Wisconsin Space Grant Consortium
University of Wisconsin-Green Bay
Dr. R. Aileen Yingst
Telephone Number: 920-465-2108
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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 Wisconsin Consortium is a Designated Consortium funded at a level of $575,000 for fiscal year 2011.

PROGRAM GOALS

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

Minor differences between these goals and objectives and those from last year are due to changes being made each year as we incorporate lessons learned. These changes are noted in italics.

Goal 1. Enhance Wisconsin growth in aerospace while supporting the NASA workforce pipeline by (1) supporting workforce development initiatives and (2) testing methods of recruiting students early in their career and retaining top students throughout their schooling.

Objectives

1.1 Use our primary Workforce Development initiative, the Student Satellite Program, to broaden workforce opportunities for science majors, *especially at smaller four-year and two-year schools*, by supporting curriculum development and hands-on research in high-altitude ballooning activities.

1.2 Maintain our ability to recruit students from a wide range of Affiliate Member institutions by supporting and refining our Balloon and Rocket Programs.

1.3 Continue to budget specific money in the Other Student Awards Program to help support at least two students (more if selected) to NASA Academy, at least two students (more if applicable) to NASA Internships and at least one team involved in NASA's Reduced Gravity Program.

1.4 Increase retention of our best and brightest aerospace students by increasing Fellowship awards for our most highly-ranked graduate students (the top 10%) from $5000 to $8,000 and investigating raising the ceiling on our Undergraduate awards. *(This was a objective primarily introduced when augmentation funding became available and is not applicable to this report)*

1.5 Provide opportunities for our funded students, faculty and other experts to present their research at our twenty-first annual Wisconsin Space Conference, to be hosted by the University of Wisconsin-La Crosse.

1.6 Support and strengthen the national Space Grant program through the Director's elected leadership roles in the national organization.

1.7 Continue to press our Affiliate Members to build relationships with the Minority Advancement offices at their campuses, and nurture growing relationships.

1.8 Support the aerospace programs associated with our minority-serving institution, the College of Menominee Nation (CMN), by investing in *First Nations rocket launch activities.* (Note that this new wording includes but broadens the original goal of supporting a Tribal College Rocket Consortium)

1.9 Continue to recruit Affiliate Members to diversify our reach.

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

Goal 2. Utilize the limited resources of the Consortium and the success of the current Special Initiatives Program to create a new suite of cohesive, progressive programs that recruit and better retain minority and female students from middle school through high school to our current higher education offerings.

Objectives

2.1. Partner with the College of Menominee Nation (CMN) in supporting aerospace-centered research and student activities under a special funding initiative that targets Native American students served by CMN.

2.2 Create a High School Rockets program as a partnership with SLI and Rockets 4 Schools, one that injects standards-based STEM curriculum into the already-successful Rockets 4 Schools spring rocket launch and closes the pipeline gap between students served by Rockets 4 Schools and those served by our University Rocket Competition.

2.3. Continue to nurture our strong relationships with our two minority-serving Affiliate Members, the College of Menominee Nation and Alverno College (a women's college with a large African-American student population).

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)

Goal 3. Seek out more effective ways to encourage Wisconsin precollege educators to learn and utilize space-related content in the classroom, and find new, innovative methods of funding those efforts.

Objectives

3.1 Continue the current Aerospace Outreach Program, with increased emphasis on reaching out to educators directly.
3.2 Create new and expand existing High School-related programs (High School Rockets Competition; High School Partners) to (1) close the gap in our pipeline between K-12 and Higher Education students, and (2) provide direct support to NASA's 2011 Education Priorities.

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 (Educate and Engage)

• Aaron Olson, an undergraduate at UW-Madison, is an excellent example of how the breadth and flexibility of WSGC offerings can be put to work for the student's benefit. Aaron was first awarded a WSGC-funded NASA Academy slot back in 2009, which narrowed his professional focus and introduced him to WSGC's other programs. Since that time, Aaron has successfully proposed for funding for two Reduced Gravity teams, and for travel to conferences (where he has presented his work) and to the high-fidelity NASA-sponsored field test Desert RATS. Aaron leveraged our broad program offerings into a set of opportunities tailor-made to provide him with precisely the skills and experience he needs to reach his NASA-related goals.

