

Iowa Space Grant Consortium
University of Northern Iowa
Professor Ramanathan Sugumaran, Director
319-273-3816
URL: www.iaspacegrant.org
Grant Number: NNX10AK63H

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 Iowa Space Grant Consortium is a Designated Consortium funded at a level of \$575,000 for fiscal year 2011.

PROGRAM GOALS

The ISGC's goal is to promote opportunities in the Science, Technology, Engineering and Math (STEM) disciplines in pursuits aligned with NASA's mission, through stimulating research, education, and outreach programs for all Iowans. Based on the comments from the ISGC twenty-year review, PY21 (FY2010) and 22 (FY2011) proposal review, NASA's new strategic plan, and Iowa's priorities, the following areas are being given special emphasis for the this five-year period from April 2010 through May 2015: 1) Promote and support applied research activities within ISGC affiliates, 2) Enhance connectivity to NASA centers and scientists, 3) Encourage ISGC participation particularly from industry and two-year colleges, and 4) Elevate the impact of the ISGC in Iowa. For PY22 (FY2011), several new initiatives were started and the following sections provide progress made as of March 30, 2012.

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

Goal 1: Continue to implement a competitive fellowship and scholarship program statewide that aligns with the higher education program at each academic affiliate, is effective at retaining students in STEM fields, and meets all of NASA's requirements.

Goal 2: Continue to implement a scholarship program for outstanding precollege seniors at the State Science and Technology Fair of Iowa (SSTFI) that has a positive impact on the retention of students in STEM-related fields.

Goal 3: Implement a scholarship program for a Minority Serving Institution (MSI) that is linked with the base program at one or more academic affiliates. (This goal has been revised

from our five year FY2010 proposal. Our MSI initiative has been moved to Precollege, see revision of Goal 10 below.)

Goal 4: Continue the development of competitive, self-sustaining base programs at each academic affiliate campus that combines active research with student involvement.

Goal 5: Continue to develop the previously selected interdisciplinary research projects and new infrastructure research projects amended to include early career faculty to receive sustained ISGC funding and build a sustainable capability in the state with the capability to support NASA's mission.

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

Goal 6: Engage more precollege organizations in the statewide Partner Schools program.

Goal 7: To ensure sustained Iowa representation in the National Junior Academy of Science program.

Goal 8: To conduct statewide STEM professional development, preservice and in-service training for formal and non-formal educators working in kindergarten through 12th grades that use NASA content

Goal 9: Effectively manage the State Science and Technology Fair of Iowa (SSTFI).

Goal 10 (new): Promote and provide hands-on, NASA-related activities to minority and underserved students and to schools for the disabled in Iowa.

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 11 (revised from #10 in FY2010 grant): Support STEM informal education programs that enhance public awareness of NASA missions and general scientific literacy for Iowa.

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

This section provides some anecdotal examples of how we are contributing to Outcomes 1 and 2.

Goal 1, 4, and 5: Engagement in research develops new scientists necessary for our future. The higher education fellowship/scholarship program provides the opportunity for students to work with researchers focused on NASA-related questions and problems. ISGC Base programs and Research Infrastructure programs on each affiliate campus provide a strong NASA presence. Selections of new base and infrastructure programs develop a cadre of faculty working in NASA related issue. Graduated programs continue to work with students and maintain NASA related research programs.

"After receiving this scholarship, I finally was able to understand the phrase, "The sky is the limit". I would have never imagined in my wildest dreams that I would one day be able to say that at the age of 19, I was able to conduct research for a NASA affiliate. This scholarship motivated me to strive for goals that seemed unattainable. I was given the opportunity to present my research to a class full of graduate students. I gained a new interest in the whole space program. I gained insight on the Carbon budget cycle, which I was unaware before given the opportunity to conduct research on it. This scholarship has enhanced my knowledge and has given me experience of working in the field and labs." -- Megan Osayande, undergraduate recipient, University of Iowa

