Maine Space Grant Consortium
Lead Institution: Maine 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 Maine Space Grant Consortium is a Capability Enhancement state funded at a level of **$590,000** for fiscal year 2009.

PROGRAM GOALS

The mission of Maine Space Grant Consortium (MSGC) is to develop and maintain a statewide program that is mutually beneficial to the State and NASA that effectively leverages NASA and state resources to (1) improve Maine's research infrastructure in areas consistent with the needs of the mission directorates and in alignment with the state of Maine Science and Technology Plan; (2) encourage more students to consider careers in fields of science, technology, engineering, and mathematics (STEM); and (3) enhance NASA's presence throughout the State of Maine.

A. Goals and Objectives Relevant to NASA Education Outcome 1

The MSGC's Research Infrastructure, Higher Education and Workforce Development goals are in alignment with activities to achieve Outcome 1. These goals are to: (a) strengthen the Affiliates' science and engineering research capacity in areas mutually beneficial to Maine and NASA (Research Infrastructure); and (b) to increase participation of Maine undergraduate and graduate students in science and engineering research conducted by the Affiliates and NASA Field Centers (Higher Education and Workforce Development). (c) positively impact the development of the STEM workforce in disciplines needed to achieve NASA's strategic goals and (d) positively impact diversity in space grant funded STEM research

To achieve these goals in a manner that will yield results consistent with Outcome 1, we conducted the following objectives:

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a. Support scholarships and fellowships for undergraduate and graduate students at Maine's graduate institutions to conduct STEM related research.
b. Support scholarships for Maine undergraduate students matriculating at Maine's primary undergraduate institutions to conduct STEM related research.
c. Increase S&E student enrollment at the University of Maine, University of Southern Maine and the College of the Atlantic by augmenting institutional scholarships to attract highly qualified high school seniors.
d. Provide undergraduate students with a 10-week research experience at NASA field centers.
e. Support new STEM course offerings.

B. Goals and Objectives Relevant to NASA Education Outcome 2

The MSGC's Higher Education and Pre-College goals are in alignment with activities to achieve Outcome 2. These goals are to: (a) to increase participation of Maine undergraduate and graduate students in science and engineering research conducted by the Affiliates and NASA Field Centers (Higher Education); and (b) **s**trengthen the capacity of Maine K-12 teachers to deliver educational programs that increase student awareness, knowledge, and participation in STEM activities (Pre-College). To achieve these goals in a manner that will yield results consistent with Outcome 2, we proposed to implement the following objectives:

- Support the evaluation of an Astrobiology curriculum in Secondary Schools
- Support STEM research experiences for High School Juniors and Seniors
- Support existing programs designed to help teachers and school districts acquire and utilize NASA and NASA related educational programs and resources.
- Develop partnerships to leverage and expand K-12 initiatives that connect schools to science and engineering research and educations strengths of the Affiliates

C. Goals and Objectives Relevant to NASA Education Outcome 3

The MSGC's Informal Education goal is to increase the public's awareness of science and engineering research and education that are associated with NASA and the Affiliates. This is in alignment with activities to achieve Outcome 3. To achieve this goal in a manner that will yield results consistent with Outcome 3, we supported efforts in a STEM collaboration

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

Outcome 1. Frederick Schwaner participated in MSGC's Aerospace Workforce Development Program in 2008 where we send outstanding undergraduate students to NASA field centers for ten weeks. The following year (2009), Fred now as a graduate student, received a fellowship award through MSGC's scholarship/fellowship program, working with his faculty mentor on wireless sensors for rocket applications, similar to the work he conducted while at NASA Johnson Space Center through our Workforce Development program. Recently Fred won the Second Place Best Paper Award at the IEEE Region 1 and Region 2 Join Conference (both regions cover 11 states).