• Victoria Salas, on the other hand, is a Physics student who was recruited into NASA-related science through WSGC programs and utilized the WSGC program pipeline to increase her knowledge, skills and experience to the point where she is now competitive for prestigious internships, including NASA Academy. Vicky captained the first non-engineering rocket team from Marquette University at our 2009 Collegiate Rocket Competition; she went on to take several science-based roles in our Elijah High-Altitude Balloon program, including payload design, and this year completed an Elijah internship, where she designed balloon payloads and packaged them in such a way that professors at non-engineering colleges and universities could use them in their classrooms as out-of-the-box design projects. Vicky is now one of those unique, highly sought-after individuals fluent in both science and engineering.

• Rocket activities for Native American students: This program comprises opportunities at a range of skills levels for native students to build and launch rockets in a collegial, culturally-relevant environment. It draws from several funding sources, including the WSGC Base Grant. We use WSGC Base Grant money primarily to fund our student mentors and to fund local native teams.

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

• Jordan Gerth is an example of a student who was recruited early, got the "research" bug and grew into a top-notch researcher. Jordan was not the strongest of applicants on paper when he wrote his first Undergraduate Research proposal, but he had innovative, student-driven ideas and expressed them in an accessible way, and we recruited him. Since that first proposal in 2005, Jordan has developed into one of our strongest applicants and the WSGC has funded him throughout his undergraduate and graduate careers. Jordan expects to receive his MS in Meteorology shortly and will continue on for his Ph.D.

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)

• Our Aerospace Outreach Program specializes in partnerships, in which NASA-related curriculum is the inspiration for long-term STEM activities between schools and other institutions. An example from this past year is the LOFTY teacher workshop on constructing and launching bottle rockets, and the accompanying school rocket competitions in the Oshkosh area. The connection between the local participating K-12 schools and the UW-Oshkosh campus and planetarium is a direct result of the WSGC funding this workshop.

PROGRAM ACCOMPLISHMENTS

Outcome 1 associated goals and objectives

Goal 1

Objective 1.1 accomplishments. We hired two Elijah Student Interns this year (formerly Instrument Development Program students). These students were tasked with designing balloon payloads to be built by faculty in ballooning workshops, specifically using their science expertise to work with faculty to create payloads that may be built easily by undergraduates but still provide authentic science data for the classroom. Students created two payloads each, for a total of four classroom-ready, hands-on high-altitude balloon science experiments.

Objective 1.2 accomplishments. We supported 50 students in 13 teams from 5 affiliates in the Collegiate Rocket Competition, an increase in representation from last year; 3 teams represented the first or second time a team was fielded from that institution. We also funded 10 students from 6 affiliates in the Elijah High-Altitude Balloon teams.

Objective 1.3 accomplishments. In FY11 with our base grant we funded 6 NASA interns and 3 NASA Reduced Gravity teams that included 19 students. Under this objective we also funded students in the Mars Desert Research program (MDRS), Desert RATS, and X-Hab opportunities.

Objective 1.4 accomplishments. We have chosen not to raise the ceiling on our Undergraduate Awards based on the limits of our current base grant.

Objective 1.5 accomplishments. The 21st Annual Space Conference, hosted by UW-LaCrosse, had 110 registered attendees from all over the state.

Objective 1.6 accomplishments. Director R. Aileen Yingst is currently serving as an active member of the Space Grant Directors' Executive Committee and Nominating Committee. The Director and Program Manager each also lead an ad hoc committee set up by the Space Grant Director, for advancing new "Great Ideas."

Objective 1.7 accomplishments. Diversity plan compliance covers nearly 70% of members.

Objective 1.8 accomplishments. We currently have 7 teams from 7 institutions participating in our First Nations Launch activities. The WSGC budgetary contribution to this objective is not easily quantified as it is focused on funding for students and staff to provide non-technical support to the program.

Objective 1.9 accomplishments. Our current membership now stands at 40 institutions, including our newest member as of this year, non-profit Spaceport Sheboygan.

Other Progress and Accomplishments under Outcome 1

WSGC Scholarships, Undergraduate Research Awards, and Fellowships: In FY 11 we made awards to 41 students within these three programs using NASA funding. Of those awards, 18 went to Undergraduate Scholars, 12 to Undergraduate Researchers, and 11 to Graduate Fellows, including the winner of the Dr. Laurel Salton Clark Award. Member institutions are supporting 10 additional undergraduate students with internal funding. Students will present their findings at this summer's Wisconsin Space Conference to be held at UW-Whitewater in August.

