescope near Socorro, NM for follow-up observations on this source and am currently applying for time on the Hubble Space Telescope for even more follow-up in order to determine how close of a neighbor this previously obscured galaxy is. I also volunteered to be a judge at a local middle school science fair, in part because of the service requirement of the NMSGC. I discovered I enjoyed this experience and will be looking for more opportunities to do so in the future. I would not have realized this without the encouragement provided by NMSGC.”

- **Internship Program:** Internship programs are instrumental in retaining students through graduation. Research indicates students who work on real world applications through internships get a better understanding of how their academic work applies in the “real world”. This proves to be a retention strategy. Internships allow students to work side-by-side with NASA and industry personnel, and other interns. These experiences make students more competitive in the workplace. Seth Perez, intern at NewTech Corporation worked on the Orion Pad Abort program said “I am extremely motivated to continue my research because of this internship and NMSGC.”
- **Student Launch Program:** The Student Launch Program provides annual access to space for student experiments. Students design, build, test, and fly experiments during a single academic year. Yaotl Rocha who built an experiment as part of a course at Dona Ana Community College said, “Knowing that something you actually placed your hands on and helped build is on its way to 75 miles above Earth is so RAD!”
- **Student Launch Program:** NMSU students will receive a flight from Masten Space Systems for a suborbital flight experiment to validate a satellite inertia identification method. Gerardo Martinez said "I want to thank Space Grant for all the assistance and encouragement you have given our team. I was awarded the prestigious NSF Graduate Research Fellowship. I believe that being involved in this type of research made me stand out. Thank you so much for everything that the Space Grant has done.”

## **PROGRAM ACCOMPLISHMENTS**

- **Outcome 1: Contribute to the development of the STEM workforce in disciplines needed to achieve NASA’s strategic goals through a portfolio of investments:**
  - **Scholarship Program:**
    - SMART Objectives
      - 50% of participating students will be under-represented minority students
      - 50% female
      - 50% enrolled in minority serving institutions
      - 100% remain in their major through graduation
      - 100% complete 10 hours of community service
    - Accomplishments
      - 31% of participating students are under-represented minority students
      - 47% female
      - 85% enrolled in minority serving institutions
      - 100% of students receiving scholarships in 2010 are still enrolled
      - 100% completed community service
  - **Internship Program:**
    - SMART Objectives

- 50% of participating students will be under-represented minority students
- 50% female
- 50% enrolled in minority serving institutions
- 100% remain in their STEM major through graduation
- Accomplishments
  - 25% of participating students are under-represented minority students
  - 14% female
  - 100% enrolled in minority serving institutions
  - 100% are still enrolled
- **Student Launch Program:**
  - SMART Objectives
    - 50% of participating students will be under-represented minority students
    - 50% female
    - 50% enrolled in minority serving institutions
    - All capstone design courses will support NASA mission objectives
  - Accomplishments
    - 25% of participating students are under-represented minority students
    - 25% female
    - 50% enrolled in minority serving institutions
    - Capstone design projects included: NMSU student experiment obtains atmospheric data from the rocket during its entire flight and collects data on temperature, altitude, acceleration & GPS. UNM student experiment takes plasma measurements using a space weather sensor and a microcontroller to investigate performance of piezoelectric and magneto elastic sensors as active elements of spacecraft structural health monitoring system.
- **Gaining Retention and Achievement for Students Program (GRASP):**
  - SMART Objectives
    - 5% increase in student retention
    - 5% increase in student achievement
  - Accomplishments
    - 5% increase in student retention
    - 5% increase in student achievement
- **Education Enhancement Program:**
  - SMART Objective - All courses will be part of the regular academic programs  
Accomplishment:
    - Sustainable energy technologies distance education course - fulfills NMSU's "Viewing a Wider-World" general education requirement.
    - Spaceflight mission design course includes the analysis and discussion of current and future space missions. Aerospace Engineering students are introduced to modern concepts of space mission design, and orbital mechanics.
    - Spacecraft Dynamics and Control became a separate course in the undergraduate aerospace engineering curriculum at NMSU.

- **Outcome 2: Attract and retain students in STEM disciplines through a progression of educational opportunities for students, teachers, and faculty:**
  - **Student Launch Program:**
    - SMART Objectives
      - 50% of participating institutions will be minority serving middle and high schools
      - 50% under-represented minority
      - 50% female
    - Accomplishments
      - 100% are minority serving high schools
      - 48% under-represented minority
      - 20% female
  - **NMSGC Education Scholarship Program:**
    - SMART Objectives
      - 50% of participating students will be under-represented minority students
      - 50% female
      - 100% will provide evidence of use of NASA education materials when student teaching
    - Accomplishments
      - 50% of participating students were under-represented minority students
      - 100% female
      - 100% used NASA education materials when student teaching
  - **Leonard R. Sugerman Public Forum:**
    - SMART Objective – 500 students will attend the Forum
    - Accomplishment – 3,000 students attended the Forum
  - **Student Spaceflight Experiment Program:**
    - Students enrolled in Central Consolidated School District developed an experiment flown on STS-134
    - Purpose of the experiment is to determine if radiation exposure affects seed germination without the protection of the ozone layer
- **Outcome 3: Build strategic partnerships and linkages between STEM formal & informal education providers that promote STEM literacy and awareness of NASA's mission:**
  - **Leonard R. Sugerman Public Forum:**
    - SMART Objective – Public Forum contributes to the economic development of New Mexico's space economy.
    - Accomplishment – Purpose is to help local communities learn from the Florida communities to plan for growth brought to the communities because of the space industry. Presenters discussed measures to be taken to prepare for economic growth. Presenters included: Mayor Tulley, Titusville, FL; Mayor Miyagishima, Las Cruces, NM; Mayor Montgomery, Truth or Consequences, NM; Mayor Nordyke, Hatch, NM.
  - **NMSGC Homepage:**
    - SMART Objective – General public inquires can be met through the information made available on the NMSGC website.
    - Accomplishment – NMSGC re-designed the website to be web 2.0 compliant

