

Illinois Space Grant Consortium
Lead Institution: University of Illinois at Urbana-Champaign
Director: Dr. Philippe H. Geubelle
Telephone Number: 217-244-8048
Consortium URL: www.ae.illinois.edu/ISGC
Grant Number: NNX10AK65H

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 Illinois Space Grant Consortium is a Designated Consortium funded at a level of \$575,000 for fiscal year 2012.

PROGRAM GOALS

2010 - 2014 ISGC Goals and Objectives

- Diversity in Fellowship/Scholarship, Research Infrastructure and Higher Education program areas.
 - Reach the underrepresented minority percentage (currently 29%)
 - Reach the ISGC target of 40% for female awards

- Fellowships and scholarships
 - Provide scholarships and fellowships to students at ISGC academic institutions.
 - Increase the number of applicants for fellowships/scholarships to 140 in 2011
 - Ninety percent of scholarship recipients will enter graduate school or STEM employment at their "next educational step" (66% employment specifically at NASA, aerospace companies, universities or other educational institutions)

- Undergraduate research programs/assistantships in aerospace engineering and science
 - Increase the number of research opportunities for undergraduates by 50% in 2010
 - There will be six undergraduate research programs at ISGC academic institutions
 - Ninety percent of undergraduate research program participants will enter graduate school or STEM employment at their "next educational step" (66% employment specifically at NASA, aerospace companies, universities or other educational institutions).

- Seed grants
 - At least two out of the ten awardees will receive additional research funding
 - At least four of the grants will be awarded to women or underrepresented minorities
 - A community college will be involved with at least one of the seed grants
- External internships/Academies
 - At least three NASA Center summer interns from ISGC academic institutions will be supported during summer 2012
 - Will establish internship opportunities at *each* of its industrial/national lab partners
 - Number of internship programs at industrial/national laboratory partners will increase by 50%
 - Three students from ISGC institutions will be funded to attend the hands-on Connecticut Space Grant Helicopter Experience
- Educational activities outside of classroom
 - Support for at least five projects in a variety of areas: aeronautics, rocketry, and spacecraft
 - Students from Chicago-area community colleges will be recruited to apply for at least one of the projects
- Higher education STEM courses
 - Support at least four course development activities that expand the STEM knowledge
 - Support at least two new or revised course that incorporates hands-on activities
 - Support the development of a Systems Engineering curriculum
 - Two aerospace-related systems engineering courses will be developed and offered
- Teacher training
 - Offer standards-based teacher training in geographically diverse areas of the consortium
- Informal education
 - Offer two informal education programs in both Chicago and Rockford that will reach at least 100,000 individuals
 - At least one informal education program will focus on rural Illinois communities
 - At least one informal education program will involve collaboration with a community college

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

- Outcome 1: ISGC exceeded its target percentages for both the participation of women and increased the participation of underrepresented minorities to the new target level

in ISGC Scholarship/Fellowship, Research Infrastructure and Higher Education programs. Females – 42%; minorities – 29%.

- Outcome 1: ISGC continues to participate in the Great Midwestern Region Space Grant rocket competition. Four undergraduate student teams from UIUC will participate in the competition on April 26-27, 2013
- Outcome 2: Seven more middle-school STEM teachers from the Chicago Public Schools have completed their Master of Science in Science Education degree at DePaul.

PROGRAM ACCOMPLISHMENTS

- *Diversity in Fellowship/Scholarship, Research Infrastructure and Higher Education program areas*
 - Direct participation by underrepresented minority students was 29%, reaching the target of 29%.
 - Direct participation by females was 42%, exceeding the target of 40%.
- *Fellowships and scholarships*
 - Applications were received from all active academic affiliates in ISGC.
 - Received 97 fellowship and scholarship applications, making the selection process very competitive. This is short of our 2010 goal, but the number of opportunities was reduced due to less funding available in 2012.
- *Undergraduate research programs/assistantships in aerospace engineering and science*
 - Support was given to (7) undergraduate research programs at (6) ISGC academic institutions; one of the programs was targeted at underrepresented minority students.
 - One of the female students was competitively selected to present a research poster at UIUC's 2013 Undergraduate Research Symposium to be held at the end of April.
 - 21 papers (4 published; 7 presented) resulted from projects related to undergraduate research programs
 - One patent was applied for based on research supported by ISGC.
 - Nine proposals, totaling \$2.26M were submitted. Four were funded so far at an amount of \$662K.
- *Seed grants*
 - Four seed grants were awarded to junior faculty/researchers.
 - Three proposals based on the ISGC seed grant work have been submitted (\$237K). So far, one has been funded (\$32K).
 - Three of the four grants were awarded to women or underrepresented minorities.
- *External internships/Academies*
 - Three students from ISGC academic institutions were supported to attend NASA Center Academies/internships (Goddard, Marshall and Ames). One of the students was female. Another female student selected by a NASA Center did not accept the offer.