“This support has made an important difference to my research pursuits. It took a lot of effort and many years of initiating collaborations in order to reach this point in my relationship with my NASA collaborations, but I now feel like I am making an important contribution and better understand the inner workings of NASA. I look forward to continuing to make significant progress in my research!” -- Sarah Vigmostad, ISGC supported faculty, Early Career Research Infrastructure Program, UI

“The Asteroid Deflection Research Center, which has been supported by the ISGC during the past four years, has achieved its initial milestone of becoming an internationally prominent research group for developing planetary defense technologies. The ADRC has received a new base program award from the ISGC to join NASA’s new endeavor for robotic and human space exploration of asteroids. The various Near Earth Object-related research projects of the ADRC, funded by ISGC and NASA, has been featured as a cover story of The Des Moines Register in January 2012” -- Bong Wie, ISGC supported faculty, ISU

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

Precollege Education

Goal 6 and 8 are both served by the ISGC Partner School program. The requirement of partners to conduct NASA professional development for colleagues in Iowa addresses Goal 8 and increases ISGC’s professional development reach and scope. ISGC Partner School program continues to support Iowa teachers through connections with NASA professionals, educational materials, and inspiration. Ten Iowa teachers were selected through a competitive application process to travel to Space Exploration Educators Conference (SEEC) held at Space Center Houston and Johnson Space Center on February 2-4, 2012. Teacher’s evaluation of the experience was very positive and many have already begun to conduct professional development and in-service programming upon their return as required in the partner agreement (each will conduct two professional development/in-service sessions annually to share NASA Education).

ISGC’s precollege program also hosted a special reception in connection with the Iowa Science Teachers Fall Conference to address Goal 6 and 8 with attendees from Iowa government divisions, regional education centers, school districts, and informal education providers. Attendees came with a preconception that ISGC would be going away. The misconceptions that were voiced at the session and in the ISGC workshop at the conference stem from the media stories about the cessation of the Moon, Mars, and Beyond program and conflating this with the entire NASA mission. The NASA Mission was shared with teachers to counter these conceptions and all ongoing NASA Missions were highlighted to emphasize the continuing STEM work occurring at NASA.

In support of Goal 7, ISGC is working with the Iowa Junior Academy of Science to support the student’s work. This includes supporting the students whose research is identified as the top work at the Iowa Academy of Science spring meeting attending the AAAS/American Junior Academy of Science.

Under Goal 9, the SSTFI was held and the senior students were surveyed. The ISGC awards offered were identified as a significant reason for the seniors to continue fair participation and staying involved in STEM.

ISGC is working with South Tama, Council Bluffs, and Des Moines School Districts to address Goal 10. These Partner School districts have high numbers of underserved and minority students.

“My overall impression of the Conference was that it provided us with essential curriculum for the Girls Science Club and that was the goal. The conference was full of group exercises and even the responsibilities of both the people working in Mission Control, and the Astronauts themselves. I feel I now have a more clear understanding of the subject of space thanks to the conference and I would gladly participate again.”

-- Nicole Matthews, teacher at South Tama School district that with Amy Wyatt run an underserved STEM club for middle school girls including Native American girls from the nearby tribal settlement. Wyatt commented, *“I couldn’t wait to get back to school and share the experiments and information I learned at the conference with my middle school girls science club.”* Amy Wyatt of Toledo, Iowa stated. *“I love the fact that I can take back what I learned and share it with the girls. Encouraging them to satisfy their curiosity in science in one of the most important goals that I have.”* Another participant added *“I am so excited about the subject after this week. Now armed with all this wonderful information I can’t wait to get back and share with my students.”*

Christy Boldt and Barbara Schmid, Partners from Council Bluffs returned from SEEC and hosted an engineering workshop for district families (Schmid teaches 1st grade, Boldt is an enrichment strategist). The workshop was NASA themed and included many activities and even had a fifth grader that designed a space video game. Longfellow principal Peg Shea said the approach used by Boldt and Schmid seems to get the message across to students.

