Indiana 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 **Indiana Space Grant** Consortium is a Designated Consortium funded at a level of **$785,000** for fiscal year 2009.

PROGRAM GOALS

INSGC Program Goals have been revised through Affiliate member discussions and ratification, in order to achieve further alignment with NASA Education Outcomes. Additional modifications and revisions have resulted from clarifying discussions with the NASA Program Manager, to reflect NASA budget and emphasis priorities for the Space Grant Program. INSGC Goals are as follows:

- *INSGC will be a preferred source of information, materials, and opportunities for inspiring, preparing, and supporting individuals for NASA-related STEM education and careers.*
- *INSGC will be an effective and preferred vehicle for enhancing the engagement of K-20 educators and students in the full range of NASA-related STEM activities and opportunities.*
- *INSGC will raise awareness of and access to NASA-related activities, events, and opportunities for the government, institutions, and residents of the State of Indiana.*

These goals are intended to follow the NASA Education Outcomes listed below:

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

Scholarship / Fellowship
1.3 Student Involvement Higher Education – Provide opportunities for groups of post-secondary students to engage in authentic NASA-related mission-based R&D activities.

Higher Education
1.1 Faculty and Research Support – Provide NASA competency-building education and research opportunities for faculty, researchers, and post-doctoral fellows.
1.2 Student Support – Provide NASA competency-building education and research opportunities to develop qualified undergraduate and graduate students who are prepared for employment in STEM disciplines at NASA, industry, and higher education.

Research Infrastructure
1.5 Targeted Institution Research and Academic Infrastructure – Improve the ability for targeted institutions to compete for NASA research and development work.

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

Pre-College / Higher Education / General Public
2.1 Educator Professional Development – Short Duration – Provide short duration professional development and training opportunities to educators, equipping them with the skills and knowledge to attract and retain students in STEM disciplines.

2.3 Curricular Support Resources – Provide curricular support resources that use NASA themes and content to a) enhance student skills and proficiency in STEM disciplines; b) inform students about STEM career opportunities; c) communicate information about NASA's mission activities.

2.4 Student Involvement K-12

- Provide K-12 students with authentic first-hand opportunities to participate in NASA mission activities, thus inspiring interest in STEM disciplines and careers.
- Provide opportunities for family involvement in K-12 student learning in STEM areas.

NASA Education 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)*

General Public / External Relations
3.1 Resources – Provide informal education support resources that use NASA themes and content to 1) enhance participant skills and proficiency in STEM disciplines; 2) inform participants about STEM career opportunities; 3) communicate information about NASA's mission activities. Develop a significant pool of qualified presenters of NASA aerospace content interactingwith a large number of participants.

3.2 Professional Development for Informal Education Providers – Provide opportunities to improve the competency and qualifications of STEM informal educators, enabling informal educators to effectively and accurately communicate information about NASA activities and access NASA data for programs and exhibits.

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

Highlights and Anecdotes
NASA Outcome 1
Scholarships/ Fellowships

An online survey of students receiving INSGC scholarships and fellowships from 2006-08 resulted in over 50 responses within a single week, including several very glowing comments regarding the role of INSGC funding in supporting their education. One example is shown below:

Quote from Justin Goeglein (Taylor University) who was awarded a scholarship from INSGC.

> The award I received last year was very beneficial in furthering my education and moving me closer to my career goals. I have had an excellent experience with INSGC both through my individual scholarship and the various grants associated with Taylor University. The funding allowed me to stay at school and as a result I was able to design and build an electric motorcycle. The motorcycle has a range of 12 miles all electric and is used on a regular basis around campus. Not only was I able to pursue my passion of electro-mechanical systems but I was also able to build and test a variety of weather related sensors that were used to test the atmosphere as a part of Taylor's High Altitude Research Platform.

The competitive awarding mechanism for INSGC scholarship and fellowship support also includes summer internships for INSGC Affiliate students at NASA Centers, and summer internships for underrepresented minority students in STEM disciplines at Purdue University in West Lafayette. (A parallel program for INSGC support of underrepresented minority students at Indiana University in Bloomington will begin in 2010.)

Research Infrastructure
Undergraduate Research in Observational Astronomy Using telescopes in Arizona and Chile uses the remotely controlled Southeast Association for Research in Astronomy (SARA) telescopes in (36-in in Arizona and 24-in in Chile) to augment undergraduate astronomy and research classes. This is part of continuing support (initiated in 2006) by INSGC of undergraduate research in observational astronomy at Ball State and Valparaiso University.

