Iowa 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 Iowa Space Grant Consortium is a Designated Consortium funded at a level of $730,000 for fiscal year 2008.

PROGRAM GOALS

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

Fellowships and Scholarships

GOAL– Competitively award up to 23, $7,000 graduate fellowships or undergraduate scholarships to support the base programs. Emphasis is on undergraduates with demographics as specified by NASA of 8.4% minority (Department of Education). U.S. citizenship required.

GOAL– To award $17,500 in scholarships to the top three outstanding seniors at the State Science & Technology Fair of Iowa. U.S. citizenship required.

Higher Education

GOAL– Strengthen the base program at each campus

GOAL – National Space Food Competition

Research Infrastructure

GOAL– Competitively select a new interdisciplinary research project to receive sustained funding (up to three years depending upon the NASA appropriation) and build a new capability in the State with the capability to support the NASA mission.

GOAL – Provide collaborator development grants

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

Precollege

GOAL– To conduct state-wide professional development, preservice and in-service training for educators working in kindergarten through 12^{th} grades.

GOAL– To conduct state-wide Partner Schools program.

GOAL– To support the Iowa Junior Academy of Science (IJAS) program

GOAL– To provide management and leadership to the State Science and Technology Fair of Iowa (SSTFI).

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

GOAL – To continue support of aerospace, scientific and nonformal educational programs which enhance public awareness of NASA missions, scientific literacy, and appreciation for the sciences and technology.

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

Note that this is a *progress report* and as such does not represent the final benefits or outcomes for the 19th program year.

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

"Receiving this scholarship was a huge step in supporting my own education. It allowed me to attend classes without taking out a private loan for the first time in my college career. I believe it shows the support of the base program at Iowa State, and I am proud of listing it on applications for graduate fellowships. I believe it is heavily responsible for my reception of the James B. Willet Educational Memorial, and I am proud that NASA is taking an active effort to support the advancement and training of young minds in what is indeed a trying time to be a college student in America." Brian Kaplinger, undergraduate scholarship awardee, Iowa State University.

"This is my third and final year doing research with Dr. Charisse Buising at Drake University. We have spent our time there working on trauma research and running tests and protocols to gather information to further our findings. With the help of a few other doctors and veterinarians, we have tested the impact of an inhalation impedance device to try and improve the cardiac output for patients suffering from bleeding trauma. We began the research using an animal model before moving to an exercise protocol using volunteer subjects. This year, we've been working on a passive body tilt and will be analyzing the data for results once the protocol has ended. It's a lot of hard work between the scheduling and data collection, but the experience has been invaluable in learning the process of conducting research in an academic setting. The heads of the research have done a tremendous time showing us the value of our work, and the friends and bonds I have made through the work are priceless. Having the chance to conduct this kind of work is rewarding and I know future Drake students will carry it to greater heights every year." Elizabeth Litman, undergraduate scholarship awardee, Drake University

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

"Primarily engineering students from the SSCL (Spacecraft Systems and Controls Lab) performed 11 tethered balloon flights to collect spores and take near infrared photographs of an infected wheat field to study the spread of wheat rust. Because of the success of these flights, the SSCL has been invited to continue more advanced flights in the summer of 2009. Students were also involved with CySAT, which aims to build a cubesat satellite, where they built and tested a mockup satellite during the Fall 2008 semester. That mockup was then flown on a high altitude balloon in December 2008. Results from that flight are advancing our designs in the CySAT program. Recently the students obtained a donation of solar cells for the project from Dr. Twiggs at Stanford. In a third activity, students traveled to Hanksville, UT in June of 2008 and competed for the first time in the University Mars Rover Challenge. They received 4th place in the competition out of eight teams. Students have continued to work on a new rover and were awarded $1,000 from the ISGC for that project.

The Iowa Multiscale Carbon and Nitrogen (IMCANS) Base Program at the University of Iowa supported one undergraduate student, two graduate students and one post-doc during this period. PI Stanier and co-PI Carmichael received a $900,000 EPA grant that involves assimilation of particulate measurements from NASA satellites, similar to the assimilation of gas measurements from satellites that is in the IMCANS program. Another co-PI, Papanicolaou, received some NSF funding related to this topic in Clear Creek watershed ($300K) and funding from the USDA-NRCS ($250K) for carbon sequestration studies pertinent to agriculture activities and crop rotations in the Midwest. Three refereed papers have resulted from the ongoing work of Papanicolaou. One student won the Petrik Scholarship for data analysis of CO_2 and boundary layer atmospheric properties from summer field experiment at West Branch. Another student presented measurements from the tall tower site at the fall American Geophysical Union meeting.