Outcome 2. Through our MERITS program (Maine Research Internships for Teachers and Students), now in our third year, we are beginning to see the progression of a number of our funded high school students. From the responses so far, all those that have graduated high school have continued onto an institute of higher education and many of them at one of MSGC's affiliates. Many students have cited their experience through the MERITS program as a factor for either being accepted into a specific program or receiving a scholarship or other opportunity. Two students so far are also co-authors of publications arising from the work they conducted during the program. One of our students had this to say about the program.

"Since my participation with the MERITS program and the Maine Space Grant Consortium, a number of exciting things have happened to me. First, as shown above, the research that I participated in was published. Second, I have sincerely become enamored with chemistry, and have decided to major in it in college. Finally I was accepted to Bowdoin College, which I am sure was at least partially the byproduct of my participation in this program. Once again, thank you for giving me this opportunity."
Adam Childs-MERITS student, 2009

Outcome 3. An affiliate of the MSGC's, the Maine Mathematics and Science Alliance along organized a STEM collaboration and held STEM Summits in 2008 and 2009, of which MSGC has participated and supported. The goal of the collaboration and summits are to increase awareness of the need to improve STEM education in Maine's K-16 educational system. Presenters and participants include Governor Baldacci, the Commissioners of Education, Labor, and Economic and Community Development, the Chancellor of the University of Maine System, STEM researchers and educators, school administrators, industry leaders, legislators, and policy makers. An outcome of the Summit was to galvanize networks of organizations and individuals who would develop and/or support informal science education initiatives.

PROGRAM ACCOMPLISHMENTS

Outcome 1.

MSGC Goal: MSGC will positively impact the development of STEM workforce in disciplines needed to achieve NASA's strategic plan.

Objectives:

1. On a biannual, at least two research collaborations between affiliates and NASA centers will be seeded . Accomplishments: three research collaborations have been seeded

2. On an annual basis, 60 graduate and undergraduate students will receive space grant stipends to participate in STEM research conducted by the affiliates and NASA centers. Accomplishments: 61 students received awards

3. On an annual basis, at least two courses that integrate NASA-related resources into STEM disciplines will be developed or improved. Accomplishments: 1 new course has been developed

4. On an annual basis, at least two NASA SBIR/STTR proposals will be developed by space grant funded faculty and/or industry partners. Accomplishments: none to date, the program has been delayed

Goal: MSGC will positively impact diversity in space grant funded STEM research

Objectives:

1. On an annual basis, at least 4% of space grant funded undergraduates and graduates students will be underrepresented minority students: Accomplishments: 5% of all student participants are underrepresented minority students

2. On an annual basis, at least 40% of space grant funded undergraduate and graduate students will be female. Accomplishments: 56% of all participating students are female

3. On a biannual basis, at least one new research collaboration between an affiliate and a minority serving institution will be seeded. Accomplishments: no new collaborations in 2009. We are working on a collaboration for 2010.

Highlight:
After completing her undergraduate degree at the University of Maine, Amanda Hoover accepted a position as a Flight Systems Engineer at the Marshall Space Flight Center. Amanda participated in our Maine Aerospace Workforce Development Program. When the program ended, she continued her work at Marshall through a coop-op experience before returning to her undergraduate studies. She is one of four students that has participated in this program who have accepted a position at NASA

Outcome 2.

MSGC Goal: Inspire interest of K-12 students in STEM disciplines and careers:

Objectives:

1. On an annual basis, at least 700 middle school students will be exposed to NASA mission-related activities, STEM disciplines and careers. Accomplishments: estimate of 980 middle school participants through our Space Day Maine

2. On an annual basis, at least 14 high school juniors and seniors will participate in summer research experiences in NASA-related STEM research.

Accomplishments: 13 high school Juniors and Seniors were supported through our MERITS program.

3. On an annual basis, at least two new or improved curricula that use NASA themes and content will be introduced in Maine K-12 schools. Accomplishments: none at this time.

