North Dakota 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 North Dakota Space Grant Consortium is a Capability Enhancement Consortium funded at a level of $535,000 for fiscal year 2008.

PROGRAM GOALS

North Dakota Space Grant explicitly stated the following SMART goals in its FY 2008 Proposal and Budget:

1. Increase the number fellowships/scholarships awarded annually by at least 5%, based on the 52 awards given in FY 2007.
2. Increase the number of significant fellowship/scholarship awards to females from five to seven.
3. Increase the number of significant fellowship/scholarship awards to under-represented minorities from 0 to 1.
4. Increase the number of faculty and students participating in the Space Grant Internet Telescope Network (SGITN) from four to six.
5. Initiate a CubeSat and/or nano-satellite project in North Dakota.
6. Increase the number of North Dakota colleges/universities participating in the Dark Skies Initiative by two.
7. Fund at least five K-12 teachers in the new Teacher Space Education Initiative (TSEI) for professional development.

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

1. Rowen Poole, UND M.S. Space Studies student, extensively utilized the Space Grant Internet Telescope Network (SGITN) to conduct broadband *BVRI* photometry on a sample of T Tauri variable stars. The goal of this M.S.

thesis project is to constrain the range of variability of T Tauri stars that have not been previously observed for a significant amount of time.

2. Emily Chwialkowski, UND M.S. Space Studies student, has worked in both the Space Suit Laboratory and the Spacecraft Simulator Facility, which has provided her with in-depth experience related to her study of human factors related to spaceflight.
3. Three UND Space Studies students (Nathan Ambler, Emily Chwialkowski, Matt Allner) presented papers at the 2008 IAC meeting, Glasgow, Scotland.

PROGRAM ACCOMPLISHMENTS

Outcome 1 Programs

Undergraduate Scholarships/Fellowships. Scholarships were provided to 81 students attending 12 affiliate colleges in FY 2008. Sixty-five fellowships were provided to 47 students in the reporting period. During FY 2008, the number of "significant awards" increased from 14 in FY 2007 to 44 in FY 2008 – an increase of 30 awards or a 214% annual increase. Also, the number of "significant" scholarships/fellowships for females increased from 5 to 10, which exceeded the SMART goal. North Dakota Space Grant met its goal of funding one under-represented student for a "significant" fellowship/scholarship. This is an increase of 0 "significantly" funded students for FY 2007.

Graduate Research Assistantships/Tuition Waivers. The Consortium provided ¼ time GRA/tuition waivers to two students, Nathan Ambler and Emily Chwialkowski, in the UND Department of Space Studies in FY 2008.

Space Center Summer Internships. Three undergraduate students (2 NDSU, 1 UND) were sponsored by the Consortium to conduct summer work at the NASA Marshall Space Flight Center, NASA Goddard Space Flight Center, and the NASA Jet Propulsion Laboratory.

Senior Design Projects. Two projects were funded by the Consortium: 1) a wind tunnel project with the UND Department of Mechanical Engineering, and 2) a biomedical sensors project with the NDSU Department of Computer and Electrical Engineering.

UND Astronomy Infrastructure. The UND Observatory made progress toward full operational status in the FY 2008 reporting period. The Small Radio Telescope (SRT) was repaired and successfully used remotely during a Summer 2008 graduate course on radio astronomy. Internet Observatory #1 was also used for a variety of individual and class educational projects. Internet Observatory #2 and #3 construction were mostly completed. ND Space Grant provided funding for some supplies in support of these observatories.

Near the end of FY 2008 or the beginning of FY 2009, the UND Observatory will begin its first fully operational year with the availability of all four remotely-controllable

observatories. This will become an important resource for expanding student research opportunities in the future.

Space Grant Internet Telescope Network (SGITN)- Sixteen North Dakota undergraduate and graduate students utilized the SGITN during FY 2008. Students primarily conducted educational projects at the UND Observatory and Badlands Observatory that included astrometric and broadband photometric observations of asteroids and stars.

Spacesuit/Spacecraft Simulator Projects- The NDX-2 project began during FY 2008, which has the goal of developing an extended capability lunar space suit. Much of the emphasis of this project revolves around developing a rear ingress/egress capability that can limit contamination from the lunar regolith.

The Spacecraft Simulator Facility has expanded and moved to a new location. The facility now includes Mercury, Apollo, Space Shuttle, and SpaceShip One simulators for undergraduate and graduate educational activities.

BalloonSat- Two launch attempts were made in FY 2008, but neither succeeded due to equipment failures. To ensure future success, subsequent efforts have focused on extensive equipment testing that will improve the odds of successful launches and flights in the future.

Summer Faculty Fellowships- Seven Summer Faculty Fellowships were provided to faculty at seven North Dakota affiliate colleges in FY 2008. The topics for these Fellowships are as follows:

1. Environmental sciences course with laboratory section (NDSCS).
2. Spaceward Bound course, "Mars in the Midst" for K-12 teachers (NDSU).
3. Space mission design course (UND).
4. Addition of planetary science components for three classes (DSU).
5. Intermediate GIS course (UTTC).
6. Geosciences workshop for K-12 teachers (VCSU).
7. Space science components for teacher education courses (MaSU).