Higher Education
Purdue Space Day took place on Purdue campus in West Lafayette, IN on November 7, 2009 with guest speaker astronaut Michael J. McCulley. This year include the Star lab that was a loan from the Brownsburg Challenger Learning Center. The Star Lab is an inflatable planetarium that uses a digital projector to show images of anything astronomy-related onto the planetarium's dome. Courtney McManus the IYA NASA ambassador ran this activity giving the kids a taste of the night sky. There was also collaboration with DURI Program in Discovery Park and collaboration with Women in the Engineering Program. This event captured 565 students in grades 3-8 in attendance. This was the 14th year for the Purdue Space Day with 4,943 grade school students and 1,555 university student volunteers participating in the program since 1996.

Pre College
SpacePort Indiana successfully completed the STS-125 Mission Project where 7 state wide chosen 11th and 12th graders were given a unique opportunity to participate in an 11 day mission from pre-launch activities to mission completion. At that time, each student picked a mission specialist to shadow and then become a "Jr. Expert" on that specialist mission role. Each student was given the opportunity to explain the mission and answer questions based on their "unique" expertise in pre-determined locations throughout Indiana. Once completed, the "Junior Experts" were offered $1,000.00 scholarships to attend an INSGC academic affiliate in a STEM discipline. A collaboration with IMAX and Indianapolis Challenger Center supported of labor, material, professional advice and in the selection process of the STS-125 awardees. Recently, the STS-125 Mission Project was awarded a NASA "Top Stars" outreach program award.

General Public / Informal Education
The Indiana Space Grant Consortium again spent 17 days at the Indiana State Fair during August 2009. The theme of Indiana Space Travels bought about many exhibits from several affiliates and was a huge success totaling over 70,000 visitors. Materials on NASA's "Toys In Space" STS flight experiment were provided to teachers, parents, and informal educators.

PROGRAM ACCOMPLISHMENTS

1.3 Student Involvement in Higher Education- INSGC has been able to provide many opportunities for groups of post-secondary students engaged in authentic NASA-related mission- based activities.

Scholarships / Fellowships
INSGC continues to receive a growing number of requests for scholarship / fellowship awards with an increase level of recognition and prestige associated with the designation of being an INSGC Scholarship / Fellowship winner. INSGC supports the NASA summer interns, Purdue PROP initiative for underrepresented minorities, and Diversity Enhancement scholarships that enhance student participation at Purdue West Lafayette (where the overwhelming majority of underrepresented STEM students attend).

1.5 Targeted Institution Research and Academic Infrastructure- INSGC provided feedback to all Research Infrastructure applicants as to the new 2009-10 Guidelines in the practice that undergraduate students be members of the research team. With this in place, INSGC was able to fund ongoing projects that met this criteria.

- Undergraduate Research in Observational Astronomy Using Telescopes in Arizona and Chile
- Matching Funds for Undergraduate Research Grant Program
- DURI-Discovery

1.1 Faculty and Research Support- Provide NASA competency-building education and research opportunities for faculty, researchers, and post-doctoral fellows.

1.2 Student Support- Provide NASA competency- building education and research opportunities to develop qualified undergraduate and graduate students who are prepared for employment in STEM disciplines at NASA, industry, and higher education.

Higher Education

The funding from INSGC has enabled 9 of our affiliates to participate in many Higher Education Projects. These projects focused on Affiliate strengths in aerospace engineering, astronomy, environmental studies, mechanical engineering, and physics.

- Galaxy Evolution
- Purdue Space Day
- Hubble 3-D
- 3D Super Cell Research
- Astronomy Activities, State Fair
- Undergraduate Research in Observational Astronomy-Ball State
- Undergraduate Research in Observational Astronomy-Valparaiso
- The Moon Buggy Ergonomic Design Consideration
- A Novel Way for Teaching Global Environmental Changes at IUPUI and ISU
- Fuel Requirements for Earth Moon Racetrack Orbit
- Engineers Rock
- UE Spring Space Day
- Purple Aces University Student launch Initiative
- Holmes Autonomous Air
- IYA State Ambassador
- Complete Database of Parameters
- Galileo Family Nights

One outgrowth of the Higher Education and Research Infrastructure support to Valparaiso University was a recently awarded National Science Foundation grant of $226,000 to Principal Investigator Bruce Hrivnak to continue INSGC-funded work on Light Curves.

In addition to scholarship and fellowship support for underrepresented minority students, ongoing relationships with the Minorities in Engineering Program, Women in Engineering Program, and Diversity Resource Center at Purdue University provide a continuing environment for engaging students previously underrepresented in STEM disciplines.

Pre College

Pre-college programs emphasized the support of activities for K-12 students to participate in STEM related activities and increase enthusiasm to pursue STEM majors at the university level. These projects included campus-based multi-day enrichment activities (such as OPTIONS for Middle School and High School Girls), and other affiliate-supported inspiration activities (FIRST Boilermaker Regional at Purdue University). Rather than supporting individual teams or schools, INSGC chooses to support the programs as a whole.