“They get the kids excited about math and science,” Shea said. *“It piques their interest, and the kids are checking out books about space and planets.”*

Thersa Wadle, an engineer that became a teacher in a second career teaches *Project Lead the Way* classes at Winterset commented following the workshop,

“Wow, still wonderfully overwhelmed with the fabulous SEEC conference. I am working to get to the June two-day training about "socializing STEM". This fits so well with the Iowa emphasis on ethics, connected-ness, character, etc. in the schools. Have you done any other work with counselors and STEM? I would love to have your input regarding aspects of the counselor's role. Obviously, career, but beyond that.”

She really gained a new insight into the collaborative process and how it is critical for education as in engineering.

Amy Jacobson and Nick Lenk teach at Lincoln High School in Des Moines, an urban school. They returned to Des Moines and have hosted a NASA lunch seminar and shared their NASA education experience with colleagues. After the lunch session they then hosted two professional development sessions for district colleagues about NASA Education opportunities and learning experiences.

***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 11: Informal Education

ISGC works with affiliates that serve informal education to enhance public awareness and improve scientific literacy for Iowans through the support of STEM programming that serves the NASA Mission. Support of three informal projects for the current year include: The Grout Museum District (GMD) is using funds awarded by the ISGC to provide staffing needs, and materials for the "Museum in a School, High Altitude Ballooning" a new outreach program; the Science Center of Iowa's project, "Unique Programming Highlighting NASA Space Exploration - Past, Present and Future"; and The Putnam Museums project in support of the Figge Art Museum's display NASA; Art: 50 Years of Exploration.

The Grout reports, "Our project is currently in week 3 of the 6 week classes. In these classes, students have designed an experiment to travel to near space via a HAB, completed an electrical circuit and have been introduced to the elements of weather. Our proposal included reaching out to serve 300 students, that has grown at the request of the school and we are serving an average of 800 students each week. The "Museum in a School, High Altitude Ballooning" is an excellent partnership with the Waterloo Community School District because the 8th grade students are starting a Weather Unit at the same time. Plans are being discussed to continue this program in future years and adding it to the 8th grade curriculum."

The Putnam Museum will offer a special public event highlighting the excitement of space exploration in recent decades to support the Figge Art Museum's display. The event will feature a speaker to talk about the intersection of STEM and art and provide materials for the support the event and create publicity to ensure the Figge's event is widely publicized and therefore well attended.

The Science Center of Iowa (SCI) project staff completed the concept and final design phases for the Facing Mars and the NASA Shuttle Legacy exhibits. The final plans include all designs for the layout of the exhibits, descriptions of all new programming, and detailed plans for the installation of both exhibits scheduled for public opening on June 2, 2012. SCI hosted three star or solar viewing events through the winter and developed a schedule for monthly star parties through the balance of the year. A family telescope workshop was presented in October 2011 at a family member night event. The workshop was quickly booked to capacity, so additional staff were added to handle a total of 42 participants. The team also planned a Mars Science Laboratory, Curiosity Rover mission launch event for November 25th, 2011 though the launch was pushed back to the next day an hour before the facility was open to the public. Staff shared programs and the video of the launch throughout the day. The Summer Camp program included 18 camps specifically about space science and/or astronomy with a few already booked to capacity.

PROGRAM ACCOMPLISHMENTS:

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

Goal 1: Continue to implement a competitive fellowship and scholarship program statewide that aligns with the higher education program at each academic affiliate, is effective at retaining students in STEM fields, and meets all of NASA's requirements.

SMART Objectives

Objective 1a. 10.8% (2007 data tables) of awardees will be from underrepresented minority students and 50% of awardees will be female.

Results: There were 23 undergraduate scholarships, 1 graduate fellowship awarded; 12.5% (3/24) of awardees were underrepresented students and 54.2% (13/24) were female. As of March 2012, the new ISGC objective will align with the NASA objective; 17.1% (2009 data tables) of awards will be underrepresented minorities and 40% of awards will be female.

In FY2011 there were 44 funded and unfunded student participants; 15.9% (7/44) were underrepresented, and 40.9% (18/44) were women. To reach more students, ISGC sent announcements of opportunities to all of the minority and financial aid offices at our academic affiliates. The ISGC Director also personally contacted these offices to advise them of our student opportunities.