- **Public Service Enhancement Program:**
  - SMART Objective –All NMSGC public service activates must support science, math, and technology, literacy
  - Accomplishment – New Mexico BEST Program (Boosting Engineering, Science, and Technology) exposes middle and high school students to the concepts of engineering and technology through a robotics design challenge.

## NASA 2010 EDUCATION PRIORITIES

- 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: Scholarship funding allows students to do NASA related research with faculty.
  - Internship Program: Internships allow students to work side-by-side with NASA & industry personnel and other interns and learn they can compete in a technical area.
  - Student Launch Program: Provides annual access to space for student experiments. Students design, build, test, fly, and analyze data for a flight experiment.
- 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: This priority is addressed by NMSGC through our Summer of Innovation Program.
- Community Colleges – develop new relationships as well as sustain and strengthen existing institutional relationships with community colleges: Students enrolled in four community colleges built experiments and launched to space as part of our Student Launch Program.
- 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): Mechanical engineering students are building a suborbital flight experiment to validate a satellite inertia identification method and will receive a flight from Masten Space Systems.
- Diversity of institutions, faculty, and student participants.
  - Scholarship Program: recipients are 47% female and 31% minority.
  - Student Launch Program – Higher Ed: participants are 25% female and 25% minority
  - Student Launch Program – K-12: participants are 20% female and 48% minority
  - GRASP Program: participants are 38% female and 56% minority
  - 6 universities and community colleges are minority serving institutions
- Enhance the capacity of institutions to support innovative research infrastructure activities to enable early career faculty to focus their research toward NASA priorities: This priority is addressed by our EPSCoR programs.

## PROGRAM CONTRIBUTIONS TO PART MEASURES

- **Longitudinal Tracking:**
  - Total students tracked = 165; Scholarship awards = 134; Higher education = 31
  - 25% of total awards represent under-represented minority F/S funding

- 23 students accepted STEM positions in an aerospace industry, NASA, or academic fields; 3 students have graduated and are pursuing advanced STEM degrees; 115 students are still enrolled in their STEM program at an NMSGC institution.
- **Course Development:** NMSGC supported the development of 5 courses
  - Engineering Technology - Distance educational curriculum delivery in the area of Sustainable Energy Technologies
  - Engineering Technology - Capstone design course which focuses on designing and building an experiment for launch.
  - Mechanical Engineering - Capstone design course which focuses on designing and building an experiment for launch.
  - Mechanical Engineering - Spaceflight mission design course
  - Mechanical Engineering - Spacecraft Dynamics and Control
- **Matching Funds:** NMSGC provides 1:1 matching funds
- **Minority-Serving Institutions:**
  - 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, GRASP, Student Launch Program (SLP), Reduced Gravity Student Flight Opportunity Program, and Research Colloquium.
  - University of New Mexico (HSI) participates in NMSGC scholarship program, internship program, Research Enhancement Program, Education Enhancement program, Student Launch Program, and Reduced Gravity Student Flight Opportunity Program.
  - Dona Ana Community College (HSI) participates in NMSGC scholarship program & SLP.
  - New Mexico Highlands University (HSI) participates in the SLP.
  - Central New Mexico Community College (HSI) participates in the SLP.
  - Southwestern Indian Polytechnic Institute (Tribal College) participates in the SLP.

## IMPROVEMENTS MADE IN THE PAST YEAR

- Public Forum: NMSGC offered three sessions during the Public Forum, one for K-12 students, one for NMSU students and faculty, and one for the general public. The Forum was held at the NMSU Pan Am Stadium. Over 3,000 K-12 students attended the event.
- Research Enhancement: NMSGC did not award research funding in 2010 in an effort to focus proposed research on NASA priorities. NMSGC will offer workshops to faculty in 2011 to inform faculty about research priorities and increase the number of relevant proposals received. We will invite NASA program managers to address emerging priorities.

## PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

- Research Universities: New Mexico State University (HSI); University of New Mexico (HSI); New Mexico Institute of Mining & Technology
- Comprehensive Universities: New Mexico Highlands University (HSI)
- Community Colleges: Dona Ana Community College (HSI); Southwestern Indian Polytechnic Institute (Tribal College); San Juan Community College, Central NM Community College (HSI)
- Partners recruit and follow-up with scholarship students, teach courses for the Student Launch Program, and offer educational programs through the Education Enhancement Program, and research programs through the Research Enhancement Program.