INSGG was able to support 10 projects associated with 7 different affiliates for the 2009-10 year. The STS-125 Mission Project was recognized as a NASA Top Stars award project. The FIRST Boilermaker Regional Robotics competition hosted over 2000 attendees in both 2009 and 2010.

General Public-Informal Education

INSGC was proud in supporting some outstanding exhibits that had of over 71,000 participants. The Indiana Space Travels Exhibit at the Indiana State Fair hosted over 70,000 attendees, and was one of the Fair-wide "key stops" on the children's souvenir question and answer card. There were over 50 media contact site references for the event. Over 200 teachers and 100 members of the public were in attendance for the IMAX Hubble 3D Premiere on March 17, 2010. Two International Year of Astronomy ambassadors (including Nathalie Haurberg, an INSGC-funded ambassador) conducted multiple general public presentations beyond the presentations done at the Indiana State Fair. There were 3 major projects that involved 11 different affiliates.

- Hubble 3-D Premiere
- Indiana Space Travel Exhibit at the Indiana State Fair
- International Year of Astronomy Programs-Valpo and IU Community based Astronomy Education and Observations

Prior to 2009, INSGC operated under an erroneous assumption that General Public and Informal Education activities should be funded at a budget level commensurate with other Outcome 1 and Outcome 2 efforts. Beginning in FY2009, this assumption has been corrected. Even though INSGC will continue to participate in projects that emphasize general STEM literacy and informal education opportunities, funding of these projects will reflect an appropriate balance of Space Grant budget priorities and levels. General Public and Informal Education activities that are funded will do so with an explicit Higher Education focus, elaborating and highlighting the STEM strengths of the INSGC Academic and Outreach affiliates.

PROGRAM CONTRIBUTIONS TO PART MEASURES

- **Longitudinal Tracking:**

INSGC has made significant strides in its longitudinal tracking efforts. Beginning in 2008, a focused effort has resulted in identification and status determinations of over 80% of significant awardees since 2005, and over 75% of significant awardees since 1995. The incorporation of Facebook connections to the INSGC Director, and a new INSGC Facebook page, has added to the speed and reach of the longitudinal tracking effort.

- **Course Development:**

Over the past three years, two different INSGC affiliates have successfully competed for NSF Course, Curriculum and Laboratory Improvement (CCLI) grants. In partnership with the Astrobiology Institute at Indiana University, courses and learning modules for both college students and in-service teachers have been developed. Faculty at Taylor University have created a course development in nanotechnology that partners with research collaborations developed at Sandia National Laboratories. Robotics research and development at Indiana University / Purdue University-Ft. Wayne (IPFW) has resulted in development and improvement of laboratory modules in robotics.

- **Matching Funds:**

INSGC continues to achieve greater than 1:1 matching for non-scholarship funds. Even in a difficult budget cycle, the Associate Dean for Undergraduate Education in the College of Engineering at Purdue has retained matching salary support for the Director and Program Coordinator. Some matching for Evaluation and Assessment activity continues from the Purdue College of Education. INSGC receives non-federal dues from academic affiliates to support travel and expenses not allowable on NASA funds; these dues contributions were previously under-reported in INSGC fiscal reporting.

Matching funds are not required for scholarship and fellowship programs, but INSGC prohibitions against tuition fee remission charges has allowed academic affiliates to provide another source of matching for graduate fellowships. Discussions to provide matching funds for Diversity Enhancement scholarships continues, but mechanisms to achieve this goal while not running afoul of university regulations are elusive.

Minimum one-to-one matching is required for all proposals submitted to the INSGC grant program competitions; overmatching is encouraged. Several ongoing INSGC programs, such as FIRST and Purdue Space Day, obtain substantial matching funds from corporate donations. Match generally comes from a variety of sources identified in the grant proposals. Award decisions specifically reference the availability of matching funds to ensure appropriate project, affiliate, and Consortium matching levels.

- **Minority-Serving Institutions:**

INSGC does not have a designated Minority Serving Institution among its academic affiliates; no Historically Black or Hispanic Serving institutions with a focus on STEM

degrees exist in the state. However, both Purdue and Indiana University (where the overwhelming majority of underrepresented STEM minorities are enrolled) have strong relationships with minority serving institutions in other states. Some discussions with Martin University have begun, in association with their recent award of a SEMAA grant.

IMPROVEMENTS MADE IN THE PAST YEAR

Management

Despite the resignation of the INSGC Program Coordinator in April 2010, INSGC has developed increased flexibility and performance in the area of consortium management. The Evaluation and Assessment Team completed a comprehensive organizational assessment between October 2009 and January 2010, which identified numerous opportunities for Consortium improvement. Drafts of Affiliate and INSGC Office Operations Manuals have been completed, and are awaiting distribution in the beginning of Fall, 2010. A search for an upgraded Program Manager is underway; INSGC operations and FY09 reporting have continued during an interim Program Coordination period. Angela Verissimo has effectively filled the role of temporary INSGC Program Coordinator since April 2010. As of August 24, 2010, candidate interviews for a new Program Manager will have been completed.