- *Educational activities outside of classroom*
 - Supported (5) hands-on projects: design/build fly remote control aircraft at UIUC; CubeSat at UIUC; USLI rocket team; NASA Lunabotics Mining Competition team and (4) teams to participate in Great Midwestern Regional Rocket Competition organized by the Wisconsin Space Grant.
 - Provided support for two Latino students to attend the Fall 2012 Society of Hispanic Professional Engineers national conference.
- *Higher education STEM courses/curricula*
 - CSU is developing a set of interactive online curriculum modules, which will be used locally and nationally by introductory astronomy and cosmology instructors. The technology being developed by CSU and by the publisher will serve as a model for transforming introductory science courses from primarily lecture- and book-based to a more engaging format.

Outcome 2:

- *Teacher training*
 - ISGC continues its support of DePaul's Master of Science in Science Education (MSSE) degree program for Chicago Public School middle-school teachers. 14 teachers took enough courses to complete the science-content course requirement for an endorsement to teach middle school science. Seven teachers have completed their master's degrees.
 - The Discovery Center Museum in Rockford offered three teacher workshops; two were 4-day workshops and one was a 2-day workshop. A total of 62, K-12 teachers attended the three workshops. The workshops trained teachers on astronomy and rocketry, including activities to be used in the classroom and in afterschool programs.
 - 64 teachers participated in Discovery Center Museum's "Weather, Rocketry and STEM Teacher Workshops" in 2012. The Rockford Public School District (Rockford is the second largest city in Illinois) and Boone/Winnebago Regional Office of Education participate in this program.

Outcome 3:

- *Informal education*
 - Four informal education programs were funded with ISGC 2012 base grant funds.
 - In 2011, ISGC funding led to a 38% increase in participants in the Astronomy Conversations program at Adler Planetarium (more than 35,000 attendees total.) With funding in 2012, the number of participants again increased (40,000).
 - One undergraduate student and fifteen YES volunteers, age 12-18, gained valuable experience learning about STEM topics, especially aerospace related subjects, as they were taught how to lead activities and demonstrate exhibits. They also learned how to engage visitors, developing confidence and public speaking skills in the process. The YES volunteers applied this knowledge with visitors at community venues with the Outreach to Space exhibits, as well as in

- the museum environment where they conducted science cart activities with the public, reaching more than 51,000 people.
- Discover Engineering (a celebration of National Engineers Week) introduced and excited children about the world of engineering. Various opportunities in the field of engineering were showcased by 20 different organizations, including UTC Aerospace Systems, Rock Valley College (a community college) and the public library in Rockford . New this year and an instant favorite was the Universal Hovercraft booth where children could ride in a hovercraft. They also made a simulated miniature hovercraft to take home. A total of 1,245 people attended including 95 Boy Scouts and 12 Girl Scouts who participated in breakout sessions to earn various engineering related badges.
 - The Bradley University Chemistry Club received ISGC funding for the first time. Three faculty members and 26 students visit schools in the Peoria area (with predominantly minority student populations.) Through demonstrations, hands-on activities and resource handouts, Bradley students introduced elementary students to chemistry and physics principles related to space,

PROGRAM CONTRIBUTIONS TO NASA EDUCATION PERFORMANCE MEASURES

- **Student Data and Longitudinal Tracking:** Total awards = 86; Fellowship/Scholarship = 39; Research Infrastructure (undergrad research programs and seed grants) = 42; Higher Education = 5. Of the students funded with 2012 base grant funds, 90% are still enrolled in current degree programs.
- **Minority-Serving Institution Collaborations:** Chicago State University continues to be an active member of ISGC. In 2012, participation focused on two research seed grants (including the participation of undergraduate researchers), a higher education project to develop a cosmology curriculum and scholarships.
- **NASA Education Priorities:**
 - *Hands-on student experiences* – ISGC supported 42 students in seven undergraduate research programs and four research seed grants. Four ISGC students were selected for NASA intern/Academy research experiences; one declined the award. ISGC funded five extracurricular projects at UIUC; design-build-fly radio-controlled aircraft, CubeSat, four teams in the Great Midwestern Region Space Grant rocket competition, a team participating in NASA’s Lunabotics competition and a team participating in the USLI rocket competition.
 - *Diversity of institutions, faculty, and student participants* – Eleven of our 12 consortium institutions are actively involved in ISGC. This group includes urban and rural institutions scattered throughout the state. 31 faculty and post-docs participated in the university-level programs. Of the 31, there were 7 women and 1 minority. Direct participation by underrepresented minority students was 29%, reaching the target of 29%. Direct participation by female students was 42%, exceeding the target of 40%.
 - *Middle school teacher training* – Two teacher programs were funded with base grant funds. The Discovery Center Museum programs involved a series of

