

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 fellowship and scholarship 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 \$730,000 for fiscal year 2008.

PROGRAM GOALS

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

- Objective: Ensure the fair and equitable distribution of funds to all academic affiliates through the allotment of competitive scholarships and fellowships to deserving students.
- Objective: Elevate the competitiveness of Nebraska's minority-serving institutions to better prepare underrepresented students for continued STEM-related studies at research universities and in STEM-related career fields.
- Objective: Provide student research and workforce development opportunities to prepare undergraduate and graduate students for employment in STEM disciplines at NASA, and in industry and higher education.
- Objective: Provide support to student researchers interested in pursuing projects aligned with NASA and aerospace industry to enhance their STEM training and workforce preparation

Goal: To raise the aggregate quality and quantity of Nebraska's aerospace research endeavors to the highest level of national competitiveness through NASA competency-building research opportunities, exploring and refining concepts that will help America return to the Moon, and ultimately travel to Mars and beyond.

- Objective: Provide statewide research program that responds to the needs of NASA, the national aerospace industry, and new and emerging research areas for Nebraska to increase the national competitiveness of the state's researchers.
- Objective: Develop qualified undergraduate and graduate students through authentic NASA-related, faculty-mentored experiences that prepare them for employment in STEM
- Objective: Provide mechanisms for minority-serving institutions to improve their ability to compete for NASA research and development work.

Goal: 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 and training opportunities to Nebraska educators, equipping them with deeper STEM understanding and skills to educate and inspire students.
- Objective: Inform educators about NASA Education resources, activities, and opportunities.
- Objective: Engage in limited student involvement activities to inspire interest in STEM fields and careers. The majority of these activities will meet at least one of the following criteria: serve underrepresented students, incorporate family involvement, promote workforce development, or offer authentic first-hand opportunities to participate in NASA mission activities.

Goal: To 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 on STEM content areas, and that strengthen the nation's future workforce.
- Objective: Increase awareness of NASA to Nebraska educators, students, and the public, inspiring them to engage in STEM-related activities, enhance learning, skills, and proficiency that will lead to a better-prepared workforce and more knowledgeable public.

Goal: To manage the Nebraska Space Grant and EPSCoR programs with broad participation from statewide leaders, and evaluate the impact to assure achievement of NASA's Education Outcomes and NASA's priorities for Nebraska Space Grant & EPSCoR.

- Objective: Assure the management of the NASA Nebraska Space Grant and EPSCoR programs reflects the intent of NASA in delivering programs statewide.
- Objective: Assess the programs to document outcomes and demonstrate progress toward achievement of goals and objectives.
- Objective: Maintain excellent communication and responsiveness to NASA program management.

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

Outcome 1: Contribute to the development of the STEM workforce in disciplines needed to achieve NASA's strategic goals (Employ and Educate)

Overall, the Nebraska Space Grant is making a difference in the educational opportunities that students are pursuing. In the past, it was difficult to get one or two qualified applicants for the Academy, USRP, and Center internships. The Nebraska Space Grant has worked hard to generate more interest among faculty and students about the opportunities available. This resulted in 9 placements in summer 2008 (3 were ESMD), as well as 1 spring 2009 placement, thereby meeting the FY 08 goal of 7 awards. The placements included 8 at NASA Centers (Langley Research Center, Johnson Space Center, JPL, and Goddard) and 2 with industry (Honeybee Robotics and Toledo-Lucas County Port Authority).

Another example of the Nebraska Space Grant's benefit to Outcome 1 is the growing interest in the NASA microgravity programs. Last year, the Nebraska Space Grant supported the first Nebraska microgravity team accepted for a NASA flight. This spurred interest among other engineering students at the University of Nebraska - Lincoln (UNL). In FY 08, two teams have been accepted for flights. Dr. Carl Nelson will serve as the PI and Jack Mondry will lead the PowRED Up team in the NASA Microgravity University Systems Engineering Educational Discovery (SEED) program. This project involves collaboration among several departments, including Mechanical Engineering, Biological Systems Engineering, and Electrical Engineering. The team will work with Sara Malloy, the Lead Reduced Gravity Program Coordinator at JSC. Ms. Malloy will assign research topics and coordinate collaboration with NASA experts.

Outcome 2: Attract and retain students in STEM disciplines through a progression of educational opportunities for students, teachers, and faculty (Educate and Engage)

The Nebraska Space Grant has worked with program partners to identify existing and emerging opportunities for students, teachers, and faculty in the state. The partnership with the Space Foundation provided valuable connections with other organizations interested in improving the quality of STEM education in the state. Discussions with the science administrators and faculty of the Omaha Public School (OPS) District, the University of Nebraska at Omaha (UNO) College of Education, the Sherwood Foundation, the Strategic Air and Space Museum, the Building Bright Futures Foundation, and the Space Foundation are centered around an emerging initiative to provide quality, graduate-level, aerospace education to 90 OPS teachers. This group is also exploring the potential to provide students with additional STEM career specialization tracks through the new Career Education program at OPS.