Outcome 2 Programs

Dark Skies Initiative- No colleges applied to the Dark Skies program in FY 2008. Re-evaluation of the program is necessary to determine its future viability and effectiveness.

Teacher Space Education Initiative (TSEI) – The TSEI made significant preliminary progress in FY 2008 by defining the nature and implementation of this new program. The TSEI has been developed into a series of two-day space education K-12 teacher workshops that will be held annually each summer. Participating teachers will receive one graduate credit from the University of North Dakota for their participation in the workshop.

The first series of TSEI workshops will occur during the weeks of June 7 and June 14, 2009. The primary goal of these workshops is to provide teachers with fundamental knowledge of the mechanics and characteristics of spaceflight and the space environment with the intent of encouraging teachers to introduce space curriculum topics in their own schools and classes.

FIRST Robotics- North Dakota Space Grant supported five FIRST Robotics teams at $6,000 per team.

Teacher Pre-service Workshops- Four pre-service workshops for 165 future teachers were conducted at the University of North Dakota, North Dakota State University, Mayville State University, and at Valley City State University.

Spaceward Bound- ND Space Grant supported the Spaceward Bound program, which is a week-long workshop that includes a biological and geological tour of North Dakota. This workshop is a collaborative activity of the ND Space Grant, the University of North Dakota, North Dakota State University, and the NASA Ames Research Center.

Outcome 3 Programs

StarDate. North Dakota Space Grant continues to sponsor the StarDate radio program, which is aired on Prairie Public Radio across North Dakota.

PROGRAM CONTRIBUTIONS TO PART MEASURES

- **Longitudinal Tracking**: Total awards = 44. Fellowships/Scholarships = 44. Higher Education/Research Infrastructure = 0; 1 of the total awards represents underrepresented minority fellowship/scholarship funding. One student has accepted a position in the aerospace industry, two are employed in STEM (non-aerospace) positions, and one is employed in an "other" STEM academic field.
- **Course Development:** The following course or course components were developed as a part of the Consortium's Summer Faculty Fellowships:
    1. Environmental sciences course with laboratory section (NDSCS).
    2. Spaceward Bound course, "Mars in the Midst" for K-12 teachers (NDSU).
    3. Space mission design course (UND).
    4. Addition of planetary science components for three classes (DSU).
    5. Intermediate GIS course (UTTC).
    6. Geosciences workshop for K-12 teachers (VCSU).
    7. Space science components for teacher education courses (MaSU).
- **Matching Funds**: The North Dakota Legislature appropriated $300,000 in cash match to the North Dakota Space Grant Consortium for the 2007-2009 budget biennium.
- **Minority-Serving Institutions**: No interactions in this reporting period.

IMPROVEMENTS MADE IN THE PAST YEAR

The Spacecraft Simulator Facility has been moved to a permanent location and has increased the number of available simulators for educational use.

The amount of scholarship funding provided to the non-research universities in North Dakota has been increased.

The NDX-2 project was approved and initiated to continue development of planetary space suit work and to efficiently expend the state cash match funding, which will expire at the end of the current two-year state budget in July 2009.

An emphasis toward funding more multi-disciplinary projects (i.e., RockSat, HASP, USLI, etc.) occurred, which also helps to develop an emerging capability and goal for participating in future satellite projects.

Collaborations with researchers at North Dakota State University, in polymers and coatings, which involves North Dakota Space Grant in an active research project with the NASA Kennedy Space Center.

PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

Institutions that comprise the North Dakota Space Grant Consortium include the following:

	Total Student		**(non-Asian)**	
Name	**Population**	**% female**	**% minority**	**Type**
UND (Fall 2007)	12559	47.87	11.08	4-year
NDSU (Fall 2007)	12527	45.51	7.25*	4-year
Mayville State (Fall 2006)	832	50.50	Not available	4-year
NDSCS (Fall 2007)	2417	42.00	4.89	2-year
VCSU (Fall 2007)	982	N/A	N/A	4-year
LRSC (Fall 2007)	2971	N/A	N/A	2-year
Minot State (Fall 2006)	3712	N/A	N/A	4-year
MSU, Bottineau (Fall 2006)	421	N/A	N/A	4-year
WSC (Fall 2006)	788	N/A	N/A	2-year
DSU (Fall 2003)	2479	N/A	N/A	4-year
BSC (Fall 2006)	3477	N/A	N/A	2-year
Turtle Mountain CC (Fall 2004)	787	N/A	100.00	2-/4-year
UTTC (Fall 2004)	536	N/A	100.00	2-year
SBC (Fall 2004)	289	N/A	100.00	2-/4-year
CCCC (Fall 2004)	197	N/A	100.00	2-year
FBCC (Fall 2004)	285	N/A	100.00	2-year
TOTAL	**45259**			
*Percentage is for undergraduate students only				