

NASA University Research Centers (URC)
FY2013 Annual Report (10/1/2012- 9/30/2013) Lance Richards, NASA – Education Director
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Project Description

Executive Summary

Since its inception in 1991, the NASA University Research Center (URC) initiative, a project within the Minority University Research and Education Program (MUREP) program, has supported efforts to build the institutional capacity of Minority Serving Institutions (MSIs) to achieve a competitive aerospace research capability consistent with NASA's vision for aeronautics and space exploration. Throughout the project's lifecycle, 51 MSIs have been selected from a national pool consisting of Historically Black Colleges and Universities (HBCU), Tribal Colleges and Universities (TCU), Hispanic Serving Institutions (HSIs), and Other Minority Universities (OMU). The project is managed at the NASA Dryden Flight Research Center in a partnership with the Aerospace, Education, Research, and Operations Institute.

The URC project is designed to support the Agency Strategic Plan and Committee on Science, Technology, Engineering, and Mathematics priorities, or CoSTEM, governing frameworks that drive Agency investments. The high-level goals are to enable institutions capacity to conduct NASA's missions, and to enhance undergraduate and graduate education for tomorrow's science, technology, engineering, and mathematics (STEM) workforce, with emphasis on groups historically under-represented in STEM fields.

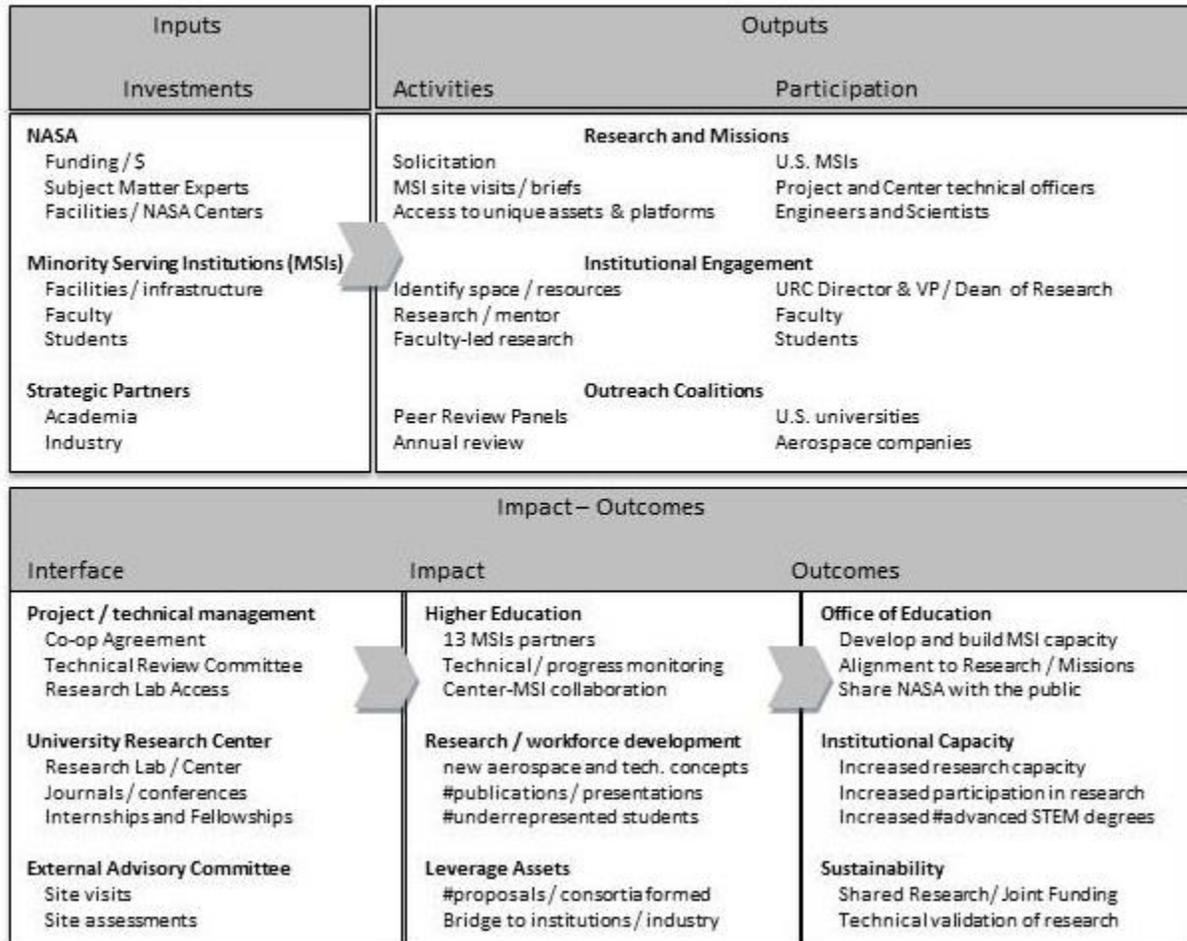
The specific goals of the URC project are to:

1. Foster new aerospace science and technology concepts
2. Expand the nation's base for aerospace research and development
3. Develop mechanisms for increased participation by faculty and students of MSIs in mainstream research
4. Increase the number of underserved / underrepresented minorities who obtain advanced degrees in STEM fields

The current URC awardees consist of 13 MSIs from eight states across the nation including Puerto Rico. Seven of the universities are in the final year of a 5-year cooperative agreement; six universities have one year left. Over the history of the program, the URCs have developed new courses, created degree programs, enhanced faculty's STEM capacity, and developed approaches to sustain research centers beyond NASA funding. The institutions have also broadened services to conduct education outreach activities for K-12 students while training and providing curriculum support for teachers, thereby contributing to the STEM education pipeline. Project outcomes include publications, faculty / student presentations, conferences, and the maturation of technologies to higher technology readiness levels. NASA-led Technical Review Committees evaluate URCs through site visits and annual reviews. In fiscal year 2014 a new solicitation will be disseminated and a sixth consortium of MSIs selected.

Logic Model

Figure 1 – Institutional Engagement model for Minority Serving Institutions (MSIs)



Project Goals

The overall goal of the URC project is to continue NASA's commitment to achieving a broad-based, competitive aerospace research and technology development capability at Minority Institutions, or MIs, that will:

- Expand the nation's base for aerospace research and development by fostering new aerospace research and technology development
- Develop mechanisms for increased participation by faculty and students at MIs in the research programs of NASA's Mission Directorates
- Increase the numbers of undergraduate and graduate degrees awarded to U.S. citizens from MIs in NASA-related fields

The specific objectives for URCs are to:

- Establish significant, multi-disciplinary scientific, engineering, and/or commercial research centers at the host university that contribute substantially to the programs of the NASA Mission Directorates described in the NASA Strategic Plan
- Move increasingly towards gaining support from sources outside the URC project by aggressively pursuing additional funding opportunities offered by the NASA Mission Directorates, industry, and other funding agencies
- Improve the rates at which U.S. citizens, who historically have been underrepresented in NASA-related fields, are awarded undergraduate and graduate degrees at their respective universities in NASA-related fields

Project Benefit to Outcome 1

The NASA URC project supports Outcome One for the NASA Office of Education. The following is a description: Outcome 1: Contribute to the development of the STEM workforce in disciplines needed to achieve NASA's strategic goal through a portfolio of investment.

All 13 project grantees were able to demonstrate their ability to utilize funds to plan and coordinate education enrichment and research activities ranging from improvements to university courses, student research opportunities, training and development for targeted populations, and quality research products highlighting technological processes and data results.

During the course of the fiscal year, projects were able to achieve the following outcomes*:

Participants

- Overall, the URC Project supported and 162* graduate students and 908* undergraduate students, including 200* from community colleges
- 88* participants received a significant investment from the grantees (\$2,500 or more in funding or 160 hours or more in program contact hours)
- 45* students who successfully defended their master's thesis or doctoral dissertation

Publications/Presentations/Patents/ 655* student and faculty authors who have published results of the research activities

- 3* patent applications with all 3* granted.

Courses and Institutional Enhancements

- Data and research materials, educational aids, instruments and equipment, software or Netware, and physical collections

*Data based on best available figures as of the writing of this report. Please see the Evaluation section for detailed explanations.

Proposals

- 10* Proposals for additional funding were awarded for a total of \$6,162,998.00*. At one URC institution alone (FIU), 7 of 17 proposals have already been funded.

NASA Collaboration

- Project activities were held at a NASA center to include the following: Ames, Goddard, Dryden, Glenn, Headquarters, Kennedy, Johnson, and Langley; and,
- A host of workshops, classroom visits, seminars, summer camps, and other presentation activities

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Project Accomplishments

URC project directors, staff, and faculties have the professional expertise and resources to produce outcomes for the program. These outcomes include conference hosting at their institution, contributors to technological developments, visibility at professional conferences, involvement with national and international research projects, acceptance at participation in competitions, and the ability to acquire additional resources to support and sustain their programs. Some highlights are as follows:

- During the fiscal year, the URC institutions achieved remarkable advances in NASA fields. Cal State Long Beach made significant contributions to areas such as Control Systems, Uninhabited Air Vehicles, Advanced Computation and Communications, Biofuel Combustion, and Jet Propulsion. North Carolina A&T University expanded research in Advanced Composite Materials and Structures, Integrated Structural Health Management (ISHM), and Advanced Aeromechanics and Propulsion. North Carolina Central University innovated the development of instruments such as a high-energy gamma-ray polarimeter, a highly sensitive biochemical detector, and a novel neutrino detector.
- Achievements were made on many levels of the engineering design process. Delaware State University made strides in theoretical frameworks, computer models, and applied technologies.
- Tangible effects of the URC program can be seen in not only in academia, government, and industry, but in the environment. For example Florida International University's URC program helps to manage and sustain the Florida Everglades.
- The positive economic impact of the URC program is clearly demonstrated in cases such as Prairie View A&M University, which started a NASA Small Business Innovative Research (SBIR) project.

*Data based on best available figures as of the writing of this report. Please see the Evaluation section for detailed explanations.

- The URC program has a profound positive impact on minority STEM engagement. For example, every physics major in Howard University’s class of 2013 had been previously engaged in the URC-supported Beltsville Center for Climate System Observation. Texas Southern University established internships to engage middle school and high school students in their cutting-edge URC research. Projects such as the University of Texas at Brownsville’s “Noche de Ciencia” (Night of Science) further support these goals.
- Innovative steps were taken for the dissemination of knowledge developed through URC. For example, the University of Puerto Rico developed a dedicated web portal. The University of Texas at El Paso posted videos to Youtube.

Project Contributions to APG Measures

The following table demonstrates how the URC Project contributes to the annual performance goals of the Agency:

- Strategic Goal 5 Enable program and institutional capabilities to conduct NASA's aeronautics and space activities.
 - Outcome 5.1 Identify, cultivate, and sustain a diverse workforce and inclusive work environment that is needed to conduct NASA missions
 - Objective 5.1.2 Provide opportunities and support systems that recruit, retain, and develop undergraduate and graduate students in STEM-related disciplines.
 - Performance Goal 5.1.2.1 - Assure that student participants in NASA higher education projects are representative of the diversity of the Nation, based on student enrollment data maintained by the U.S. Department of Education’s National Center for Education Statistics.
 - 5.1.2.1: ED-13-1 – ED-13-1: Provide significant, direct student awards in higher education to (1) racially or ethnically underrepresented students, (2) women, and (3) persons with disabilities at percentages that meet or exceed the national STEM enrollment percentages for these populations, as determined by the most recent publicly available data from the U.S. Department of Education's National Center for Education Statistics for a minimum of two of the three categories. (Note, significant investment is \$2500 or more or 160 or more contact hours or both)

URC Project Contributions- Students with Significant Awards = 88*

Total Black or African-American: 45*

Native Hawaiian or other Pacific Islander: 1*

*Data based on best available figures as of the writing of this report. Please see the Evaluation section for detailed explanations.

URC Project Contributions- Research Participants = 147*
Total Female = 42* Total Male = 105*

- Strategic Goal 6 Share NASA with the public, educators, and students to provide opportunities to participate in our Mission, foster innovation, and contribute to a strong national economy.
 - Outcome 6.1 Improve retention of students in STEM disciplines by providing opportunities and activities along the education pipeline.
 - Objective 6.1.1 Provide quality STEM curricular support resources and materials.
 - Performance Goal 6.1.1.1 Assure the availability and accessibility of NASA's online curricular support and resources to improve educators' STEM content knowledge and enhance student interest and proficiency in STEM disciplines.
 - 6.1.1.1: ED-13-2: maintain no fewer than 1,000 online STEM-based teaching tools for K-12 and informal educators and higher education faculty (alternative, 6.1.1.1: ED-12-3: 35,000 educators participate in NASA education programs)

URC Project Contributions- Educators = 55*
Total Pre-Service Teachers= 3*
Total Informal Educators= 0*
Total Teachers Grades K-4= 17*
Total Teachers Grades 5-8= 33*
Total Teachers Grades 9-12= 2*

- Objective 6.1.2 Provide NASA experiences that inspire student interest and achievement in STEM disciplines.
 - Performance Goal 6.1.2.2 Provide elementary and secondary students with authentic NASA mission based opportunities that build STEM knowledge, skills, and career awareness.
 - 6.1.2.2: ED-13-3: Conduct no fewer than 200 interactive K-12 student activities that leverage the unique assets of NASA's missions (alternative, 6.1.2.2: ED-12-5: 200,000 elementary and secondary students enrichment activities).

