

**Minority University Research and Education Program (MUREP)  
Curriculum Improvement Partnership Award  
for the Integration of Research (CIPAIR)  
FY 2013 Annual Report (10/1/2012 – 9/30/2013)**

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**Project Description**

The Curriculum Improvement Partnership Award for the Integration of Research (CIPAIR) assists two- and four-year minority-serving institutions with strengthening their science, technology, engineering and mathematics (STEM) academic fields and technical programs. Funding is used to increase the quantity and quality of STEM curricula, the number of underrepresented and underserved students who attain STEM degrees, and the number of underrepresented and underserved students who choose careers in NASA-related fields. Examples of CIPAIR funded activities include: engaging CIPAIR students and faculty in research at NASA Centers; building alliances/partnerships between community colleges and research universities to enhance the availability of research experiences and ease the transition of CIPAIR students from two- to four-year institutions; and providing CIPAIR faculty with professional development and training to teach STEM courses.

CIPAIR integrates project management methodology to strategically enhance STEM curricula. Through the development of innovative project management curricula and/or the infusion of project management methodology into existing STEM curricula, minority institutions will be able to prepare STEM students for success in NASA and aerospace industry careers by providing both theoretical knowledge for thorough understanding, and "real world" experiences necessary for increased productivity. Students will gain the confidence, knowledge and skills necessary to understand conceptual frameworks, apply skills to manage projects and implement solutions to maximize efficiency. The project management aspect also helps students develop and improve social skills necessary for working within a team environment.

**Project Goals**

The primary goal of CIPAIR is to help two-year and four-year Minority Serving Institutions (MSIs) strengthen their curriculum in order to attract more students into STEM-based academic programs, retain them, and prepare them for success when they take the next steps in their education or careers. The strategy for achieving improvements in curriculum and student-learning outcomes is built upon four elements:

- Establishment or strengthening of relationships of MSIs faculty with NASA Centers;
- Integration of NASA-related content and research opportunities into the MSIs curriculum;
- Involvement of students in curriculum development and improvement; and
- Commitment of the MSIs administration to long-term sustainability.

It is through these elements that CIPAIR addresses Outcomes 1 and supports Outcome 2 of the NASA Strategic Plan (2006), the NASA Annual Performance Indicators (APIs), and priority STEM education

areas identified by the Committee on STEM Education (CoSTEM) of the National Science and Technology Council.

CIPAIR addresses the following FY13 Annual Performance Indicator (API):

- APG 5.1.2.1: ED-13-1: Provide significant, direct student awards in higher education to (1) students across all institutional categories and types (as defined by the U.S. Department of Education); (2) racially or ethnically underrepresented students, (2) females, and (3) persons with disabilities at percentages that meet or exceed the national STEM enrollment percentages for populations, as determined by the most recently 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.

The CoSTEM priorities that are indirectly supported by CIPAIR are:

- Enhance STEM Experience of Undergraduate Students: Graduate one million additional students with degrees in STEM fields over the next ten years
- Better Serve Groups Historically Under-represented in STEM Fields: Increase the number of students from groups that have been underrepresented in STEM fields that graduate with STEM degrees in the next 10 years and improve women's participation in areas of STEM where they are significantly underrepresented.

### **Project Benefit to Outcomes 1 and 2**

CIPAIR directly addresses Outcome 1 (*Contribute to the development of the STEM workforce in disciplines needed to achieve NASA's strategic goals through portfolio of investments*) and supports Outcome 2 (*Attract and retain students in STEM disciplines through a progression of educational opportunities for students, teachers, and faculty*) of the NASA education strategic plan. Additionally, CIPAIR contributes to the national agenda for STEM with focus on the community college STEM pipeline. CIPAIR institutions have continued to promote a number of the "Elements of Successful STEM Education Programs," described in the President's Council of Advisors on Science and Technology, *Engage to Excel: Producing One Million Additional College Graduates with Degrees in Science, Technology, Engineering, and Mathematics (STEM)*.

As a higher education-focused activity within MUREP, CIPAIR is responsible for reporting data from the previous year during this reporting call. **The following is finalized CIPAIR data for FY 2012 that addresses APG 5.1.2.1: ED-13-1:**

- 13 revised or new NASA-related STEM courses during FY2012
- 4,885 total course enrollment
- 4 CIPAIR students engaged as Summer Interns at nine NASA Centers

### **Project Accomplishments**

While no new awards were given in FY 2013 due to budget constraints, the following accomplishments were noteworthy:

- Students from Gadsden State Community College launched their first successful balloon launch and recovery. The data retrieved from this project was used in lab modules in the physical science courses during the academic year. Further lab modules were successfully implemented at the institution, including the implementation of a lapse rate study to analyze weather balloon data collected from the project.
- Grambling State University (GSU) made curriculum improvements by integrating NASA related research in the Physics, Chemistry, and Astronomy departments. Additionally, a new collaboration developed between GSU and Prairie View A&M University at Texas resulted in an invitation to present at THERMEC 2013: International Conference on Advanced Materials (paper will be published in Science Forum journal).
- Cañada College successfully implemented a program to enhance community college engineering student preparation for transfer to San Francisco State University (SFSU) through participation in upper-division capstone design and laboratory courses at the institution. The collaborative relationship between the partner institutions has been further strengthened through sharing of curriculum, participation of Cañada students in upper-division engineering courses at SFSU, and working with student interns to collaboratively develop and evaluate curriculum. These accomplishments resulted in five publications.
- Fond Du La Tribal and Community College experienced significant increase in number of Native American student applications (from 3 applications in 2012, to 13 applications in 2013). FDLTCC also added graduate student position to assist with mentoring activities.
- CUNY City Tech CIPAIR students and faculty participated in the Annual CUNY Summer Research Symposium in August 2012, where they showcased their summer NASA Center research and heard from keynote speaker Leland Melvin, Associate Administrator for NASA Education.
- Rust College conducted a 4-week NASA UNCF CIPAIR Summer Science Academy, which focused on astronomy and weather measurement.
- The University of Texas, San Antonio CIPAIR project led a 5 day workshop for 20 middle and high school teachers focused on NASA related science including remote sensing, climate change, polar research, and planetary science.
- Claflin University's CIPAIR PI, Nesan Sriskanda was selected to participate in the Claflin-Hofstra Faculty Exchange Program, where he spent Spring 2011 teaching engineering mechanics, and disseminating the NASA educational expertise and training he received in the previous years of the grant.
- A Virginia State University CIPAIR student was offered full-time employment upon graduation by the Goddard Space Flight Center (GSFC).

### **Project Contributions to Annual Performance (API) Measures and CoSTEM Priorities**

Successful CIPAIR-supported projects have contributed to performance measures and CoSTEM priorities as follows:

- FY2011 CIPAIR projects included 20 Minority Serving Institutions (MSIs)
- Of the 22 MSIs, 11 are HBCUs (52%); 8 are HSIs (33%); and 3 are TCUs (14%)
- Representation of 12 community colleges or two-year institutions (52% of total CIPAIR MSIs)
- Of the students enrolled in new and/or revised CIPAIR courses, 3,382 students are from underrepresented minority groups (69.23%) and 1,586 (32.47%) are female students
  - 1,407 African American; 881 Latino/Hispanic; 246 Native American; 39 Pacific Islander

### **Improvements Made in the Past Year**

In FY13 CIPAIR continued its transition towards a planned, full decommissioning in FY14. The project management team worked with the remaining projects to ensure the successful conclusion of their activities in FY14.

During the span of the project, CIPAIR has incorporated several strategies for institutional and research building capacity, including but not limited to the following:

- Involving students and faculty in NASA-related STEM research at NASA Centers.
- Building alliances/partnerships between community colleges and research universities to enhance the availability of research experiences to CIPAIR students at community colleges and ease their potential transitions from two- to four-year institutions.
- Providing mentoring through role models of diverse backgrounds to inspire students and help them excel in STEM subjects.
- Providing CIPAIR faculty with profession development and training to teach STEM courses, through summer institutes and programs organized by professional societies and organizations.

### **Project Partners and the Role of Partners in Project Execution**

The 17 awardees (including 14 active projects in FY2013) are partners in CIPAIR. Other partners include nine NASA Centers that collaborate with these projects to develop NASA-related curriculum and provide summer research experiences for CIPAIR students and faculty. Several projects are also developing partnerships with other entities to expand and sustain CIPAIR activities:

- The Cañada College/San Francisco State University project partnered with the Cañada College MESA and CALSTEP programs to secure funding for additional internships, for a total of 16 students.
- The CSU San Bernardino/College of the Desert project partnered with CSUSB Career Center for five additional internships (funded by Student Success Fee). The College of the Desert MESA program is also incorporating strategies developed under CIPAIR into its offerings.
- Two additional student interns were funded at the Fond du Lac Tribal and Community College through a partnership with the American Indian Higher Education Consortium (AIHEC).

### **Dissemination and Scientific Presentations**

Three CIPAIR projects engaged in notable examples of CIPAIR dissemination in FY2013 that will benefit other two-year institutions. The CSU San Bernardino/College of the Desert “Winternship” or winter intersession mini-research experience model developed under CIPAIR has now been implemented at Irvine Valley College (IVC) in California with successful outcomes. Three IVC students who participated in “winternships” presented posters at undergraduate research conferences.

