Michigan Space Grant Consortium
University of Michigan
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2009 – 2010 Funding Interval

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. Space Grant programs encompass the entire length of the education pipeline, including elementary/secondary and informal education. The Michigan Space Grant Consortium is a Designated Program Consortium funded at a level of $785,000 for fiscal year 2009.

PROGRAM GOALS

Outcome 1: *Contribute to the development of the STEM workforce in disciplines needed to achieve NASA's strategic goals. (Employ and Educate)* Higher Education: MSGC Fellowship, Internship, and Seed Grant Programs.

The MSGC Fellowship Program

Goal: Increase the number of proposals that the MSGC Fellowship Program receives.

Goal: Improve the longitudinal tracking of the MSGC Fellowship award recipients.

Goal: Competitively award graduate and undergraduate fellowships with demographics as specified by NASA of 16.8% underrepresented minority (Department of Education). U. S. citizenship required.

The MSGC Research Seed Grant Program

Goal: Improve participation in the MSGC Research Seed Grant Program across the Consortium.

Goal: Increase the diversity (underrepresented minorities and women) in the MSGC Research Seed Grant Program.

Outcome 2: *Attract and retain students in STEM disciplines through a progression of educational opportunities for students, teachers, and faculty. (Educate and Engage)* Elementary/Secondary Education: MSGC Higher Education, K-12 Educator Incentive, Pre-College, and Augmentation Programs.

The MSGC Precollege Education, Higher Education, K-12 Educator Incentive and Augmentation Programs

Goal: Increase the number of applications coming from outside of the Consortium for the MSGC Precollege Education and K-12 Educator Incentive Programs with augmentation funds available to programs that target underrepresented minorities and women.

Goal: Award quality programs that target underrepresented minorities and women.

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)* Informal Education: MSGC Informal Education and Augmentation Programs.

The MSGC Public Outreach Program

Goal: Increase the number of applications coming from outside of the Consortium for the MSGC Public Outreach Program with augmentation funds available to programs that target underrepresented minorities, women, and persons with disabilities.

Goal: Award quality programs that target underrepresented minorities and women.

Goal: Award quality programs that encourage Science, Technology, Engineering, and Mathematics education in informal settings (e.g., museums science centers, boy and girl scouts, etc.)

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

Outcome 1: *Contribute to the development of the STEM workforce in disciplines needed to achieve NASA's strategic goals. (Employ and Educate)* Higher Education: MSGC Fellowship, Internship, and Seed Grant Programs.

Josh Armstrong graduated with his Bachelor's Degree in Electrical Engineering from Western Michigan University. He has worked at Georgia Pacific as a Project Engineer since 2008. Josh is an active member of the Young Professionals of Savannah, the National Society of Black Engineers, the Institute of Electrical and Electronics Engineers and Eta Kappa Nu, a national electrical and computer engineering honor society. "Work on my MSGC undergraduate research project really expanded my professional development," says Josh. "Research on that project has helped me look at my current projects from different perspectives. When my team came up with different ideas for the

associated senior design project, we had to verify the feasibility of each option and move forward with the best design. This same approach is something I use today."

"The Michigan Space Grant Consortium's Fellowship awards made it possible for me to conduct both my M.S. and Ph.D. research at Michigan Tech," reports Dr. Emily McCarthy. "With it I was able to travel to conferences, field sites, workshops, and participate in special training courses. Through my work, I grew as a researcher and was able to find a postdoctoral position at an excellent lab, the Naval Research Laboratory, which was my goal."

"The MSGC helped to fund the C-9 microgravity experiments that I was involved with at the University of Michigan for the 5 years that I was an undergraduate and graduate student," says Theresa Biehle. "I was invited to attend the National Council of Space Grant Directors' Meeting in Washington, D.C. I also visited the Michigan Delegation on Capitol Hill and attended the Distinguished Service Award Banquet. These opportunities deeply increased my interest in working in Space Systems Engineering, and helped me to obtain at job at Orbital Sciences through the sheer amount of experience I was able to gather at such a young age. I am currently a Flight Controller for the Glory Spacecraft."

"The MSGC Fellowship award gave me the opportunity to travel in order to expand my research in Astronomy and attend professional conferences," says Saida Caballero-Nieves. "These experience have led to collaborative efforts with others in my field. Saida is currently a Ph.D. candidate in Astronomy at Georgia State University.