Additionally, the Nebraska Space Grant and the Strategic Air and Space Museum established new collaborations with the Seattle Museum of Flight, the Texas Aerospace Scholars Program at JSC, and the Virginia Space Grant Consortium to discuss a new Aerospace Scholars program in Nebraska. This project uses NASA-developed curriculum and is targeted toward improving STEM knowledge of high school juniors statewide. While this is a program aimed at high school students, the vision for Space Grant is to

use NASA fellows to serve as mentors for the students during the residence phase. The program is under development and we are actively seeking government, industry, and non-profit program partners.

Outcome 3: Build strategic partnerships and linkages between STEM formal and informal education providers that promote STEM literacy and awareness of NASA's mission (Engage and Inspire)

The Nebraska Space Grant, in collaboration with the Strategic Air and Space Museum, the UNL State Museum, the Omaha Astronomical Society, and Prairie Astronomy Club, hosted a kickoff event for the International Year of Astronomy (IYA). This event featured displays, telescope demonstrations by the area astronomy clubs, a meteorite display from a local collector, and a special guest lecture by the Executive Director of the Astronomical Society of the Pacific. There were over 170 people in attendance.

The Nebraska Space Grant continues to support the NASA IYA Student Ambassador of Nebraska, Sandra Behncke of Creighton University. Sandra was granted funding to create her own IYA programs, and will be working with Neale Woods / Millard Observatory, Creighton University, and the Omaha Astronomical Society to facilitate those goals. The Nebraska Space Grant will fund Sandra and her faculty mentor from Creighton University, Dr. Jack Gabel, so they can present their research at the annual Nebraska Star Party.

Many other Nebraska Space Grant-sponsored and facilitated IYA activities are planned for early 2009. Astronomy Week will take place April 27 through May 3 at the Strategic Air and Space Museum. Space Grant will also be working with the Omaha Astronomical Society and the Prairie Astronomy Club to hold a number of telescope-training and observing sessions at Nebraska State Parks and at Native American Community Colleges to engage and inspire the citizens of Nebraska.

PROGRAM ACCOMPLISHMENTS

Outcome 1: Contribute to the development of the STEM workforce in disciplines needed to achieve NASA's strategic goals (Employ and Educate)

The Space Grant is supporting a student-initiated project to establish a chapter of the American Institute of Aeronautics and Astronautics (AIAA) at UNL. The intent is to create an organization for students who have any interest in space, aeronautics, or aerospace-related fields. The group plans to have activities including speakers, tours, community events, and design competitions. The affiliation with the AIAA national organization also offers student opportunities such as scholarships, internships, online resources, research paper competitions, and more.

To date, fellowships have been awarded at 11 of the 13 academic affiliates. Space Grant staff will work with Metropolitan and Northeast Community Colleges to make their FY 08 awards.

The fellowship, research, and higher education awards to underrepresented minorities exceed the state enrollment figures of 8.4%. To date, 14.29% of the awards were made to underrepresented students.

Higher education workforce development activities for FY 08 include 2 microgravity teams, 1 CANSAT team, 1 FAA Design Competition team, support of 4 senior design projects in physics at Hastings College, and the AIAA Chapter, among others. This exceeds the 4 workforce development activities proposed.

In FY 08, competitive research mini-grants were awarded to 7 academic affiliates, including UNL, UNO, Creighton, Chadron State College, University of Nebraska Medical Center, University of Nebraska at Kearney, and the College of St. Mary. To date, travel grants have been awarded to researchers, students, and educators from UNL (3), UNO (4), the Strategic Air & Space Museum (3), Creighton University (1), Winnebago Public Schools (1), Metropolitan Community College (1), the College of St. Mary (1), Lincoln North Star High School (1), Omaha Public Schools (3), and Wayne Community Schools (1). The Nebraska Space Grant has exceeded the FY 08 goal of 5 travel grants. Competitive higher education mini-grants have been awarded to Western Nebraska Community College (2), the Nebraska Department of Aeronautics (1), UNL (5), the College of St. Mary (1), and the Strategic Air & Space Museum (1).

87.5% of mini-grant awards include a student research experience (FY 08 goal: 75%); 100% of mini-grant awards are aligned with the NASA's vision or priorities (FY 08 goal: 75%); 37.5% of mini-grant awards are being used to strengthen NASA collaborations, and another 37.5% have discussions underway with

NASA contacts to identify a collaborator. (FY 08 goal: 75% of mini-grant awards would be to strengthen or establish new NASA collaborations).