URC Project Contributions- K-12 Students = 1340*
Total grade k-4 students= 452*
Total grade 5-8 students= 504*
Total grades 9-12 students= 888*

*Data based on best available figures as of the writing of this report. Please see the Evaluation section for detailed explanations.

Evaluation

For FY13, the reporting system used for URCs in previous years was discontinued and a new reporting model implemented. The details of this shift, the challenges encountered, and the recommendations for the future are enumerated in the Lessons Learned section below.

At the time of this report, the number of outstanding data required from URCs is significant. This report was generated with the best available data at the time of publication. More accurate and complete data is attainable given an additional 90 days. Dryden Office of Education would welcome the opportunity to further revise this Report when data submission is completed, which would provide an opportunity for much more accurate reflection of the Program's results.

Lessons Learned

In FY12, the Office of Education's Performance Management System (OEPM) had been utilized by trained grantee users to enter data in order to track student activity, grantee performance, and outcomes. FY12 was the first fiscal year in which grantees were able to utilize OEPM to report their activities to headquarters by completing data summary forms and distributing higher education surveys. This allowed the project management office to obtain real-time data from grantees, and allows the Agency to build reports using various tools within the system. The reports have enabled institutions to complete project reports, and to provide effective feedback on the institution's contributions toward the APGS, while assisting the institutions to achieve other desirable goals.

In response to guidance given by Headquarters at the Higher Education Summit, for FY13 the data recording procedure was changed. Grantees no longer input their information directly into OEPM. Instead, the grantees were directed to submit documents to the Center containing the pertinent data, to be entered into OEPM by Center staff. The revised procedure created a number of challenges and unintended consequences.

Firstly, the open-ended document style format of information submitted by grantees did not require the same level of structure as the form style input present in OEPM. For example, a drop down menu in OEPM may require a selection before the user can proceed, however a document style report contains no such safeguards. The document style format led to the submission of missing, erroneous, or extraneous information by the grantees and a lack of consistency between reports submitted by different institutions.

Secondly, a number of significant data were not punctually submitted by the grantees. Late and incomplete submissions of data by the grantees occurred in a number of cases. Grantee reports which were submitted often contained gaps in information required by OEPM. As OEPM data entry is often contingent on previously entered information, even small gaps in the submitted information would forestall the data entry process completely.

Lastly, there is a conflict in reporting schedules which is complicating the reporting process. Per the Office of Education, the Annual Performance Report must align with OEPM data, however for FY13, the Annual Performance Report must be completed a full month prior to the OEPM data entry deadline. A number of URCs, perhaps believing the data was not due until the end of the calendar year, have not submitted all the required OEPM data necessary to derive information needed for the Annual Performance Report. Another factor at play in communication challenges with URCs may be the fact that due to winter academic breaks, university employee vacations, and events, many universities are effectively shut down and unresponsive during the holiday periods in which these data are required.

Recommendations

A few small improvements would dramatically increase the amount, accuracy, and punctuality of available data in future years:

Forms instead of documents- Structured forms sent directly to grantees with clear, embedded instructions for each item could be provided. The same forms could be supplied to all grantees via email attachment leading to increased consistency, and they could include items such as drop down menus with clear explanations of each possible response.

Holding URCs accountable for accurate and timely data submission- As punctuality of grantee reports was also a challenge, an incentive for timely data submission may be warranted. For example, the URC's final allotment of funds could be released upon the submission of accurate and complete OEPM data as verified by the Center. Alternatively, qualification for future participation in the URC program could be contingent upon compliance with reporting requirements. Holding URCs responsible for needed data submission would align the program with financial best practices utilized in the majority of industries and maximize the use of taxpayer funds.

Resequencing the deadlines for OEPM and Annual Performance Report The Annual Performance Report is due before the OEPM data from which it is derived. Going forward, the reporting process could be expedited and improved by aligning the reporting deadlines so the OEPM data is due before the Annual Performance Report. This would ensure that the Annual Performance Report accurately and thoroughly reflects OEPM data. An added measure for additional data expedition would be to align these deadlines either significantly before or significantly after the end of the calendar year, when many universities are operating on a skeleton crew.

Project Partners and Role of Partners in Project Execution

At the time of this report, nearly all grantee reports regarding partnerships are still outstanding. However, informal communication from grantees indicate a wide range of collaborative projects

and partnerships with other higher education institutions, industry, local education agencies, as well as NASA. This section can be expanded upon once grantee data has been submitted.

Appendix

Contacts

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Supporting Documentation

Office of Education Performance Management System. 23 Oct. 2012. Raw data. N.p

The STEM Workforce Challenge:. Rep. N.p.: U.S. Department of Labor, 2007. Print