"The Michigan Space Grant Consortium has provided me with excellent opportunities to learn about the inner workings of NASA and provided partial funding for my first year of graduate school," says Ryan Anderson. Ryan is currently a Ph.D. candidate at Cornell University. He is actively involved in operations of the Mars Exploration Rovers and calibration of the ChemCam instrument for the upcoming Mars Science Laboratory Rover.

Adebimpe Lawal participated in the Student Space Systems Fabrication Laboratory internship during the summer of 2008. She is currently in graduate school at Texas A&M studying Natural Gas Engineering with plans to graduate in 2012. Adebimpe is an active member of in the Society of Women Engineers and the National Society of Black Engineers. "Working on the MClimber during my internship not only strengthened my team-working skills, but also helped me to improve my communications skills," says Adebimpe. "The internship was an invaluable experience for me, and I will always appreciate the MSGC for the opportunity."

Outcome 2: *Attract and retain students in STEM disciplines through a progression of educational opportunities for students, teachers, and faculty. (Educate and Engage)*
Elementary/Secondary Education: MSGC Higher Education, K-12 Educator Incentive, Pre-College, and Augmentation Programs.

The Development, Implementation, and Ongoing Support for Computationally-Based Investigative Course Modules in High School Classrooms program brought together 11 high school teachers to Hope College's campus and trained them in modern computational science and modeling (CSM) techniques. "The teachers developed lessons for the classrooms in which students apply methods from CSM to problems in the fields of chemistry or biochemistry, improving their scientific understanding while exposing them to the kinds of modern CSM tools that are essential to every branch of science," reported Dr. Brent Krueger. "Assessment results collected after completing just one lesson indicate that 39% of these students have an increased interest (4 or 5 on a 5-point scale) in pursuing further education after graduation from high school and 28% have an increased interest in pursuing a career in science."

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)* Informal Education: MSGC Informal Education and Augmentation Programs.

Funding for the Ann Arbor Hands-On Museum's (A2HOM) Exploration Gallery has resulted in outcomes that have exceeded our original goals," says Mel Drumm. Executive Director of the A2HOM. "The Exploration Gallery was designed to be phase one of a collection of exhibits and programs tailored to the interests of Museum guests. Through the Museum's evaluation process, it was determined that space, space exploration and astronomy were high interest areas. Based upon the continued interest due to the MSGC Informal Education grant, we believe the public is engaged in our informal learning process and that this type of experience is inspiring the technological workforce of tomorrow. The funding for this project has sparked the development of two additional exhibits, each representing a supplemental opportunity to further reinforce the original exhibit. In our case, the creation of two exhibits provided a tangible series of additional learning experiences tied to both the original exhibit and our state science educational standards. The three exhibits are used guests and by staff members, including informal educational experts and highly certified teachers. In addition, two exhibits have been designed to provide portability so that University of Michigan professors may utilize them in off-site environments. In watching the interactions that result from facilitated experiences, it is clear that explaining difficult concepts in a social environment further reinforces interest and excitement in those topics. All three exhibits are linked to either state educational standards or national educational benchmarks. From our *ViewSpace* video interactive to the other in-depth hands-on exhibits, being able to explore content in an in-depth manner through hands-on experiences is a key element in our success. These successes have led to additional interest from others to add additional content in the future."

PROGRAM ACCOMPLISHMENTS

Outcome 1: *Contribute to the development of the STEM workforce in disciplines needed to achieve NASA's strategic goals. (Employ and Educate).* Higher Education: MSGC Fellowship, Internship, and Seed Grant Programs.

The MSGC Fellowship and Internship Programs

Goal: Increase the number of proposals that the MSGC Fellowship Program receives.

Metrics: Compare the number of proposals received from year-to-year.

Approach: Provide brochures to all MSGC campus representatives to supplement the other ways (newsletter, website, postings, and e-mails) in which we announce the MSGC Fellowship and Internship opportunities.

Accomplishment: The MSGC Fellowship Program received 60 proposals in 2009 as compared to 58 in 2008.

Goal: Improve the longitudinal tracking of the MSGC Fellowship and Internship award recipients.