Objective 1b. 100% of awardees will actively participate in base programs or other ISGC-supported faculty on their respective campus.

Results: 100% of fellowship and scholarship awardees actively participated in research on their campus. Each awardee enrolled in an independent or research class at their institutions. In FY2011, ISGC:

- Successfully competed and awarded 23 undergraduate student scholarships and one graduate student fellowship from our four academic affiliates, all higher education institutions.
- Identified and funded two community college scholarships to attract and retain students in STEM fields.
- Placed two undergraduate students in internships at academic affiliates' research labs.

Objective 1c. Awardee retention in STEM exceeds STEM retention in their higher institutions.

Results: Of the FY2006-FY2010 awardees (36) in our tracking system, 91.7% (33/36) remain in STEM. Three of the 36 have reached the next step in non-STEM fields (employment and academic degree track).

Goal 2: Continue to implement a scholarship program for outstanding precollege seniors at the State Science and Technology Fair of Iowa (SSTFI) that has a positive impact on the retention of students in STEM-related fields.

SMART Objectives

Objective 2a. All senior entrants are aware of ISGC awards.

Results: The top research projects were selected at the SSTFI. Student researchers were offered scholarships to attend college at the ISGC academic affiliates. The scholarships incentivize the student involvement through their senior year in science fair research. Of the 16 senior participants, seven were females. Eight of the 16 were eligible for the award. Eligibility requires academic affiliate enrollment in a STEM discipline. Six responded to our survey, with four being aware of our award (67%).

Objective 2b. Awardee retention in STEM exceeds STEM retention of general student population in their post-secondary institution.

Results: All four students currently being tracked are still in STEM-related education disciplines.

Objective 2c. Majority of awards will go to students who participated in SSTFI in prior years.

Results: Awardees have participated in the SSTFI for two to six years.

Goal 3: This goal has been revised from our five-year FY2010 grant. Our MSI initiative has been moved to Precollege, see revision of Goal 10 below. Originally stated: Implement a scholarship program for a Minority Serving Institution (MSI) that is linked with the base program at one or more academic affiliates.

Goal 4: Continue the development of competitive, self-sustaining base programs at each academic affiliate campus that combines active research with student involvement.

SMART Objectives

Objective 4a. Each base program will produce publications, non-ISGC grant proposals.

Results: The base programs produced 30 publications. The base programs also produced and secured non-ISGC grant proposals of more than \$500,000.

Objective 4b. Each base program will develop a NASA collaboration prior to its establishment.

Results: Each base program developed a NASA collaboration that did not exist prior to the establishment of the base program.

- Drake University's new base program in FY2011 titled, "Effects of Low Gravity Environments on Host-Pathogen Interactions", started a collaboration with Johnson Space Center. Dr. Duane Pierson came to Drake's campus in December 2011 to discuss research, tour facilities, and present his work in low gravity environments in a seminar.
- Iowa State University's new base program in FY 2011 "Space Technology Research for Robotic and Human Exploration of Near-Earth Objects" has a new collaboration with Goddard Space Flight Center.
- The University of Iowa's base program developed a collaboration with Dr. Jim Collatz, Goddard Space Flight Center.
- The University of Northern Iowa's base program developed a collaboration with researchers at Goddard.

Objective 4c. Each base program will generate non-federal cash or in-kind match equal to NASA funding.

Results: Each base program generated non-federal cash or in-kind match equal to or greater than NASA funding.

Objective 4d. All students receiving funds will be U.S. citizens.

Results: All students funded were U.S. citizens.

Objective 4e. Competitions will be conducted to select new base programs on a three-year cycle.

Results: New base program competitions were conducted for the University of Iowa and University of Northern Iowa in FY2011 and will begin in FY2012. Drake University base program led by Dr. Marc Busch and Iowa State University base programs led by Dr. Bong Wie were in their first year for FY2011. Dr. Busch is early in his university career.

FY2011 was the final year for The University of Iowa's base program titled "Iowa's Multiscale Carbon and Nitrogen Studies". The University of Iowa base program competition was completed in April 2012. In FY2012, the University of Iowa's new base program will be led by Dr. Bernd Fritzsche and titled "Understanding gravity sensing defects through targeted ear manipulations".