Outcome 2: Attract and retain students in STEM disciplines through a progression of educational opportunities for students, teachers, and faculty (Educate and Engage)

The College of St. Mary (CSM), a Space Grant academic affiliate and all-women's college, is committed to developing signature programs in math and science to attract women to these areas of study. With the recent \$4.2 million renovation of the Math & Science Hall, CSM developed a state-of-the-art facility for the instruction of science and math, and is now sharing the resources with the community and encouraging young women to pursue careers in the sciences. With Space Grant support, a team of CSM faculty and administrators will offer workshops for area female high school students to participate in hands-on science and math activities and demonstrations.

To date, the Nebraska Space Grant has funded five mini-grants for teacher training in FY 08, exceeding the goal of four and awarded four travel grants for educators to attend NASA-sponsored workshops or conferences, exceeding the FY 08 goal of one.

The Aerospace Education Workshop, co-sponsored by Nebraska Space Grant, has seen an increase in enrollment over the past three years due to the inclusion of the BalloonSat experience. Additionally, the Nebraska Space Grant is providing support for curriculum development of science educator courses, as well as teacher stipends for completing these courses that include authentic NASA curriculum.

Outcome 3: Build strategic partnerships and linkages between STEM formal and informal education providers that promote STEM literacy and awareness of NASA's mission (Engage and Inspire)

The Nebraska Space Grant supported at least six informal education activities to date that align with NASA's informal education goals. These activities include NASA's 50th Anniversary celebration in conjunction with Space Day at the Strategic Air & Space Museum (SASM), a host of IYA activities, 2 new education outreach programs with, and the career presentation and student workshops at the Strategic Space and Defense Conference, among others.

Partnering with Nebraska's NSF EPSCoR, the Native Indian-Centered Education Program through Omaha Public Schools, and UNO's College of Information Science and Technology, we were able to send four students and two faculty members to the American Indian Science and Engineering Society (AISES) national conference. This annual conference provides educational and networking opportunities for Native Americans in the fields of science, technology, and engineering. The faculty and staff members will now work with these students in pursuit of establishing an AISES Chapter in Omaha.

PROGRAM CONTRIBUTIONS TO PART MEASURES

- Longitudinal Tracking: The numbers provided here are only inclusive of awards that have been made to date. Total awards to date (56); Fellowship / Scholarship(30); Higher Education / Research Infrastructure(26); Underrepresented / Minority(8); Female (22); 1 student graduated and is pursuing an advanced STEM degree; 55 students are still enrolled in their degree programs
- Course Development: Nebraska Space Grant is supporting four new or enhanced undergraduate courses. It is also supporting the development of a new graduate course targeted for teacher preparation. Dr. Dave Gosselin developed four earth systems science graduate courses. Dr. Greg Snow, UNL Physics and Astronomy, is receiving support for the integration of online educational materials developed by NASA to enhance two online, calculus-based introductory physics courses. Professor Hamid Vakilzadian is developing a pilot undergraduate course in modeling and simulation. Space Grant is sponsoring the development of the Physics 1070 Astronomy course and lab projects.
- Matching Funds: The Nebraska Space Grant will meet the required cost share for the program of \$547,000 or 75%. Nebraska Space Grant achieves this cost share statewide from numerous affiliates and program partners. The Strategic Air and Space Museum secured one successful matching grant from the Iowa West Foundation in partnership with Space Grant.
- Minority-Serving Institutions: A new contact with the Academic Dean of the Nebraska Indian Community College is providing a rejuvenated relationship . New collaborations include staffing

science labs with Space Grant fellows and training for faculty in how to use the new lab equipment. The Little Priest Tribal College recently hired a GIS Coordinator, Colleen Campbell. A meeting with her resulted in some positive steps toward reinstating the previous Native IMAGE program, now renamed the Indigenous Geospatial Sciences Institute. Work with MSIs outside of Nebraska include researchers such as Dr. Erick Jones providing travel stipends for his faculty collaborator and students from Prairie View to travel to UNL for RFID research experiences. Dr. John Schalles, Creighton University, is working with scientists from Jackson State, Florida A&M, and Texas A&M – Corpus Christi on his geospatial research. Dr. Mike Leite, Chadron State College, is including faculty and students from Oglala Lakota College on the Pine Ridge Reservation in the watershed research project.

IMPROVEMENTS MADE IN THE PAST YEAR

In September 2008, the Nebraska Space Grant moved into new office space in the renovated College of Public Affairs & Community Service Building on the UNO campus. The new working quarters features three separate offices, an administrative assistant work center, and a student work center. Space Grant also occupies a fully equipped conference room, seminar room, and in cooperation with the Aviation Institute, administers the NASA-Aviation Resource Center. The Nebraska Space Grant also renovated its virtual space with a newly designed website.

Two new staff members were added this year. Michael Sibbernsen is the new Outreach Coordinator. Michael's background in astronomy has facilitated new connections and opportunities for the 2009 IYA. Gayle Lokey also joined the team as the new Staff Assistant. Gayle provides administrative support for both the Space Grant and EPSCoR programs.

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; Northeast Community College, 2-year public CC, four locations serve 20 Nebraska counties; 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 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 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.