Metrics: Track the next steps that students take after they are awarded fellowship funding from the MSGC.

Approach: Mark Fischer, Executive Director of the National Space Grant Foundation, provides us with results from the surveys that he routinely sends to our Fellowship and Internship award recipients with the contact information provided by Bonnie Bryant, MSGC Program Coordinator. Bonnie also contacts the mentors of Fellowship and Internship award recipients for input.

Accomplishment: The number of students that received funding from the MSGC Fellowship and Internship Program was 62 as compared to 43 from 2008. Out of the 62 awarded students, 19 took next steps in 2009: 7 are in graduate school in STEM disciplines, 1 is employed as an aerospace contractor, 6 are employed in a STEM positions that are non-aerospace, and 5 are employed in STEM academic positions at non- K-12 institutions. All students are funded through the Fellowship Program where we are not charged indirect costs so that we can provide more dollars for students.

Goal: Competitively award graduate and undergraduate fellowships and internships with demographics as specified by NASA of 16.8% underrepresented minority (National Center of Education Statistics Digest). U. S. citizenship required.

Metrics: Compare the number of proposals received each year by gender and ethnicity.

Approach: Offer a fellowship program targeted to underrepresented minority students. The program will offer $2,000 from the MSGC and will require a $2,000 match from the proposal institution for the mentor's salary. Funding in the amount of $2,500 will be awarded for each underrepresented minority student. Offer a $500 incentive to mentors of underrepresented students to be used for supplies and materials.

Accomplishment: Our goal is to strive for a minimum of 16.8% underrepresented minority students in our fellowship program. The goal is derived from the underrepresented minority student enrollment percentage for the state of Michigan as per the National Center of Education Statistics Digest. Our commensurate minimum for women is 40%. During funding interval 2009 we exceeded our goal; 23% of the fellowship and internship award recipients were underrepresented minority students, the same amount of underrepresented minority students that we reached in 2008 (23%). The number of women that we funded dipped from 40% in 2008 to 35% in 2009. Over the years we have found that this number fluctuates between 35% and 40%.

The MSGC Research Seed Grant Program

Goal: Improve participation in the Research Seed Grant Program across the MSGC.

Metrics: Compare the distribution of awards across the institutions within the MSGC.

Approach: Keep a record of the proposals we received overall as well as the distribution across the Consortium.

Accomplishment: During the 2009 funding interval, we received proposals to the MSGC Research Seed Grant Program from 7 of out of 10 affiliate universities as compared to 8 out of 10 affiliate universities in 2008. We funded proposals from 4 universities in 2009 as compared to 7 universities in 2008 due to the number and superior quality of the proposals received by Michigan Technological University.

Goal: Increase the diversity (underrepresented minorities and women) in the MSGC Research Seed Grant Program.

Metrics: Record the number of applicants each year by gender, ethnicity, and persons with disabilities.

Approach: Target announcements to college and university groups using e-mail, group meetings, and invitations from the director and campus representatives.

Accomplishment: During the 2009 funding interval, we received proposals from 2 women and 1 underrepresented minority (African-American male) as compared to 1 woman and 1 underrepresented minority (Hispanic) in 2008.

Outcome 2: *Attract and retain students in STEM disciplines through a progression of educational opportunities for students, teachers, and faculty. (Educate and Engage)*
Elementary/Secondary Education: MSGC Higher Education, K-12 Educator Incentive, Pre-College, and Augmentation Programs.

The MSGC Precollege Education, Higher Education, and K-12 Educator Incentive Programs

Goal: Increase the number of applications coming from outside of the Consortium for the Precollege Education, K-12 Educator Incentive, and Augmentation Programs (all K-12 Educator Incentive Program proposals come from outside of the MSGC).

Metrics: Record the number of applications that the MSGC receives from outside of the Consortium.

Approach: Some 8,000 brochures are sent to public and intermediate school districts, including high, middle, elementary, charter along with the Boy and Girls Scouts, museums and after-school clubs.

Accomplishment: During the 2009 funding interval, we received 8 proposals from outside of the MSGC as compared to the 6 proposals we received from outside of the MSGC in 2008. Ten teachers were awarded from the MSGC K-12 Educator Incentive Program as compared to the same number, 10, in 2008 and all were from outside the MSGC.

