

NASA Nebraska Space Grant Consortium
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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 Nebraska Space Grant Consortium is a Designated Consortium funded at a level of \$785,000 for fiscal year 2009.

PROGRAM GOALS

Goal 1: To deliver a fellowship program that offers aerospace-related research opportunities to diverse student populations at Space Grant academic affiliates throughout Nebraska. Contribute to the STEM workforce pipeline by providing a progression of educational opportunities for talented Nebraska students, preparing them to pursue careers in aerospace science and industry.

Objective: Offer a statewide competitive fellowship program that provides meaningful experiences, allowing students to acquire and enhance workforce development skills.

Objective: Provide workforce development opportunities to prepare students for employment in STEM disciplines at NASA, industry, and higher education.

Goal 2: To raise the aggregate quality and quantity of Nebraska's aerospace research endeavors to the highest level of national competitiveness.

Objective: Ensure the fair and equal distribution of funds to faculty researchers at academic affiliates through the research mini-grant competition.

Objective: Provide a statewide research program that responds to the needs of NASA, the national aerospace industry, and Nebraska; and that includes faculty mentoring students.

Objective: Stimulate, motivate, and support the development of Nebraska faculty to become nationally competitive.

Goal 3: To strengthen the Nebraska STEM education base from elementary through university levels with emphases on NASA content, teacher training, and delivery to underrepresented groups.

Objective: Provide professional development opportunities to Nebraska educators, equipping them with deeper STEM understanding to educate and inspire students.
Objective: Engage in limited K-12 student activities to inspire interest in STEM careers.

Goal 4: Increase public support for NASA through informal education and spreading NASA's mission to Nebraska citizens and beyond.

Objective: Support informal education programs throughout Nebraska that use NASA themes and content to enhance skills and learning of students, educators, and the public.
Objective: Increase awareness of NASA to Nebraska educators, students, and the public.

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

Outcome 1:

UNL's Microgravity Team partnered with Ad Astra Rocket Company, and designed a project to test cryonic cooling systems that may be used in next-generation rocket propulsion technologies. Space Grant's relationship with Ad Astra expanded to include a new summer internship opportunity for Nebraska students.

Summer internships at NASA continue to provide valuable experiences for Nebraska students. UNL graduate, Justin Green, is currently doing research at NASA LaRC while attending the National Institute of Aerospace. He credits his continued success to the two summer internships and says, "My experiences have and continue to help me realize my career goal of working for NASA."

In early 2009, Nebraska Indian Community College was able to acquire new GIS/GPS apparatus, but was lacking the trained staff to implement the equipment. With the help of the Iowa and Nebraska Space Grants, two undergraduate students traveled to the Univ. of Northern Iowa where they were trained on GIS/GPS technology and equipment, and initiated a basic research project using this knowledge. The students then returned to NICC where they not only completed their research project but they were able to train other students and faculty on the use of the college's specialized GIS/GPS equipment.

Jason Porta, Ph.D. student from the University of Nebraska Medical Center, worked on "Studying Effects of Modulation on Protein Crystal Structures." Upon completion of the project, he will have learned important techniques such as experimental phasing, structure refinement, and computer programming. "Obtaining these skills is vital to my goal of becoming a successful and competitive X-ray crystallographer." This was Jason's second NASA project, with the first taking place as an Ohio Space Grant Consortium undergraduate scholar.

Outcome 2:

In recent years, the Space Foundation of Colorado Springs has become a strong Nebraska Space Grant partner. In FY2009, a number of teacher workshops were delivered in partnership with the Space Foundation and received enthusiastic reviews. These included a 2-week summer workshop for the Omaha Public School district, as well as special programming during the Space Foundation's Strategic Space Symposium held in downtown Omaha. Other successful Space Grant funded teacher training programs include a photovoltaic workshop with the Nebraska Chapter of the National Association of Physics Teachers, a Metropolitan Community College-facilitated workshop on space

science utilizing online data, and a program entitled KICKStart, which was designed to inform new teachers about state and national science education opportunities and organizations (NATS, NSTA, AAPT, and NASA).

Dr. William Spurgeon, Western Nebraska Community College, utilized electromechanical component kits to provide students with applied experiences in building and programming robots. Engineering students learned how to identify hardware and electronic components. Students modified the programmable code to create their own mode of operation for the robots. Dr. Spurgeon says, "This was the first time we have worked with robots in an Introductory Engineering or IT class. Students were very excited to work with the kits, which help introduce a number of practical non-textbook challenges."

Dr. Jun Wang, Assistant Professor for UNL's Department of Geosciences, was the PI for a project entitled "Advancing Undergraduate Research with NASA's A-train Satellite Data." This project supported six undergraduates to study air pollution, snow events, and climate change, using the remote sensing data. Three of these undergraduates have subsequently received full scholarships to go on to graduate school in 2010.