Highlight:

11 host institutions participated in our MERITS program where students conducted hands-on research in STEM and NASA-related fields. Currently we are still receiving data from our 2009 MERITS students through our longitudinal tracking system. So far, we received information from seven, all of who have continued into a STEM field at an institute of higher education and one of which is a co-author on a publication.

Outcome 3.

MSGC Goal: Increase the public's awareness of NASA-related STEM research and education:

Objectives:

1. On an annual basis, support at least five informal education activities that use NASA themes and content. Accomplishments: none at this time. Since this objective was reported, we have changed our focus and at this time, have supported the STEM collaborative and summit described above.

PROGRAM CONTRIBUTIONS TO PART MEASURES

- Longitudinal Tracking: Number of student participants who are:

Employed by NASA	5
Employed by Aerospace Contractors	1
Employed by universities	1
Employed by other education institutions	7
Employed in other STEM fields	29
Pursuing advanced education in NASA-related disciplines	39
Underrepresented	15

MSGC longitudinally tracks students that receive a significant award or benefit from the award/experience. Notices are sent out to these students twice annually requesting information on their academic and workforce status as well as data on publications, presentations, and proposals submitted to other funding agencies, as a result of their Space Grant award.

- Course Development:
  New courses 1

Physics and Mathematics of Sustainable Energy. This course is an introduction to the basic physical principles and mathematical tools needed to understand sustainable energy generation an energy conservation. Topics covered include energy and power, dimensional analysis and unit conversions, order of magnitude estimate4s, financial mathematics, spreadsheets. Students gain hands-on experience in weekly lab sessions. Evaluation based on weekly problem sets, lab write ups, and a final project and presentation. Location – College of the Atlantic

- Matching Funds: Total matching funds for 2009 is $440,000 which consists of:

Academic Affiliates	$366,694
Non-profit	6,135
Industry	25,877
Other non-federal	8,237
Lead institution	33,057

- Minority-Serving Institutions: There are no minority serving institutions in the State of Maine. MSGC implemented a collaborating program with California State Long Beach, Department of Mechanical and Aerospace Engineering (minority serving institution) and the University of Maine, Department of Electrical and Computer Engineering in 2008. The project finished in 2009. We are currently looking at partnering with another minority serving institution in Ohio.

IMPROVEMENTS MADE IN THE PAST YEAR

PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

Higher Education Affiliates

- Bates College, 4-year or above, Private, Baccalaureate College-Liberal Arts
- Bowdoin College, 4-year or above, Private, Baccalaureate College-Liberal Arts
- Colby College, Waterville, 4-year or above, Private, Baccalaureate College-Liberal Arts
- College of the Atlantic, Bar Harbor, 4-year or above, private, Baccalaureate College-Liberal Arts
- Embry-Riddle Aeronautical University, 4-year
- University of Maine, Orono, 4-year or above, Public, Doctoral/Research-Extensive, member of the Board of Directors
- University of Southern Maine, Portland, 4-year or above, Public, Master's Colleges and Universities II, member of the Board of Directors

- University of New England, Biddeford, 4-year or above, Private, Master's Colleges and Universities II.
- Maine Maritime Academy, Castine, 4-year or above, Public, Specialized Institutions

Non-Higher Education Affiliates

- Bigelow Laboratory for Ocean Sciences, Boothbay Harbor, Marine Research and Education, member of the Board of Directors
- Gulf of Maine Research Institute, Portland, Private not-for-profit, Marine Research and Education
- Maine Manufacturing Extension Partnership, Augusta, Private not-for-profit, Manufacturing Extension, member of the Board of Directors
- Applied Thermal Sciences, Sanford, High Tech Small Business, member of the Board of Directors
- Maine Mathematics and Science Alliance, Augusta, Private not-for-profit, Education
- The Challenger Learning Center of Maine, Bangor, Private not-for-Profit, Education
- BioAnalyte, Portland, Industry
- Island Astronomy Institute, Private not-for-Profit, Education
- Lockheed Martin, Industry