In FY2011, the "Enhancing Remote Sensing Education in Iowa" base program at the University of Northern Iowa graduates. A new base program competition was completed in April 2012. In FY2012, the University of Northern Iowa's new base program will be led by Dr. John Ophus titled "High-altitude ballooning for enhancing STEM learning among undergraduate, preservice teachers in science and geography/social science".

New to FY2011: curriculum development to build research skills in undergraduate students. Two new curriculum development grants were funded to develop and implement a project-based research course at Drake University and University of Northern Iowa. Research based courses provide hands-on learning and develop critical thinking and problem solving skills. Drake University has engaged in a real research project involving the yeast two-hybrid (Y2H) system, 13 students are gaining technical skills in molecular and microbial genetics (e.g., gel electrophoresis, cloning, PCR, sequence analysis, yeast genetics). The University of Northern Iowa project focus is on Earth's climate.

Goal 5: Continue to develop the previously selected interdisciplinary research projects and new infrastructure research projects amended to include early career faculty to receive sustained ISGC funding and build a sustainable capability in the state with the capability to support NASA's mission.

SMART Objectives

Objective 5a. Research Infrastructure Programs will produce publications and non-ISGC grant proposals each year.

Results: There are three Research Infrastructure Programs funded by ISGC. Two of the three infrastructure projects are early career awards. All of the programs produced publications and non-ISGC grant proposals. More than 22 faculty, post-docs, graduate and undergraduate student members have been involved in research infrastructure activities at different academic affiliates.

- Dr. Bong Wie was awarded a NASA Advanced Innovative Concepts Phase 1 from NASA Office of the Chief Technologist for \$100,000. It was selected as one of 30 projects out of 700 proposals submitted to the OCT. A \$500,000 Phase 2 proposal is being prepared for a submission to NASA this summer.

- Dr. Zhiyou Wen from Iowa State University is in the second year of an early career program award. Dr. Wen received a \$215,000 grant to advance research in algal culture development for biofuel production.
- Dr. Sarah Vigmostad from the University of Iowa was chosen to receive an early career program award based on a successful statewide competition. Her research topic is entitled “*Development of realistic computational models of the spaceflight effects on human physiology.*”

Objective 5b. Research Infrastructure Programs will develop a NASA collaboration that did not exist before the ISGC research program was established.

Results: The Research Infrastructure Programs have developed NASA collaborations as well as collaborations with researchers from other national laboratories, academic institutions, and industry.

- Dr. Bong Wie collaborates with Bruce Campbell and Brent Barbee, Goddard Space Flight Center, Dr. Roberto Furfaro from the University of Arizona and Dr. David Dearborn of the Lawrence Livermore National Laboratory.
- Dr. Zhiyou Wen has established a strong collaboration with the NASA scientist, Dr. Tiffany Moisan, at NASA Goddard Space Flight Center (Wallops Island, VA) in several projects related with the algal wastewater treatment and biofuel production in the past years. Dr. Wen and students also visited NASA Goddard Space Flight Center to share research interests with Dr. Moisan.
- Dr. Sarah Vigmostad developed collaborations at Johnson Space Center with researchers, Steven Platts and David Martin, and at Glenn Research Center with researcher, Jerry Myers.

Objective 5c. Research Infrastructure Programs will generate non-federal cash or in-kind match to the NASA funding provided.

Results. All of the Research Infrastructure programs generated non-federal cash or in-kind match equal to or greater than NASA funding provided.

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

Goal 6: Engage more precollege organizations in the statewide Partner Schools program.

SMART Objectives

Objective 6a. Partner schools will actively use NASA content and ISGC professional development services beyond the first year of participation.

Results: Survey to be completed by school year-end to determine those still active from a total of 82 teachers who have participated over the past seven years.

Objective 6b. Former NASA Explorer Schools will continue to participate as ISGC Partner Schools beyond their term as an Explorer School.

Results: Survey to be completed by school year-end to determine those still active.

Objective 6c. The majority of Partner School trained teachers will offer at least two professional development programs in the first year and at least one in subsequent years.

