

NASA University Research Centers (URC)

FY2012 Annual Report (10/1/2010- 9/30/2011)

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Project Description

The University Research Centers (URC) are multi-disciplinary scientific, engineering and/or commercial research Centers at host universities from Minority Institutions (MI). URCs provide a broad-based, competitive NASA-related research capability among the Nation's MIs that foster new aerospace science and technology concepts. Designed to expand the Nation's base for aerospace research and development, URCs provide mechanisms for expanded participation by faculty and students of MIs in mainstream research, and increase the number of underrepresented and underserved U.S. students obtaining advanced degrees in NASA-related fields. URCs are collaborative Centers conducted in cooperation with NASA's Mission Directorates and NASA Centers, substantially contributing to NASA's space and aeronautics goals and objectives.

The first competition for URC was held in Fiscal Year (FY) 1991 open only to HBCUs. It resulted in five-year awards to seven universities designated as NASA HBCU Research Centers. A second competition for new awards, open to both HBCUs and Other Minority Universities (OMU), was held in FY 1995, resulting in five-year awards to four HBCUs and three OMUs designated as Minority URCs. Shortly thereafter, the HBCU Research Centers and the Minority URCs were formally combined into a single program, with the two sets of awardees designated as Group 1 and Group 2, respectively. In FY 1996, Group 1 URCs were invited to propose for a second five-year period. After extensive reviews, all seven Group 1 URCs were awarded a second five-year term. In FY 2000, the Group 2 Centers were renewed for a second five-year period after extensive reviews. In FY 2002, eleven awards were made to Group 3 URCs (four HBCUs, four OMUs and three Group 1 URCs were renewed for four years). By the end of FY 08, seven new awards were made as Group 4 URCs and in FY 09 another solicitation was announced and 6 new URCs were funded.

The NASA University Research Centers(URC) project continues to make progress in serving higher education students by creating opportunities for students to engage in NASA related Science, Technology, Engineering and Mathematics (STEM) research, and developing avenues for success in academia. Currently, the project funds 13 minority serving institutions (Group 4 and 5) across the nation to develop the capacity at these institutions to support STEM students in research and develop activities, enrich faculty capabilities in areas of interest to NASA enabling the facilitation of educational activities and competitive research.

Over the 20 year history of the program, the URCs have been able to establish short and long-term goals to achieve the overall goals of the project including new courses, create new degree programs, enhance mentoring activities, and develop reasonable approaches to sustain research centers beyond NASA funding support. In addition to serving higher education students who are the target population, the institutions have also been successful in broadening services to conduct education outreach activities for K-12 students while training and providing curriculum support for teachers. As a benefit from serving these additional populations, the URCs have been able to contribute to the development of the STEM education pipelines which are critical in preparing competent professionals for the workforce of tomorrow. The U.S. Department of Labor has stated that due to the lack of a quality education in math and science at the K-12 level and limited resources to support education institutions and students to

pursue high education, developing the pipeline is now essential to ensure the continuing growth of our society. This has led the U.S. Department of Labor to recommend the following; via partnerships with federal and state governments, education institutions, and community organizations:

- Building the gateway to STEM careers;
- Catalyzing and supporting innovation, entrepreneurship, and economic growth;
- and, Enhancing the capacity of talent development institutions.

This URC project encompasses each of the elements above by preparing students and allowing them to engage in competitive research work and presentation that can prepare them for NASA STEM careers upon graduation.

During FY2012, the NASA URC project created a number of partnerships with other federal agencies, local education institutions, and business entities. The project also reported a wealth of publications, student and faculty presentations at professional meetings, and carried out a variety of professional development activities to include participant training, seminars, instructional support, and conferences. A total of 315 students were engaged in research and 708 undergraduate and graduate students received a significant investment (\$2,500 or more and/or 160 or more of program contact hours) to include 29 internships at the various NASA Centers across the nation.