workshops that included middle school teachers. The program provided training to teachers on weather, astronomy and rocketry, including activities to be used in the classroom and in afterschool programs. The second program ISGC continued to support was the Master of Science of Science Education (MSSE) degree at DePaul. MSSE includes both traditional coursework as well as NASA materials that will be used in the classroom.

- *Community colleges* - Chicago State University continues to work with Harold Washington College (one of the City Colleges of Chicago) in astronomy education research. The Discovery Center Museum works with Rock Valley College during its Discover Engineering program.
- *Aeronautics research* –Two undergraduate research projects at UIUC were aeronautics-related: “Investigation of Ice Accretion Effects on a Three-Dimensional Swept Wing” and “Development of Micro Aerial Vehicles”. Four research projects in the Fluid Dynamics Research Center at IIT were aeronautics-related: “Investigation of Turbulence Through an Urban Environment in an Atmospheric-type Boundary Layer”, “Extended Kalman Filtering for Improved Fluidic-Oscillator Performance”, “Experiments & Computations in Duct Flows to Enhance Our Understanding Contribute to Improving Turbulence Modeling” and “Computations & Experiments of Oil Droplets for Enhanced Accuracy of Oil Film Interferometry for Wall-Shear Measurements.”
- *Research support for early career faculty* – ISGC continued to strongly support its research seed grant program for early career faculty and researchers at smaller institutions. Four faculty were selected for base grant funding. Each selected researcher receives \$10,000 to conduct research in areas of interest to NASA and gather data that will lead to a proposal(s) for further funding.

IMPROVEMENTS MADE IN THE PAST YEAR

- ISGC exceeded its target percentages for both the participation of women and the participation of underrepresented minorities in ISGC Scholarship/Fellowship, Research Infrastructure and Higher Education programs. Females – 42%; minorities – 29%.
- In spite of a 27% decrease in funding, ISGC was able to support high-quality STEM programs at the higher education, pre-college and informal education levels through careful resource allocation.

PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

University of Illinois at Urbana-Champaign
PhD-granting research university
Lead institution for ISGC
Public, land-grant institution

ISGC activities: management; undergraduate research; scholarships and fellowships; seed grants; course development; design/build/fly student projects

Illinois Institute of Technology

PhD-granting research university

Private university

ISGC activities: undergraduate research; scholarships and fellowships; seed grants; course development

Northwestern University

PhD-granting research university

Private university

ISGC activities: undergraduate research; scholarships and fellowships; seed grants; course development, teacher training

The University of Chicago

PhD granting research university

Private university

ISGC activities: undergraduate research; scholarships and fellowships; seed grants;

Southern Illinois University Edwardsville

Master's-granting university (professional degrees in medical fields)

Public institution

ISGC activities: seed grants; scholarships and fellowships; course development

University of Illinois at Chicago

PhD granting research university

Public institution

ISGC activities: undergraduate research; scholarships and fellowships; seed grants

DePaul University, Chicago

Master's granting university

Private institution

Eighth-largest private, not-for-profit university in the nation

ISGC activities: scholarships; K-12 teacher training; undergraduate research; seed grants

Bradley University, Peoria

Master's granting university (one PhD program)

Private Institution

ISGC activities: scholarships; seed grants; K-12 teacher training

Chicago State University, Chicago

Master's granting university

Public institution

Recognized as a Minority Serving Institution

ISGC activities: undergraduate research; scholarships; seed grants; course development

Western Illinois University, Macomb (will focus on reactivation in 2012)

Master's granting university

Public institution

ISGC activities: K-12 teacher training; scholarships

Adler Planetarium & Astronomy Museum, Chicago

Planetarium, education and research institution

Not-for-profit

ISGC activities: seed grants; K-12 teacher training; higher education programs; informal education programs

Discovery Center Museum, Rockford

Educational and recreational institution

Not-for-profit

ISGC activities: K-12 teacher training; informal education programs

The National Space Grant Office requires two annual reports, this Annual Performance Data Report (APD) and the Office of Education Performance Measurement System (OEPM) report. The former is primarily narrative and the latter data intensive. Because the reporting timeline cycles are different, data in the two reports may not necessarily agree at the time of report submission. OEPM data are used for official reporting.