Goal: Encourage quality programs that target underrepresented minorities and women.

Metrics: Record the number of programs targeted to underrepresented minorities and women.

Approach: Announce that augmented support will be available to those programs that target underrepresented minorities and women. Within the announcement add that to be considered for augmented support, an additional page describing in detail why added funds are necessary to assure the success of program targeting underrepresented minorities and/or women.

Accomplishment: During the 2009 funding interval, we received 9 proposals that directly targeted underrepresented minorities and/or women. During the 2008 funding interval, we received 8 proposals that directly targeted underrepresented minorities.

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)* Informal Education: MSGC Informal Education and Augmentation Programs.

The MSGC Informal Education Program

Goal: Increase the number of applications coming from outside of the Consortium.

Metrics: Record the number of applications that the MSGC receives from outside of the Consortium.

Approach: Some 8,000 brochures are sent to public and intermediate school districts, including high, middle, elementary, charter along with the Boy and Girls Scouts, museums and after-school clubs.

Accomplishment: During the 2009 funding interval, we received 4 proposals from outside of the MSGC, the same amount of proposals that we received in 2008 in the Informal Education category.

Goal: Encourage programs that target underrepresented minorities and women.

Metrics: Record the number of programs targeted to underrepresented minorities and women.

Approach: Announce that augmented support will be available to those programs that target underrepresented minorities and women. Within the announcement we added that to be considered for augmented support, an additional page describing in detail why additional funds are necessary to assure the success of program targeting underrepresented minorities and/or women.

Accomplishments: During the 2009 funding interval we received 2 proposals that directly targeted underrepresented minorities and/or women as compared the 3 proposals that were received in 2008.

Goal: Encourage programs that include Science, Technology, Engineering, and Mathematics in informal settings (e.g., museums, science centers, boys and girl club, etc.).

Metrics: Record the number of applications that come from libraries, museums, planetariums, and others that offer STEM education in informal settings.

Approach: Some 8,000 brochures are sent to public and intermediate school districts, including high, middle, elementary, charter along with the Boy and Girls Scouts, museums and after-school clubs. We also encourage MSGC campus representatives to reach out to these establishments in their communities.

Accomplishment: During the 2009 funding interval, all of the programs awarded offered STEM education in informal settings with highly trained staff that provided supplemental materials as compared to the same percentage, 75%, in 2008. Informal settings included libraries, symposiums, mobile planetariums and museums like the Detroit Science Center's Orion's Quest.

PROGRAM CONTRIBUTIONS TO PART MEASURES

- Student Data and Longitudinal Tracking: Students who were supported from FY09 funds, 7 students graduated and are pursuing advanced STEM degrees, 1 is employed as an aerospace contractor, 6 are employed in STEM positions that are non-aerospace, and 5 are employed in STEM academic positions at non-K-12 institutions. The remaining students are still enrolled in the degree program that they were in when they received their Space Grant award. All students are funded through the Fellowship Program where we are not charged indirect costs so that we can provide more dollars for students.

- For all students that were significantly supported in the period spanning FY06-FY09, 24 graduated and are pursuing advanced STEM degrees, 6 accepted positions at NASA contractors, 11 accepted STEM positions in industry, 2 accepted positions at NASA, and 10 accepted STEM positions in academia. The remaining students have not yet received the degree that they were pursuing while the received their Space Grant award.

- Course Development: Professor James Sheerin from Eastern Michigan University developed a new entry-level interdisciplinary course for pre-service teachers designed to meet state K-12 science education and teacher certification requirements using NASA resources integrated into each lesson module. The course number is AST105E. *Astronomy for Teachers* is taught at Eastern Michigan University.
- Astronomy for Teachers.

- Matching Funds: A match of at least one-to-one is required of all programs with the exception of fellowships. Historically, the MSGC augmented NASA funding by a ratio of nearly 2-to-1 overall as reported in CMIS (2003 – 2007).

- Minority-Serving Institutions: The underrepresented minority enrollment Wayne State University and Eastern Michigan University is 36% and 20%, respectively, as compared to 4% - 13% at other MSGC-affiliated universities and colleges. The only historically black college that we have in the state of Michigan is Lewis College, a non-accredited business college in Detroit. Bay Mills Community College and Keweenaw Bay Ojibwa Community College are the two tribal colleges located in Michigan but at this time, no science programs are offered on either campus. Our focus remains to recruit minority students and junior faculty members from MSGC institutions.