Research Infrastructure Program: Three Research Infrastructure grants were awarded to provide relatively new faculty or staff the opportunity to establish a space-related research project, or more experienced faculty or staff the opportunity to begin new space-related research programs. Also included in this program is our support of the WIYN Astronomy Consortium, which provides 1-3 observing nights per year to members and students. Requests for these nights have increased 40% in the last few years.

Higher Education Incentive Grants: One award was made to college or university faculty or academic staff interested in developing a new course, minor, major, or curricular area related to any NASA-related discipline.

Industry Awards: We have partnered with our Industry members to fund 2 industry staff members to receive additional training to stay abreast of important changes in the high-technology field of aerospace engineering. In addition, there were 2 research awards made to Industry/Academic teams.

<u>Outcome 2 associated goals and objectives</u>

Goal 2

<u>Objective 2.1:</u> We funded 1 Native American student through our Base Grant this year.

<u>Objective 2.2:</u> We currently use funds other than our Base Grant to fund our High School Rockets program.

<u>Objective 2.3:</u> We have discussed our native programs earlier.

Other Progress and Accomplishments under Outcome 2

Special Initiatives program: Four awards were made to faculty, educators or other individuals or groups to develop and conduct innovative programs that target groups traditionally underserved in aerospace. This program rarely funds higher education students directly, but often funds programs that have been proposed by undergraduate and graduate students.

<u>Outcome 3 associated goals and objectives</u>

Goal 3

<u>Objective 3.1:</u> Our Aerospace Outreach Program is designed to fund innovative planning grants and supplemental grants for projects that increase interest, recruitment, experience and training of pre-college students in the pursuit of space- or aerospace-related science, design, or technology, or encourage K-12 students in space-related pursuits. We have funded 7 projects under this program.

<u>Objective 3.2:</u> To support these programs we have secured new personnel; this individual is not funded through the Base Grant.

PROGRAM CONTRIBUTIONS TO PART MEASURES

Student Data and Longitudinal Tracking: Total awards = 131 awards, 11 students received awards in more than one project; Fellowship/Scholarship = 41. 4 underrepresented students including Hispanic: 2, Pacific Islander: 1, Black: 1. Thus 9.7% of total awards represents underrepresented minority F/S funding. We currently cannot report on our Higher Education/Research Infrastructure programs, or the number of students taking the "next step" because tracking is not complete.

Diversity: The vast majority of funding for our marquee diversity program, our First Nations Launch activities (including our Tribal College Rocket Consortium), comes from sources other than our Base Grant.

Minority-Serving Institutions: Wisconsin has two tribal colleges and one primarily female college. Of these three institutions, two are members of the WSGC: Alverno College and the College of Menominee Nation (CMN). Both are active members and have received competitively awarded grants nearly every year. Paul Smith, a professor at Alverno College, has become a key mentor in our Collegiate Rocket program. Our primary interaction with CMN is the First Nations Launch activities described above, which includes their hosting the associated workshops each year.

NASA Education Priorities: Our focus this year was on the NASA Education Priorities 1, 4 and 7, as noted below.

• ***Authentic, hands-on student experiences:*** With the possible exception of some of our Undergraduate Scholars, *every student* funded directly by the WSGC is engaged in this type of active, authentic, hands-on, problem-solving experience. This includes all students funded through our Undergraduate Research and Graduate Fellowship programs; all NASA Academy, Intern and special programs students; and all of our Student Satellite Initiative team members and interns. Additionally, all of the programs designed and run by the WSGC are *fully student-driven*, with students taking responsibility for defining problems and testing solutions.

• ***Community Colleges:*** The WSGC continues to support our two public and one tribal 2-year colleges, as well as our technical college member. All WSGC members are equal members of the Consortium and have an equal representation on our Advisory Council. Approximately 10% of our awards this fiscal year went to students at these institutions.

• ***Diversity:*** First Nations Launch activities reported here significantly supported increasing the diversity of institutions, faculty and student participants both in Wisconsin (among our native students) and nationally (through recruitment of tribal schools and student teams across the country).