Dr. Neal Grandgenett, UNO College of Education, developed several GPS-based learning activities for use with pre-service and in-service teachers at UNO. The GPS activities are now used on a regular basis in the Mathematics and Science Methods courses for the UNO teacher education program. Additional projects helped teachers learn about Earth System Science Education, as well as introductory robotics. Teachers integrated NASA related sites, materials, and ideas (including robotics), into their instruction. They now use the material and lessons in their own classroom.

Outcome 3:

Each year, the Nebraska Space Grant works with the Strategic Air and Space Museum (SASM) on a number of different STEM related programs. The International Year of Astronomy (IYA) in 2009 invigorated this relationship to include three major general public astronomy-related events: First Light, Space Day (in association with Lockheed Martin), and Astronomy Day. These events included lectures, demonstrations, displays, art activities, teacher-training workshops, and guest appearances by NASA astronauts. Attendance totaled over 5000 for these programs. Other smaller IYA events with the SASM throughout the year included a lecture by JPL scientist Bridget Landry, hands-on meteorite programs, a public viewing for Comet Lulin, and a number of general public star parties. In an effort to expand the museum's astronomy programming for its daytime visitors, a mobile planetarium dome was acquired with the assistance of Nebraska Space Grant. Through a subsequent fundraising campaign, the museum was able to generate the funds necessary to purchase a digital planetarium projector to complete the system. The museum plans on making planetarium programs available for school groups and the general public by mid-Fall of 2010. A major new collaboration between the Strategic Air and Space Museum and Space Grant, included the facilitation of the first annual Nebraska Robotics EXPO. Over 2400 students, instructors, and members of the general public, participated in, and visited the competition.

The International Year of Astronomy in 2009 provided a number of opportunities for Nebraska Space Grant to promote STEM literacy throughout the state. In April, Space Grant worked with the Omaha Astronomical Society to provide safe solar viewing during

the Earth Day Omaha event. In August, Space Grant facilitated programming for the Nebraska Star Party, and in October, hosted JPL Scientist Nagin Cox to lecture to the Lincoln chapter of the Society For Women in Engineering, a general public presentation at the State Museum, and a presentation for faculty and students at Creighton University.

PROGRAM ACCOMPLISHMENTS

Key metrics highlight the accomplishments of the Nebraska Space Grant in FY09, although not all results are in as the performance period is not yet complete.

92% of active academic affiliates received at least 1 fellowship this year.

11 interns placed at NASA and with aerospace industry this year, including 4 students at JPL, 3 students at JSC, 1 student each at Ames, Marshall, Ad Astra, and Lockheed.

Four new courses related to aerospace science and engineering were developed this year, and 11 courses were revised.

Supported 5 teams of Nebraska students engaged in aerospace-related competitions.

Awards to underrepresented minorities exceeded the state enrollment percentages, and awards to women exceeded the national enrollment percentage of undergraduate women in science degree programs.

128 underrepresented students were served in the higher education programs, with 22 of them receiving funding.

90% of research mini-grant awards are endorsed by a NASA collaborator, or aligned with the NASA Vision, Mission Directorates, or NASA Center priorities.

10 funded researchers made new contacts or strengthened existing collaborations with NASA scientists.

84% of mini-grant awards included a student research experience.

At least 1 publication will result from each funded project, however the results are not yet available.

4 research mini-grants linked minority-serving institutions to Nebraska research universities.

Directly supported 6 teacher workshops, with the trained teachers offering another 25 workshops.

83% of teacher participants are using the teacher workshop resources in their curriculum.

Engaged 3,911 Nebraska students either directly or as a result of teacher training workshops.

PROGRAM CONTRIBUTIONS TO PART MEASURES

- Longitudinal Tracking:

Total significant awards to date (83); Fellowship / Scholarship (57); Higher Education / Research Infrastructure(26); Underrepresented / Minority(19); Female (34). This year's longitudinal tracking report includes students who took the Next Step from FY06-FY09. 36 students graduated and are pursuing an advanced STEM degree; 5 students are still enrolled in their degree programs; and 3 students are employed in industry with aerospace contractors. One standout example is Sandra Behnke, a graduate of Creighton University. Sandra completed a summer 2009 internship at JPL and was subsequently

offered a job at California Institute of Technology's Spitzer Science Center.

- **Course Development:**

Over a dozen new or revised courses were introduced this year throughout Nebraska with the help of NASA and Space Grant opportunities. Dr. Gregory Snow, UNL, is enhancing his online calculus-based general physics classes using NASA multimedia resources. Dr. Ganesh Naik of the College of Saint Mary, an all women's college, is producing innovative multi-tiered course material that not only stimulates CSM science and mathematics undergraduates but does so by having the students create and implement science workshops for area underrepresented high school girls.