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

- 708 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/Proposals

- 268 student and faculty authors who have published results of the research activities
- A total of 68 invited papers based on research of the URCs
- 4 patent applications with three patents that were granted
- 2,129 education materials were developed
- 16 websites designed for dissemination of information and project results

Partnerships

- 25 partnerships with higher education institutions

Courses and Institutional Enhancements

- 38 higher education courses developed
- 22 higher education courses were revised
- Data and research materials, educational aids, instruments and equipment, software or Netware, and physical collections

Proposals

- 49 proposals for additional funding were awarded

NASA Collaboration

- 26 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

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.

Several URC institutions were able to host and facilitate conferences at their site. During the fiscal year, institution grantee Texas Southern University hosted their first STEM Awareness Forum which allowed for discussions surrounding STEM education and awareness. The forum was attended by industry leaders, local politicians, as well as students. The University of Texas at El Paso was able to conduct their first Southwest Energy Science and Engineering Symposium. A variety of presentations and opportunities to dialogue were made by students, faculty, NASA subject matter experts, and professionals from industry.

Students supported by the URC project had research projects accepted for high level events. The URC Project had three grantee institutions with student teams accepted for the Reduced Gravity Flight Week Event at Johnson Space Center. Institutions with student teams accepted were University of Puerto Rico-Rio Piedras, University of Texas at El Paso, and Prairie View A&M University. In addition, Texas Southern University, Prairie View A&M University and University of Puerto Rico- Rio Piedras students presented papers at the International Astronautical Congress located in Cape Town, South Africa. California State University Long Beach also had students accepted to present their preliminary findings on their human factors research projects at the Department of Defense Human Factors Engineering Technical Advisory Group Meeting held in San Jose, CA.

NASA have recognized the excellence in our grantees and Project Directors. The URC project director of California State University Los Angeles was awarded the IT Summit Award during the NASA IT Summit in San Francisco, CA. University of Texas at El Paso was selected as a NASA Science Engineering Mathematics and Aerospace Academy (SEMMA) site for the 2010 solicitation. Funding for this program assists the institution with providing educational services to underrepresented K-12 target populations. The grantee institutions have also established collaborative partnerships with NASA centers to conduct research. Ames Research Center, White Sands Test Facility, and Goddard have all reported collaborative efforts with the URC institutions.

The URC projects were also able to acquire a cumulative of \$513,760,527.00 of funding from other NASA projects, external federal agencies, state government, and community organizations to support the centers. Many of the institutions have assistance from internal departments such as Sponsored Programs and Grant Contracts that provide assistance to projects preparing proposals to leverage funding. Some of the grantees also receive institutional support to purchase equipment, arrange for travel to conferences, hire additional faculty, establish workspace and facilities, and provide tuition support for students.

Project Contributions to APG Measures

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

<p>Performance Goals</p> <p>Achieve 40 percent participation of underserved and underrepresented (in race and/or ethnicity) in NASA higher education projects.</p> <p>URC Project Contributions = 1,981 <i>Total Hispanic or Latino: Female= 492, Male= 60, Total= 1,093</i> <i>Total Black or African-American: Female= 371, Male= 513, Total= 884</i> <i>Total American Indian or Alaskan Native (Tribal): Female= 2, Male= 1, Total= 3</i> <i>Native Hawaiian or other Pacific Islander: Female= 1, Male= 0, Total= 1</i></p>
<p>Achieve 45 percent participation of women in NASA higher education projects.</p> <p>URC Project Contributions = 823 <i>Total Female = 823</i> <i>Total Male = 1060</i> <i>Total= 1,883</i></p> <p>* Calculations include the number of Hispanic Females plus non-Hispanic Females.</p>
<p>20,000 undergraduate and graduate students participate in NASA education opportunities</p> <p>URC Project Contributions = 4,758 <i>Total Community College= 132</i> <i>Total Undergraduate= 2,546</i> <i>Total Graduate= 2,080*</i> Not all individuals in the total count receive a 'significant investment from the URC project'.</p>
<p>35,000 educators participate in NASA education programs.</p> <p>URC Project Contributions = 1,123 <i>Total Pre-Service Teachers= 27</i> <i>Total Informal Educators= 315</i> <i>Total Teachers Grades K-4= 138</i> <i>Total Teachers Grades 5-8= 399</i> <i>Total Teachers Grades 9-12= 244</i></p>
<p>200,000 elementary and secondary students participate in NASA instructional and enrichment activities.</p> <p>URC Project Contributions = 9,858 <i>Total grade k-4 students= 434</i> <i>Total grade 5-8 students= 3,083</i> <i>Total grades 9-12 students= 6,341</i></p>

