



PUERTO RICO LOUIS STOKES ALLIANCE
FOR MINORITY PARTICIPATION



PR-LSAMP

2008-09 ANNUAL PROGRESS REPORT

YEAR 3 PHASE IV

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Dr. Manuel Gomez, PI

**PR-LSAMP 2008-09 ANNUAL REPORT
YEAR 3 OF PHASE IV**

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I. Introduction

The Puerto Rico Louis Stokes Alliance for Minority Participation PR-LSAMP) is an alliance of three major higher education institutions in Puerto Rico with a total STEM undergraduate enrollment in the Fall of 2008 of 25,471, jointly working to strengthen STEM undergraduate education. Created in 1991, the PR-LSAMP alliance aims at increasing the number of STEM BS graduates, and the number of BS graduates that enroll in graduate school and eventually complete a PhD degree in a STEM field. As of June 2009, PR-LSAMP institutions have awarded 50,062 BS degrees in STEM fields (1991-2009). To achieve this goal, PR-LSAMP works at improving the effectiveness and efficiency of undergraduate STEM education by transforming the teaching and learning culture of the participating institutions. During Phase IV (2006-11) the following institutions are members of the PR-LSAMP alliance: University of Puerto Rico System, Inter American University System, and Pontifical Catholic University of Puerto Rico. The Polytechnic University of P.R. left the alliance at the end of Phase III, and no other institution was added in Phase IV. Since the emphasis of Phase IV is to increase the number of BS graduates that continue on and complete a graduate degree, the current three institutions in the alliance are the main P.R. institutions with this track record.

During Phase IV, PR-LSAMP will develop and implement four main strategies:

1. Enhancing Students Knowledge and Skills for Graduate Studies
2. A Mentored Undergraduate Research Experience, including an annual local scientific forum for students to present their research projects, and travel stipends to present research results at national scientific conferences
3. A Role Model Series to expose students to successful professionals in science and engineering fields to motivate them to continue graduate studies.
4. The Annual Best Practices Conference on Teaching and Learning to continue to expose STEM faculty to successful strategies to improve the teaching and learning process, so as to increase the number of STEM students that obtains a BS degree and continue graduate studies.

Also, the Bridge-to-the-Doctorate HRD/NSF Initiative, implemented in 2003, provides 2-year fellowships to former PR-LSAMP graduates to pursue graduate studies in STEM fields. As of July 2009, 72 fellowships have been awarded.

II. Major Accomplishments

1. In the Fall of 2008, 25,471 students were enrolled in STEM fields at PR-LSAMP institutions.
2. In academic 2008-09, 2,661 baccalaureate degrees were awarded in STEM disciplines (preliminary data)
3. 17% of the Hispanics who received a PhD nationwide in a natural science field, from 2002 to 2007, received their BS degree from a PR-LSAMP institution (NORC data).
4. 20% of the Hispanics who received a PhD nationwide in engineering, from 2002 to 2007, received their BS degree from a PR-LSAMP institution (NORC data).
5. The University of Puerto Rico awarded a total of 52 PhD degrees in STEM fields in academic year 2008-09.
6. Seventy four (74) third year students have been participating since their freshman year in a sustain 5-year effort (from entrance to graduation) to prepare them for graduate school and pursue a doctoral degree in a STEM field.

7. In academic year 2008-09, PR-LSAMP awarded 372 stipends (\$297,600) to undergraduate STEM students to participate in research experiences. Also, 248 stipends (\$49,600) were awarded by PR-LSAMP to researchers to cover laboratory materials for PR-LSAMP participants.
8. Three hundred fifty one (351) STEM students (246 undergraduates and 105 graduates presented their research projects at the annual Puerto Rico Interdisciplinary Scientific Meeting (PRISM), to an audience of 400 faculty members and students, for a total of 795 participants.
9. Thirty-two (32) undergraduate STEM students received PR-LSAMP travel stipends (\$18,120) to present their research projects in national and international conferences.
10. The National Institute of Standards and Technology provided \$53,341 to seven undergraduate STEM students to participate in research experiences with nationally recognized scientists, at their main site in Maryland
11. PR-LSAMP institutions secured \$25.8M in external and institutional funds to implement educational projects geared at strengthening STEM education at their institutions.
12. Pfizer Corp awarded 4 fellowships to Pharmaceutical Sciences majors for a total contribution of \$36,000.
13. PR-LSAMP received a \$25,500 supplemental award from NSF to participate in the DOE FaST Program.
14. One hundred and sixty six (166) participants from 14 institutions attended de PR-LSAMP 2008 Annual Best Practices Conference on Teaching and Learning (101 STEM faculty members, 38 STEM graduate students, and 27 STEM undergraduate students).

III. Participants and Collaboration with Other NSF Programs

Participating Institutions

The participating PR-LSAMP institutions in Phase IV are: The University of Puerto Rico System (www.upr.edu); Inter American University System (www.inter.edu), and Pontifical Catholic University of Puerto Rico (www.pucpr).

PR-LSAMP Staff

For the past 17 years the UPR Resource Center for Science and Engineering (RCSE) has served as the umbrella organization in this alliance, promoting the maximum collaboration of all institutions and synergy of efforts. The Project Investigator is Dr. Manuel Gómez, Director of the UPR Resource Center for Science and Engineering. During this period of time, Dr. Ana C. Piñero, served as the Co-PI and Coordinator at the Central Administration. Dr. Piñero retired this year and is now serving as an advisor to the Alliance. The Assistant Coordinator is Prof. Javier Figueroa, who is also the Coordinator of the BD Initiative, and coordinates the implementation of the PR-LSAMP Mentored Undergraduate Research Program and the Role Model Series. The Management Coordinator is Mrs. Ana Feliciano, responsible for the administrative and budgetary aspects of the project. They are all located at the UPR Resource Center for Science and Engineering main facility at the UPR-Río Piedras Campus.