IMPROVEMENTS MADE IN THE PAST YEAR

• In this year we began investigating potential programs to recruit female students into NASA-related fields. Previous efforts to reach out to underserved populations have been most successful when the WSGC enters into meaningful dialogue first with the population in question, so that we may understand their needs and how we can work together to help meet them. For female students, issues are unique because women don't have a single cultural reference or a common set of experiences from which to draw conclusions about how best to address needs. Neither do women have a single group that

may speak for them as a whole. Our approach will thus need to be adapted to these circumstances. We have begun by identifying individuals that are stakeholders in female education (K-12 and higher education) and working with them to create a state task force that can discuss how the WSGC can best use our resources to recruit more female students into STEM fields.

• This year, as noted above, we utilized students as interns to design payloads and instructions for faculty to bring high-altitude balloon driven science into the classroom. The students designed four payloads, along with instructions on how to construct them and read and analyze resulting data. We hope to test their use in a classroom this summer (next fiscal year), and then bring them into classrooms of interested schools through the use of faculty training workshops.

• This year, we have had several requests for funding that grew out of targeted grants and programs funded by the WSGC. These include NASA-related Senior Design courses at the Milwaukee School of Engineering, curriculum development through high-altitude ballooning at UW-Whitewater, student participation in the X-Hab, Desert RATS, and MDRS programs, and increased student participation in the WIYN telescope consortium. That is, we are seeing an increase in our response to our members' desire for NASA-related opportunities, rather than the school responding to a specific funding initiative. We believe this is a result of our policy to invest in small, focused types of experiences that can enrich an undergraduate's experience at crucial points in their education, keeping them engaged, rather than funding programs focused at a single school. This model works for us because of the highly distributed nature of the higher education institutions across WI. This flexible, non-centralized approach allows diverse campuses to participate fully in our programs. Importantly, it also allows individual students, no matter how large or small, well- or poorly equipped their campus, to plug in to our programs from a distance and take advantage of them.

PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

Wisconsin Space Grant Consortium Members		
Alverno College	Academic	4yr bac
Carroll University	Academic	4yr bac
Lawrence University	Academic	4yr bac
Ripon College	Academic	4yr bac
St Norbert College	Academic	4yr bac
University of Wisconsin-Oshkosh	Academic	4yr bac
University of Wisconsin-River Falls	Academic	4yr bac
Wisconsin Lutheran College	Academic	4yr bac
Carthage College	Academic	4yr bac/Grad
University of Wisconsin-Green Bay	Academic	4yr bac/Grad
University of Wisconsin-La Crosse	Academic	4yr bac/Grad
University of Wisconsin-Parkside	Academic	4yr bac/Grad
University of Wisconsin-Platteville	Academic	4yr bac/Grad
University of Wisconsin-Stout	Academic	4yr bac/Grad
University of Wisconsin-Superior	Academic	4yr bac/Grad
University of Wisconsin-Whitewater	Academic	4yr bac/Grad

Milwaukee School of Engineering	Academic	Bac/Master
College of the Menominee Nation	Academic	Tribal
University of Wisconsin-Fox Valley	Academic	Com/Jr
University of Wisconsin-Sheboygan	Academic	Com/Jr
Western Technical College	Academic	Com/Jr
Marquette University	Academic	PhD
University of Wisconsin-Madison	Academic	PhD
University of Wisconsin-Milwaukee	Academic	PhD
Medical College of Wisconsin	Academic	Medical
Aerogel Technologies, LLC	Industry	Aerospace
Astronautics Corporation of America	Industry	Aerospace
Orbital Technologies Corporation	Industry	Aerospace
Space Explorers, Inc.	Industry	K-12 Ed.
Space Education Initiatives	Industry	Informal Ed.
Spaceflight Fundamentals, LLC	Industry	Informal Ed.
Experimental Aircraft Association (EAA)	Not-for-Profit	Aviation Ed.
AIAA – Wisconsin Section	Not-for-Profit	Student Eng.
BioPharmaceutical Technology Center Institute	Not-for-Profit	Informal Ed.
Great Lakes Spaceport Education Fnd, Inc.	Not-for-Profit	K-12 Ed.
Spaceport Sheboygan	Not-for-profit	Space Ed.
Wisconsin Association of CESA Administrators	Not-for-Profit	Formal Ed.
Wisconsin Aerospace Authority	Government	State
Wisconsin Department of Public Instruction	Government	State
Wisconsin Department of Transportation	Government	State

All WSGC members have equal status and equal representation on our Advisory Board regardless of their size.