Results: Survey to be completed by school year-end to determine how many programs have been held.

Goal 7: To ensure sustained Iowa representation in the National Junior Academy of Science program.

SMART Objectives

Objective 7a. The majority of Iowa Junior Academy of Science senior entrants will be aware of ISGC support for the national competition.

Results: All IJAS members in the IJAS Competition (and their teachers) are exposed to information about ISGC through the IJAS Wiki-Handbook, in the Annual Meeting Program, and at the IJAS Award Luncheon.

Objective 7b. The Iowa Junior Academy of Science endowment will grow to sustain the national competition participation program.

Results: The endowment deposit was confirmed by the Director of the Iowa Academy of Science.

Objective 7c. The majority of Iowa Junior Academy of Sciences winners will study in STEM fields at academic affiliate institutions or other higher education institutions.

Results: The Iowa Junior Academy of Science meeting was held April 21, 2012. Data is unavailable at the time of this writing, and will be submitted in the final report.

Goal 8: To conduct statewide STEM professional development, preservice and inservice training for formal and non-formal educators working in kindergarten through 12th grades that use NASA content.

SMART Objectives

Objective 8a. All Iowa schools will be aware of the ISGC STEM professional development services available.

Results: The Iowa Dept. of Education, in cooperation with ISGC, communicates regularly with all school districts to inform them of sponsored professional development opportunities.

- The ISGC precollege program conducted short-term (single day) workshops for 776 teachers and long-term (multiple day) for 61 teachers.
- ISGC was one of the sponsors for the Iowa Academy of Science's Fall Teachers Conference held October 17-18, 2011. Approximately 400 Iowa Science Teachers attended the meeting held at Iowa State University. Of the teachers in attendance, 55 responded to the ISGC survey and all knew of NASA Education. There was a strong NASA presence at the meeting. John Weis, Marshall Space Flight Center, and Jay Staker, ISGC Associate Director of Education, presented multiple hands-on presentations including: Teaching Newton's Laws with NASA, NASA Mass vs. Weight, Touchdown! A NASA Design Challenge and Partnering with NASA for Science.
- University of Iowa researchers developed a summer workshop titled, "Inquiry approaches to Climate, Weather, and Energy in the 6-9 Classroom". Morgan Yarker - Ph.D. candidate, Science Education and Dr. Stanier, College of Engineering,

developed the workshop, which attracted 21 participants, including 19 middle school science teachers in Iowa.

- Ten ISGC Partners were identified and included school districts that have high percentages of underserved and minority students. The Partners attended the NASA education conference, Space Exploration Educators Conference in Houston. Partners will each conduct two professional development/in-services for Iowa educators.
- Mr. Jay Staker, ISGC Associate Director of Education, was recognized with a plaque for the “Friend of Science Award – Individual” for significant contributions to ISTS and/or to science education at the local, regional or statewide level. This award was presented at the Iowa Science Teaching Section fall conference on October 11-12, 2011.

Objective 8b. Significant participation from informal organizations such as science museums, clubs, and home school groups will be reached each year.

Results: Six of seven of our informal outreach affiliates actively participated in ISGC STEM professional development as well as 4-H, Scouts, and home-school groups.

Objective 8c. The ISU Extension-Science, Engineering and Technology (E-SET) staff will maintain technical proficiency by attending at least one NASA workshop.

Results: The director of E-SET attended the NASA SEEC at Space Center Houston on February 2-4, 2012.

Goal 9: Effectively manage the State Science and Technology Fair of Iowa (SSTFI).

SMART Objectives

Objective 9a. Participation in the SSTFI will increase.

Results: The 2012 science fair held March 30-31, 2012 increased to 530 students as compared to 500 students in March 2011.

Objective 9b. Home-school participation in SSTFI will increase.

Results: In FY2011, two home-schooled students participated in the SSTFI as compared to zero in FY2010.

Objective 9c. The SSTFI will establish an endowment, which will grow from earnings and sponsorships.

Results: Because of accounting changes at Iowa State University and Iowa 4-H Foundation, this endowment has been discontinued.