- **Matching Funds:**

The Nebraska Space Grant exceeded the required cost share for the program, providing \$590,764. Nebraska Space Grant achieves this cost share statewide from numerous affiliates and program partners.

- **Minority-Serving Institutions:**

In 2008, Little Priest Tribal College hired GIS Coordinator Colleen Campbell, who immediately became a primary point of contact with the college for Nebraska Space Grant. In the last year, Colleen helped implement a half dozen educational and fellowship Space Grant programs. One such program was the creation of a solar energy and photovoltaic battery charger-building workshop. Additional tribal college and community solar energy workshops are planned in the future. A new Space Grant collaboration also emerged in 2009, with the aviation faculty at Elizabeth City State University, an HBCU in North Carolina.

IMPROVEMENTS MADE IN THE PAST YEAR

Nebraska Space Grant worked with the National Space Grant Foundation to create a new website, complete with all-inclusive information about the opportunities available through the Space Grant program. Included within the website's multi-media content, are three new promotional videos. To complete Space Grant's expanded web presence, a variety of popular social networking sites like Facebook, Twitter, and LinkedIn have been employed.

Nebraska Space Grant added a Model Rocketry: Introduction to Payloads workshop to introduce high school and community college participants to future Space Grant student satellite opportunities.

Created to brainstorm and possibly initiate Summer of Innovation programs, Nebraska Space Grant formed a collaborative STEM advisory group from a number of innovative University of Nebraska faculty and staff. Although the SOI plans were temporarily put on hold for Nebraska, the Space Grant STEM advisory group continues to meet to discuss potential projects.

Space Grant has seen expanded press coverage this year. A recent Op-Ed in the statewide newspaper featured the Nebraska Space Grant and EPSCoR programs, a front-page story in the same paper featured the microgravity team, and a new University promotional video covering the microgravity team was shown on national television and at the home football games.

PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

Academic affiliates of the Nebraska Space Grant Consortium include:

Chadron State College, 4-year public college and graduate degree granting institution; College of St. Mary, 4-year private college, all women's institution; Creighton University, 4-year private university and graduate degree granting institution; Hastings College, 4-year private college; Little Priest Tribal College, 2-year public community college, Tribal college; Metropolitan Community College, 2-year public CC, over 110 off-site locations; Nebraska Indian Community College, 2-year public CC, Tribal college; University of Nebraska – Lincoln, 4-year public university and Master's and Ph.D., graduate degree granting institution, Flagship of the University of Nebraska system; University of Nebraska at Kearney, 4-year public university and graduate degree granting institution; University of Nebraska at Omaha, 4-year public university and Master's and Ph.D. degree granting institution, Lead institution for Space Grant; University of Nebraska Medical Center, 4-year public university, Master's and Ph.D. granting medical institution; Western Nebraska Community College, 2-year public CC.

Industry, government, and non-profit affiliates and partners include:

- 99th Pursuit Squadron Civil Air Patrol: Offers informal aerospace education outreach targeted to underrepresented populations
- CALMIT- Center for Advanced Land Management Information Technologies: Research projects and internships in the field of agricultural remote sensing.
- Girl Scouts: Offers informal aerospace education targeted to female populations.
- Nebraska 4H: Projects in robotics, agriculture, and geospatial research.
- Nebraska Department of Aeronautics: State government division that offers internships and projects in aeronautics.
- Nebraska Academy of Sciences: Partner in delivering annual research conference.
- Nebraska Aviation Council: Includes representatives of aeronautics industry throughout the state. Developer of the Nebraska STARBASE Rocket Team.
- Strategic Air and Space Museum: Foremost aviation museum in the Midwest. Offers informal STEM programming.
- Tuskegee Airmen: Offers internships and aeronautics outreach targeted to underrepresented populations.
- Nebraska Star Party, Inc.: One of the largest gatherings of amateur astronomers in the country. Offers both informal and teacher-training programs.
- Ad Astra Rocket Company: Now working with Nebraska Space Grant to offer unique industry internship opportunities for Nebraska students.

One of the more unique partnerships Nebraska Space Grant formed in 2009 was with a facility created by artist Jun Kaneko. KANEKO provides an open space for a variety of creative general public programs; Space Grant saw the facility as a potential outlet to deliver NASA and STEM inspired programs to an audience that may otherwise be missed. Our first collaboration with KANEKO was to bring in Dr. Richard Komp, an expert in solar energy, to lecture about sustainability, and our second program facilitated a lecture and demonstration by Dr. Peter Schultz on the NASA LCROSS Mission.