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).*

The Science Center of Iowa is engaging preschool through 12th grade teachers in professional development programs that enhance their ability to deliver STEM focused curriculum to their students. In September 2008, teachers from across Iowa attended SCI's annual Educator Fair and another SCI Educator Fair is

planned for Spring 2009. In October 2008, the Science Center of Iowa hosted three science focused teacher training sessions with more than 50 teachers in attendance ranging from Kindergarten through eighth grade and representing schools from across central Iowa, including Des Moines Public Schools (DMPS), Southeast Polk, Newton, Ankeny and Osceola schools, as well as West Liberty schools in eastern Iowa.

PROGRAM ACCOMPLISHMENTS

Note that this is a *progress report* and as such does not represent the final program accomplishments for the 19th program year.

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

Fellowships and Scholarships

GOAL– Competitively award up to 23, $7,000 graduate fellowships or undergraduate scholarships to support the base programs. Emphasis is on undergraduates with demographics as specified by NASA of 8.4% minority (Department of Education). U.S. citizenship required.

Metrics: Strive for student demographics that meet or exceed the demographics for Iowa as specified by NASA plus 100% placement into STEM employment after graduation.

Accomplishments: Funded a total of 29 competitive awards (23 undergraduate/6 graduate) with 7.89% to underrepresented minority students and 31.6% to women. Since tracking began for competitive awards, 98.5% have been employed in STEM after graduation or continued STEM education.

GOAL– To award $17,500 in scholarships to the top three outstanding seniors at the State Science & Technology Fair of Iowa. U.S. citizenship required.

Metrics: Increase the senior-level entries in the science fair plus 100% placement into STEM employment after graduation

Accomplishments: Funded three awards with 33% to women. The fair occurs in March and impact on the senior entries is not yet available. 85% of the awardees since tracking began remain in undergraduate STEM academic degree programs.

Higher Education

GOAL– Strengthen the base program at each campus

Metrics: Balanced student participant demographics that match the NASA-specified target listed above for scholarships and fellowships plus 100% placement into STEM employment after graduation. An increased number of collaborations and interactions with NASA Centers also indicates success.

Accomplishments: Funded 11 students. Five undergraduates, six graduates and 27.2% women. Since tracking began, 95.2% of supported students were employed in STEM or continued in STEM education.

GOAL– National Space Food Competition

Metrics: Specific metrics cannot be developed until the nature and specifics of the competition are known.

Accomplishments: Due to a loss of key personnel in the state and the inability to obtain key collaborations, this goal was abandoned.

Research Infrastructure

GOAL– Competitively select a new interdisciplinary research project to receive sustained funding (up to three years depending upon the NASA appropriation) and build a new capability in the State with the capability to support the NASA mission.

Metrics: A positive number of new NASA collaborations attempted and developed indicates a successful project.

Accomplishments: This competition was conducted and a new research program began 1 January 2009 entitled, "Development of Integrated System Architectures and Innovative Technologies for Near-Earth Object Surveys and Threat Mitigation".

GOAL – Provide collaborator development grants

Metrics: A positive number of new NASA collaborations attempted and developed indicates a successful program.

Accomplishments: These funds have been used primarily to support higher education competitive teams. This year three teams were supported: a high powered rocket and payload design competition at the University of Iowa, a mars rover competition at Iowa State University and a rocket design and launch competition at Iowa State University. In the future, these funds will be re-assigned to the Higher Education category.

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

Precollege

GOAL – To conduct state-wide professional development, preservice and in-service training for educators working in kindergarten through 12th grades.

Metrics: A statistically significant number of students and teachers impacted will indicate success.

Accomplishments: Conducted statewide professional development, preservice and in-service training for ISGC program year 19. The ISGC has also done independent in-service trainings for schools and partnering groups such as area education agencies. Professional development was also provided for the statewide home-school association coordinators to familiarize them with ISGC educational support, curriculum, and science pedagogy. ISGC continues providing preservice/in-service teacher professional development in cooperation with NASA centers.

Trainings conducted to date – 33; Teachers reached – 691 (Preservice and in-service). This represents 16.9% of the 4084 assigned science teachers in Iowa.

GOAL – To conduct state-wide Partner Schools program.

Metrics: A statistically significant number of students and teachers impacted will indicate success. In addition, ISGC Partner Schools will provide written annual reports including an assessment of classroom impact for students and professional development impact for their colleagues.