Goal 10 (new): Promote and provide hands-on, NASA-related activities to minority and underserved students and to schools for the disabled in Iowa.

- A new underserved and minority effort connected with South Tama School District and supported a science club. The club consists of 13 girls in grades 6-8. The club has girls from varying socioeconomic backgrounds. Three of girls are special education students. Most of the girls come from a Latino or Native American background.
- Two Drake faculty members are developing two new STEM camp curricula. The camps are designed to reach youth but include teachers (in-service and preservice) in both development and delivery as a dissemination strategy. The first camp is focused on

computer programming used for application development. The “App” camp registration filled in two days with a waiting list of 17 educators. The second camp is the wide world of science summer camp, which targets underserved and minority students.

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 11 (new - previously Goal 10 in FY2010 grant): Support STEM informal education programs that enhance public awareness of NASA missions and general scientific literacy for Iowa.

Objective 11a. Use non-federal funds to support STEM programming on Iowa Public Television that will reach at least 20,000 Iowans and that is consistent with other ISGC education objectives in that it uses NASA content and meets informal education requirements.

Results: NASA related programming is being supported by ISGC for statewide coverage.

Objective 11b. Competitively generate proposals for ISGC affiliates to conduct one or more informal education projects in Iowa.

Results: Two proposals were funded in FY2011 at the Grout Museum District and the Science Center of Iowa. ISGC has supported two projects that are ongoing at informal affiliates that target STEM and NASA educational outcomes. High altitude ballooning, and NASA exploration are the topics. These were described under Program Benefits above.

PROGRAM CONTRIBUTIONS TO PART MEASURES

- ***Student Data and Longitudinal Tracking:***

In FY2011, there were 18 “new significant” participants. Eight students received fellowship or scholarship awards in previous years (24 minus 16) and were excluded. In addition, one higher education student and one research infrastructure student participated at a significant level (\$5,000 or 160 hrs.) in an ISGC-funded program.

- Total new significant awards = 18; Fellowship/Scholarship = 16, Higher Education = 1, Research Infrastructure = 1; 3 of the total awards were to underrepresented minorities (16.7%); and 10 of the total awards were to women (55.6%).
- All FY2011 students remain enrolled in their current STEM degree programs with four graduating in the spring 2012 semester.
- Of the FY2006-FY2010 awardees (36) in our tracking system, 33 students are still enrolled in their current STEM degree program, one has graduated and is pursuing an advanced STEM degree, and one has graduated and is seeking STEM employment. One of these students is classified as an underrepresented minority, and 13 are women. Three of the 36 are in non-STEM fields (employment and academic degree track).

- ***Diversity:*** Prior to March 2012, our underrepresented participants goal was 10.8% of total awards (2007 data tables). During preparation of this report, it was discovered that the new goal is 17.1% (2009 data tables). There were 23 undergraduate scholarships, 1 graduate fellowship awarded; 12.5% (3/24) were underrepresented students and 54.2% (13/24) were

female. In FY2011, there were 44 funded and unfunded student participants; 15.9% were underrepresented, and 40.9% were women. ISGC sent announcements of opportunities to all of the minority and financial aid offices at our academic affiliates. The ISGC Director also personally contacted these offices to advise them of our student opportunities.