Projects

The Indiana Space Travels Exhibit at the Indiana State Fair leads the list of several projects resulting in significant improvements in visibility, recognition, and enthusiasm for INSGC's Education Outcome efforts. INSGC Affiliates have also been involved in IMAX Hubble 3D and International Year of Astronomy efforts. As a result of INSGC Director discussions with NASA Headquarters, budgets for INSGC projects now better reflect the priorities of and alignment with NASA Office of Education expectations. Several projects continue to receive additional follow-on recognition and success. Most recently, the "Light Curves" research project conducted at Valparaiso University (and supported by INSGC) was awarded an NSF grant of $226,000.

Collaborations and Partnerships

A program sponsored by the INSGC, Purdue Space Day is an initiative designed to give young people in grades three through eight, the opportunity to learn about astronautical engineering and space exploration through hands-on experiences with the intention of sparking their interest in science, technology, engineering and mathematics. (STEM) The existence of PSD programs at several sites has opened the possibility of addressing community and educational needs that extend beyond those of a university and its local community. The IMAX Hubble 3D premiere and FIRST Boilermaker Regional events in March 2010 created the opportunity to begin a partnership collaboration with the office of Tony Bennett, Indiana State Superintendent of Public Instruction. Development of the INSGC Summer of Innovation proposal helped to create new collaboration discussions with the ISTEM academic network hosted at Purdue, and other statewide academic and informal education partnerships.

PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

All Affiliates (Academic, Outreach, Corporate) have voting rights and responsibilities for approving strategic directions and Consortium program decisions discussed at Affiliate Meetings. Two Affiliate Meetings per year are held: one two-day, physical attendance meeting in April, and one teleconference in the Fall (usually October). The Director presents goals and expected budget priorities at the Fall Affiliate Meeting, and presents expected Consortium Priority (non-competed) budgets. All Affiliates are then invited to apply for Award Competition funds, based on general INSGC strategic goals and priorities. Beginning in April 2010, Affiliates have self-selected for participation in one of several working groups to help foster and encourage future INSGC development in key areas identified in prior Affiliate Meetings. Two current working groups are addressing the areas of interactions with state and local governments, and greater partnerships with Project Lead the Way.

One priority of the INSGC is to provide at least one undergraduate scholarship award to every academic affiliate; support for at least one Award Competition application to each affiliate has been a historical goal, but is not always achieved due to Affiliate capability and funds available. Although the majority of STEM students and researchers are concentrated at two flagship research universities (Purdue University in West Lafayette; Indiana University in Bloomington), awards are spread among the affiliates. Relatively few research infrastructure or faculty development awards are granted to tenure-track faculty at the flagship research institutions. A list of Affiliates by type follows:

Academic Affiliates
Ball State University / Dr. Ronald H. Kaitchuck (Affiliate Director)
Indiana State University / Dawn Underwood (Affiliate Contact)
Indiana University – Bloomington / Dr. Richard H. Durisen (Affiliate Director)
Indiana University – Purdue University Fort Wayne / Dr. Jihad Albayyari (Affiliate Director)
Indiana University – Purdue University Indianapolis / David Coats (Affiliate Director)
Purdue University – Calumet / Dr. Adam W. Rengstorf (Affiliate Director)
Taylor University / Dr. Jeff Dailey (Affiliate Director)
University of Evansville / Dr. Philip Gerhart (Affiliate Director)
University of Southern Indiana / Dr. Glen Kissel (Affiliate Director)
Valparaiso University / Dr. Bruce J. Hrivnak (Affiliate Director)

Outreach Affiliates
Brownsburg Challenger Learning Center / Mary Patterson (Affiliate Director)
Challenger Learning Center of Northwest Indiana / Amanda Maynard (Affiliate Director)
Ethos, Incorporated
IMAX Theater / Craig Mince (Affiliate Director)
Indiana State Museum / Barry Dressel (Affiliate Director)

Indianapolis Challenger Learning Center of Decatur Township / Cyndy Moriarty, NBCT-Flight Director
Science Central / Shane Pickett & Lou Pepai (Co-directors)
SpacePort Indiana / Brian Tanner, Chief Technology Officer
Terre Haute Children's Museum / Linda Edwards (Affiliate Director)

Corporate Affiliates

StratoStar Systems / Jason Krueger
Orbit Frontiers, LLC / Joseph Gangestad, President

Submitted on behalf of the Indiana Space Grant Consortium

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Barrett S. Caldwell, PhD, Director
Indiana Space Grant Consortium
August 23, 2010