The Cañada College/San Francisco State University partnership presented on their CIPAIR strategies and outcomes at a number of local and national conferences:

Chen, C., DeAndreis, J., Moala, P., Robles, A., Valdovinos, J., Enriquez, A., Pong, W., & Shahnasser, H. "Integrating earthquake engineering into community college student educational experience through a summer internship," American Society of Engineering Education Pacific Southwest Section Conference, April 18-20, 2013, Riverside, CA,.

Enriquez, A., Pong, W., Shahnasser, H., Mahmoodi, H., Jiang, H., and Chen, C., "Promoting academic excellence among underrepresented community college engineering students through a summer research internship program," American Society of Engineering Education Conference and Exposition, June 23-26, 2013, Atlanta, GA.

Garcia, J., Lohse, J., Paulino, J., Prado, H., Balani, A., Sridevi, L., Chen, C., Enriquez, A., Jiang, H., Mahmoodi, H., Pong, W., & Shahnasser, H. "Engaging community college students in research using summer internship on analysis of aerformance degradation of integrated circuits due to transistor aging effects in nano-scale," American Society of Engineering Education Pacific Southwest Section Conference, April 18-20, 2013, Riverside, CA,.

Mahmoodi, H., Garcia, J., Lohse, J., Paulino, J., Prado, H., Balani, A., Sridevi, L., Chen, C., Enriquez, A., Jiang, H., Pong, W., & Shahnasser, H. "Involving undergraduate students in nano-scale circuit research using summer internship," Interdisciplinary Engineering Design Education Conference, March 4-5, 2012, Santa Clara, CA.

The Grambling State University/Southern University at Shreveport partnership presented their CIPAIR model at the International Technology, Education, and Development (INTED) conference:

Seetala, N., Himaya, M., Derosa, Pl, War, M., Hubbard, D. and Reddy, Y. "Research experience - STEM undergraduate gear-up." Proceedings of INTED2013 Conference, Valencia, Spain, March 4th-6<sup>th</sup> 2013, Valencia, Spain. (Published by IATED, Eds. L. G. Chova, A. L. Martínez, I. C. Torres, ISBN: 978-84-616-2661-8, pp-2792-2801).

During FY2013, CIPAIR projects also contributed number of peer-reviewed presentations, posters, and publications o their NASA Center research. The following is a partial listing:

County, M. "Organic foods." NASA-STEM Academic Year Scholarship Program Seminar, SUSLA, Nov. 13, 2012, Shreveport, LA,.

Days, E. "Nanoparticles synthesis." NASA-STEM Academic Year Scholarship Program Seminar, SUSLA, March 2013, Shreveport, LA.

Days, E. "Using polyimides to enhance CNT composite films." NASA-STEM Academic Year Scholarship Program Seminar, SUSLA, October 4, 2012, Shreveport, LA.

Garcia, A. "Fuel cell degradation analysis." Poster at Southern California Conference on Undergraduate Research, Nov. 19, 2012, Camarillo, CA.

Himaya, M. "Super brain." Invited Seminar, Southern University at Shreveport, April 25, 2013, New Orleans, LA.

Seetala, N. "Material science research at GSU and NASA collaboration with SUSLA." Invited Seminar, Southern University at Shreveport, April 18, 2013, New Orleans, LA.

Seetala, N., Hendon, C., Tull-Walker, N., Van Behr, J., Hester, B., Lebron-Colon, M., and Meador, M. "Synthesis and characterization of polyimide-carbon nanotube composites." Invited Talk at the International Conference on Composites or Nano Engineering (ICCE-20), Beijing, China, July 22-28, 2012. (Paper is published in the World Journal of Engineering, 2013).

Seetala, N., Tull-Walker, N., Baburaj, A., Zhou, J., Wilkins, R., and Barnett, M. "Positron lifetime studies of irradiated ultra-high molecular weight polyethylene and composites made of Martian regolith" THERMEC '2013: International Conference on Advanced Materials, Las Vegas, NV, Dec. 2-6, 2013. (Paper published in the Science Forum Journal 2013).

Tull-Walker, N., Seetala, N., Barburaj, A., Zhou, J., Wilkins, R., and Barnett, M. "Irradiation effects of Ultra high molecular weight polyethylene and composites made of Martian regolith studied by PALS." Louisiana Academy of Sciences Meeting, March 9, 2013, Grambling, LA.

Van Behr, J., et. al. "Polyimides-CNT Composite Films Synthesis." Emerging Researchers National (ERN) Conference in STEM, February 28 - March 2, 2013, Washington, DC,.

Van Behr, J., et. al. "Synthesis and Characterization of Polyimides-CNT Composite Films." Presented at the 245th National Meeting and Exposition of American Chemical Society (ACS), April 11, 2013, New Orleans, LA.

Van Behr, J., et. al. "Synthesis and characterization of polyimide-CNT composite films." Annual Biomedical Research Conference for Minority Students (ABRCMS), November 7-11, 2012, San Jose, CA.