Accomplishments: The ISGC Partner School Program continued in program year 19 with a workshop at Kennedy Space Center held in July 2008. The workshop was held in partnership with Space Education Initiatives Inc. and included teachers from Wisconsin, Oklahoma, and Iowa as well as participants sponsored by the Civil Air Patrol. Partner School workshops are also scheduled for Marshall Space Flight Center and Johnson Space Center (Space Center Houston sponsored Space Exploration Educator's Conference). Also new this year is the ISGC Partner School Academy. The Academy is an online delivery of professional development for teachers and class-to-class connections to promote science learning through students sharing and discussing ideas.

Current Partner School districts – 22; ISGC Partner Teachers – 57 trained or scheduled for training. This represents 6% of the 364 Iowa school districts.

GOAL – To support the Iowa Junior Academy of Science (IJAS) program

Metrics: An increased balance in the IJAS endowment such that the program may eventually achieve self-funding sustainability.

Accomplishments: Sent two high school students to the American Junior Academy of Science meeting in Chicago. The two students were selected based upon their poster contest results from research projects conducted in 2008. 38 students competed for the chance to compete nationally. This represents participation from 31 mostly rural high schools across Iowa. The endowment to provide sustained support for the IJAS doubled to more than $12,000.

GOAL – To provide management and leadership to the State Science and Technology Fair of Iowa (SSTFI).

Metrics: An increasing number of students and teachers impacted will indicate success.

Accomplishments: The SSTFI will be held in March.

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

GOAL – To continue support of aerospace, scientific and nonformal educational programs which enhance

public awareness of NASA missions, scientific literacy, and appreciation for the sciences and technology.
Metrics: Maintain support for Iowa Public Television as long as the viewership for the ISGC-sponsored programs remains at about 20,000 people per NOVA program. Track the impact of the other activities by patron demographics.
Accomplishments: Non-federal matching funds were used to sponsor several NOVA programs and other science-related programs to promote scientific literacy of the general public. Two competitively selected awards were provided to outreach affiliates in the state for informal education activities: "Rivers to the Sea" at the National Mississippi River Museum and Aquarium and "New STEM Focused Robotics and Engineering Programming" at the Science Center of Iowa.

PROGRAM CONTRIBUTIONS TO PART MEASURES

- Longitudinal Tracking: Total awards = 40; Fellowship/Scholarship = 29, Higher Education = 11; 3 of the total awards were to underrepresented minorities; and 12 of the total awards were to women. All of the awardees remain enrolled in their current STEM degree programs.
- Course Development: No courses were developed as a result of ISGC funding
- Matching Funds: This information cannot be determined until the end of March 2009
- Minority-Serving Institutions: There are no minority-serving institutions in Iowa.

IMPROVEMENTS MADE IN THE PAST YEAR

A new research project competition was held for the first time in several years. One award was selected for $80,500 in funded research this program year for Near Earth Object (NEO) threat identification, assessment, and mitigation. The funds are matched at least dollar-for-dollar with non-federal funds. Funding is renewed for at least three years provided there is adequate progress.

PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

Note that the list of ISGC affiliates below does not mean that each affiliate is active in some specific project each year. Their participation varies as research topics and themes vary from year-to-year. Specific involvement in the current program year is listed in italics.

1. Ames Laboratory of the U.S. Department of Energy (Federal lab)
2. Drake University (Private four-year university)- *Executive Committee member, base program management, scholarship and fellowship selections, ESMD internship participants*
3. Grout Museums (Science Museum)- *Informal education competition*
4. Iowa Academy of Science (Non-profit organization)- *Iowa Junior Academy of Science poster competition*
5. Iowa Aviation Promotion Group (Non-profit organization)
6. Iowa Department of Education (State government)- *Partner Schools program, State Science and Technology Fair of Iowa*
7. Iowa Department of Natural Resources (State government)- *Research Competition*
8. Iowa Department of Transportation - Office of Aviation (State government)
9. Iowa State University (Public PhD-granting university)- *Lead institution, Executive Committee member, base program management, scholarship and fellowship selections, research competition winner*
10. National Mississippi River Museum and Aquarium (Science museum)- *Informal education competition winner*
11. National Soil Tilth Lab of the U.S. Department of Agriculture (Federal lab)- *Technical proposal reviews, research competition team member*
12. Rockwell Collins (Industry)
13. Science Center of Iowa (Science museum)- *Informal education competition winner*
14. Science Station (Science museum)- *Informal education competition*
15. Softronics Limited (Industry)- *Research support*
16. University of Iowa (Public PhD-granting university)- *Executive Committee member, base program management, scholarship and fellowship selections, research competition*
17. University of Northern Iowa (Public Masters-granting university)- *Executive Committee member, base program management, scholarship and fellowship selections, research competition*