- ***Minority-Serving Institutions:*** There are no minority-serving institutions in Iowa. However, a new program has been initiated to promote and provide hands-on, NASA-related activities to minority and underserved students, and schools for the disabled in Iowa.
- ***NASA 2011 Education Priorities:***
 - Authentic, hands-on student experiences in science and engineering disciplines – the incorporation of active participation by students in hands-on learning or practice with experiences rooted in NASA-related STEM-focused questions and issues; the incorporation of real-life problem-solving and needs as the context for activities:
 - There were 44 funded and unfunded students working in science and engineering research rooted in NASA-related questions and issues.
 - Curriculum grants engaged 15 students in hands-on experiences.
 - Engage middle-school teachers in hands-on curriculum enhancement capabilities through exposure to NASA scientific and technical expertise. Capabilities for teachers to provide authentic, hands-on middle school student experiences in science and engineering disciplines:
 - University of Iowa researchers developed a summer workshop titled, "Inquiry approaches to Climate, Weather, and Energy in the 6-9 Classroom". Morgan Yarker - Ph.D. candidate, Science Education and Dr. Stanier, College of Engineering, developed the workshop, which attracted 21 participants, including 19 middle school science teachers in Iowa.
 - ISGC Partner School program continues to support Iowa teachers through connections with NASA professionals, educational materials, and inspiration. Ten Iowa teachers were selected through a competitive application process to travel to SEEC held at Space Center Houston and Johnson Space Center on February 2-4, 2012.
 - The Grout Museum District (GMD) is using funds awarded by the ISGC to provide staffing needs, and materials for the "Museum in a School, High Altitude Ballooning"
 - Student Spaceflight Experiments Program (SSEP) support for teachers and school districts to participate in spaceflight experiments: ISS Mission 1 and STS-135.
 - Summer opportunities for secondary students on college campuses with the objective of increased enrollment in STEM disciplines or interest in STEM careers.
 - A summer internship program began in FY2011.
 - Community Colleges---develop new relationships as well as sustain and strengthen existing institutional relationships with community colleges.
 - Two scholarships were awarded to community college students.
 - Environmental Science and Global Climate Change---research and activities to better understand Earth's environments.

- Two of the four ISGC affiliate base programs focus on environmental and global climate change research.
- Enhance the capacity of institutions to support innovative research infrastructure activities to enable early career faculty to focus their research toward NASA priorities:
 - Two early career faculty researchers were funded through the research infrastructure program.
 - One of the four ISGC affiliate base programs is led by a third-year faculty member.

IMPROVEMENTS MADE IN THE PAST YEAR

- ISGC initiated a new summer internship program for undergraduate and community college students in Iowa.
- An additional project was funded to conduct interdisciplinary research (IR) incubation project to early-career faculty at academic affiliates in fields aligned with NASA's mission.
- A new curriculum development/enhancement grant awarded for faculty to develop and/or update courses and curriculum in areas related to the mission of NASA.
- A new program was initiated to promote and provide hands-on, NASA-related activities to minority and underserved students and to schools for the disabled in Iowa.

PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

The participation of partners varies as research topics and themes vary from year-to-year. Specific involvement in the current program year is listed in italics below.

1. Aerial Services, Inc. (industry) - *new member*
2. AeroDyne Laboratories (industry) - *new member*
3. Ames Laboratory of the U.S. Department of Energy (federal lab)
4. Drake University (private four-year university) - *Executive Committee member, base program management, scholarship and fellowship selections*
5. Grout Museum District (science museum) - *Informal education competition winner*
6. Iowa Academy of Science (nonprofit organization) - *Iowa Junior Academy of Science poster competition*
7. Iowa Aviation Promotion Group (nonprofit organization) - *Informal education competition participant*
8. Iowa Department of Education (state government) - *Partner Schools program, State Science and Technology Fair of Iowa*
9. Iowa Department of Natural Resources - Iowa Geological & Water Survey (state government)
10. Iowa Department of Transportation, Office of Aviation (state government)
11. Iowa State University (public Ph.D.-granting university) - *Executive Committee member, base program management, scholarship and fellowship selections, research infrastructure project continuation, early career investigator research program, host of ISGC main office.*
12. National Lab for Agriculture & the Environment (federal lab)
13. National Mississippi River Museum & Aquarium (science museum) - *Informal education competition participant*

14. Putnam Museum & IMAX Theatre (science Museum) - *Informal education competition participant*
15. Rockwell Collins (industry)
16. Science Center of Iowa (science museum) - *Informal education competition winner*
17. Science Station (science museum) - *Informal education competition participant*
18. Softronics Limited (industry)
19. University of Iowa (public Ph.D.-granting university) - *Executive Committee member, base program management, scholarship and fellowship selections*
20. University of Northern Iowa (public master's-granting university) - *Lead institution, Executive Committee member, base program management, curriculum development project, scholarship and fellowship selection*