Improvements Made in the Past Year

Grantees of the URC project vary in educational programming and in the methods used to support students. Many of the institutions have been able to work towards graduating students in the degree programs while other institutions have been able to acquire resources to continue developing their program. Center Technical Officers (CTO) from the various NASA Centers have been assigned to provide oversight and guidance to the projects. Project Directors frequently utilize the assistance of the CTO and subject matter experts to create partnerships with the NASA centers to provide access to laboratories and to identify researchers to assist with mentoring.

The Office of Education’s Performance Management System (OEPM) has been utilized by trained grantee users to enter data in order to track student activity, grantee performance, and outcomes. This is 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 allows 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.

The University Research Centers created the Student Leadership Series to highlight student achievements and offer a wide range of professional development opportunities for NASA URC-supported students as well as other STEM students at URC institutions. The inaugural Student Leadership Series conference was conducted at the Kennedy Space Center and hosted a select group of 29 students from the various URC projects and recommended for participation by URC grantee Project Directors. The conference included lecture workshops featuring Associate Administrator for Education Leland Melvin and engineering professor and professional development consultant Dr. Calvin Mackie. Three subsequent Student Leadership Series video conferences, hosted by the URC Project Management Office throughout the academic year, featured modules presented by Dr. Calvin Mackie. Topics included leadership skills, approaches to conduct research, and long-term career planning. Three sessions were held at Prairie View A&M University, Texas Southern University, and California State University Los Angeles with 605 students who attended.

The University Research Centers provided 13 of the 99 students confirmed to Cohort 3 of the NASA Student Ambassadors Virtual Community, or NSAVC. NASA's Office of Education provided special guidance to prime these graduates and undergraduates to participate in NASA events and to maximize employment and educational opportunities provided by the public exposure as a NASA Ambassador. The URC institutions represented by NSAVC Cohort 3 include: California State University, Long Beach; Delaware State University; Morgan State University; Prairie View A&M University and University of Texas at El Paso.

During the spring, the project management staff was able to develop an administrative and technical site visit evaluation rubric to be completed by the Technical Review Committee (TRC) at the completion of the annual site visit of their assigned URC institution. The rubrics were designed to assist TRC members with the review of the grantee. Questions provided in the rubric serve as an effective guide by providing criteria and goals for the evaluation during a site visit. This evaluation tool assists reviewers with staying on task, and obtaining feedback to determine how appropriately the site is achieving the goals of the program.

The URC Project Management office conducted a URC Project Directors' Meeting hosted by URC grantee Morgan State University on February 7-9, 2011. The conference served as an opportunity for URC Project Directors, staff, faculty, Technical Review Committee members, and NASA representatives to engage in conversations surrounding the development and sustainability of the grantees. Presenters at the meeting facilitated discussions regarding the goals and requirements of NASA Higher Education, highlight talking points to include strategic planning, partnerships, technical assistance, project administrative tools, and best practices. The URC Project Management Office continues to identify additional opportunities for project constituents to continue these conversations and share information to support and maintain the success of the grantees.

Project Partners and Role of Partners in Project Execution

Reports from the grantees indicate a wide range of collaborative projects and partnerships with other higher education institutions, industry, local education agencies, as well as NASA. University of Puerto Rico Rio Piedras developed a partnership with Cornell University to conduct a Biotechnology Workshop

titled Biomineralization and Drop Tube. North Carolina Central University's URC was able to submit a joint proposal with University of North Carolina to obtain funding for the National Science Foundation's Research Experiences for Undergraduates Program. Research scientists at the various NASA centers also utilize the URCs to conduct research and utilize the technical assistance from students to work towards completing projects for the agency. The grantees also create partnerships with local school districts in order to deliver STEM educational outreach, recruit students for summer camps and enrichment programs, and to provide training to teachers. URCs also utilize the professional expertise of advisory board members consisting of consultants in the field, faculty, industry-related businesses such as Boeing and Lockheed Martin, as well as small businesses.

References:

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