IMPROVEMENTS MADE IN THE PAST YEAR

As Mr. Timothy Wilson retired from the MSGC Board, Mr. Michael Madison joined the Board. Mike is the Principal of Dicken Elementary School in Ann Arbor. He is a tireless advocate for children attending Ann Arbor Public Schools. Mike strives to help each child learn "how to do school," to learn how to think and problem-solve, and to learn how to become a contributing member of our society.

MSGC Director, Professor Alec Gallimore, was recognized as a fellow of the American Institute of Aeronautics and Astronautics (AIAA). Presentation of the newly elected Fellows and Honorary Fellows of the Institute took place at the AIAA Aerospace Spotlight Awards Gala, at the Ronald Reagan Building and International Trade Center, in Washington, D.C. This annual black-tie event recognizes the most influential and inspiring individuals in aerospace, whose outstanding contributions merit the highest accolades.

The Great Midwestern Regional Space Grant Consortia collaborated to provide a research opportunity in remote sensing: *Land Use in the Midwest.* Professor Okan Ersoy from Purdue University was awarded for his proposal, *Innovative Remote Sensing Techniques for Harmful AlgalBloom Monitoring* in 2008. The results, *Seed Grant Impact: Compressive Sensing for Remote Sensing,* was reported at the regional meeting in September of 2009 in Cleveland. MSGC-awarded students participated in the poster session hosted by the Ohio Space Grant Consortium.

PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

Dicken Elementary School

Ann Arbor Public School System

Mr. Michael Madison is the principal.

Eastern Michigan University

Public Ph.D.-granting university

James Sheerin is Professor of Physics and Astronomy and is very active in space physics research and in developing science courses for non-majors and pre-service teachers.

Grand Valley State University

Public Master's-granting university

Ms. Mary Ann Sheline is the director of the Regional Math and Science Center. As a former teacher, she is an expert in K-12 matters.

Hope College

Private four-year liberal arts college

Peter Gonthier is an astronomer and Professor of Physics.

Michigan State University

Public Ph.D. granting university

Dr. Aurles Wiggins is director of the Office of Support Services (OSS). In addition to directing the OSS, Dr. Wiggins is a key element in the management team of the NSF-funded *Louis Stokes Alliance for Minority Participation* (LSAMP). This program is engaged in recruiting underrepresented minorities into STEM fields. The MI-LSAMP facilitates the long-term goal of increasing the production of Ph.D.'s in STEM fields with an emphasis on entry into faculty positions.

Michigan Technological University

Public Ph.D. granting university

Ms. Chris Anderson is the Special Assistant to the President and specializes in the recruitment of women and underrepresented minorities into engineering. Chris was

recognized at the Dr. Martin Luther King Banquet with a MTU Black Student Association Award, *Parting of the Waters*.

Oakland University

Public Ph.D. granting university

Bhushan Bhatt is Associate Dean of Engineering and Professor of Mechanical Engineering.

Saginaw Valley State University

Public Master's-granting University

Garry Johns is Professor of Mathematics at Saginaw Valley State University.

University of Michigan (lead institution)

Public Ph.D. granting university

Alec Gallimore is the MSGC director, Arthur F. Thurnau Professor of Aerospace Engineering, and an Associate Dean in UM's Rackham Graduate School. Professor Gallimore is an expert in advanced spacecraft propulsion systems and an avid supporter of diversity initiatives in higher education. Professor Gallimore plays a key role in the NSF-funded *Louis Stokes Alliance for Minority Participation* (LSAMP) and the NSF-funded *Alliances for Graduate Education and the Professorate* (AGEP).

Dr. Cinda Davis is the director of UM's Women in Science and Engineering Program.

Wayne State University

Public Ph.D. granting university

Gerald Thompkins is Associate Dean of Engineering and Associate Professor of Engineering who has been very active in minority student recruitment throughout the Detroit metropolitan area.

Western Michigan University

Public Ph.D. granting university

Frank Severance is Professor of Electrical Engineering and the author of textbooks on controls and robotics.

Respectfully submitted on August 23, 2010,

Michigan Space Grant Consortium
Director