The Dean of Science and the Dean of Engineering at the participating institutions collaborate with PR-LSAMP staff in the implementation of the PR-LSAMP strategies, and in articulating them with other STEM reform initiatives at their institutions. In institutions where the organizational structure does not provide for a science or engineering dean, the academic dean is the PR-LSAMP collaborator. A STEM faculty member is appointed at each institution by the dean to serve as the PR-LSAMP Liaison Officer, responsible for the on-site implementation of the program. For Phase IV, the PR-LSAMP Liaison Officers are:

Dr. Ivelisse Rubio, UPR-Río Piedras (Computer Science)
 Dr. Jeannette Santos, UPR-Mayaguez (Engineering)
 Dr. Ileana Rodríguez, UPR-Humacao (Chemistry)
 Dr. Belinda Román, UPR-Cayey (Biology)

Dr. Migdalia Sotomayor, UPR-Aguadilla (Biology)
Dr. Maiella Ramos, UPR-Arecibo (Chemistry)
Dr. Concepción Rodríguez, UPR-Bayamón (Biology)
Prof. Rafael Canales, UIA-Bayamón (Physics)
Dr. Rosa Brito, UIA-Metro (Chemistry)
Prof. Carmen Asencio, Pontifical Catholic University (Biology)

Information on the PR-LSAMP staff is found in the web page (www.prlsamp.org).

Other Collaborating Organizations

The Universidad Central del Caribe Medical School and the UPR Medical Sciences Campus provide students with research opportunities, particularly to biology and chemistry majors. The National Institute of Standards and Technology (NIST) of the U.S. Department of Commerce and the Smithsonian Institute provide students with research experiences during the summer. Students also benefit from the REU Programs across the nation, and research opportunities at mainland institutions.

Collaboration with Other NSF Sponsored Programs

The Resource Center for Science and Engineering (RCSE) of the University of Puerto Rico serves as the coordinating unit for this alliance, promoting the maximum collaboration of all institutions and synergy. The RCSE coordinates all major STEM systemic educational reforms on the Island, therefore, it provides for an integrated, systemic strategy to increase participation of Puerto Rican students in the STEM pipeline. At the K-12 level, the RCSE completed the implementation of a Distance Learning Program for K-12 Science and Math Teachers. The first of its kind in Puerto Rico, the program made use of distance learning technologies, and one of its key features was the integration of high-level learning computer technologies (mind tools) to train participants in the use of these tools to enhance the teaching and learning process. The project was implemented in 80 schools, covering all educational levels and impacted more than 1,500 teachers. Other K-12 projects implemented by the RCSE included the Statewide Systemic Initiative (SSI), and the Collaborative for Excellence in Teacher Preparation (CETP).

At the undergraduate level, the RCSE also coordinated the Title V Developing Institutions Consortium that included three PR-LSAMP/UPR campuses: Rio Piedras, Humacao and Arecibo. The project ended in 2008 and provided for the development of a series of electronic modules to assist STEM students in a variety of science and math courses at the three institutions. The modules deal with foundation knowledge and skills, key concepts, and areas that have proven difficult to master adequately. In the process of developing the modules, STEM faculty developed techniques for making the teaching-learning environment more student-centered. In addition, they became aware of the need for adequate assessment. Models and protocols were developed for developing additional support materials using technology.

At the graduate level, RCSE is coordinating the GK-12 Program and the Institute of Functional Nanomaterials (IFN) sponsored by the Puerto Rico Experimental Program to Stimulate Competitive Research (PR-EPSCoR), co-funded by NSF. The GK-12 Program began in 2008 and is a strategic interdisciplinary partnership between the two largest and most developed research institutes of the University of Puerto Rico System: the Institute of Tropical Ecosystem Studies (ITES) and the Institute for functional Nanomaterials (IFN), who together provide doctoral research projects to more than half of the graduate students (160) in the PhD programs in chemistry, biology, chemical physics, and environmental science at UPR-Rio Piedras. The GK-12 project will strengthen 7th to 9th teachers and students' scientific knowledge through multidisciplinary explorations of tropical ecosystems and functional nanoscience while improving graduate students' abilities to communicate and teach science. The project will impact 24 graduate students, at least 48 science teachers in eight 7th to 9th level schools, and at least 3,000 students at this level will have experienced first-hand the excitement of investigative research and have improved understanding of science.

The PR-EPSCoR IFN institute brings together 28 scientists and engineers actively working in nanoscience and technology problems from the University of Puerto Rico two main campuses: the research-intensive Rio Piedras Campus, and the Mayaguez graduate engineering programs. They are organized into three thematically coherent research clusters: 1) Functional dispersed nanostructures; 2) Functional nanostructures at the Interface, and 3) Multifunctional nanostructures. These clusters will function as Multicampus Interdisciplinary Research Groups (IRG) that share infrastructure and develop new group research projects and proposals. The IFN works with six strategic national partners: Argonne National Laboratory; Purdue University; UMass, NASA Glenn Research Center, Northwestern University, and Cornell University, all nationally recognized for their centers for nanotechnology research. The educational plan of the Institute explicitly calls for joint courses and co-supervision of thesis by the 28 professors, grouping participating PhD students into a single community of learners in the fields of nanoscience and nanotechnology. PR-EPSCoR has been key in the strengthening of the Puerto Rico scientific community by increasing the number of competitive researchers and building a sustainable infrastructure for competitive research at the main research universities. The main accomplishments of IFN in its first two years of operation have been: 1) The IFN researchers published collectively a total of 153 peer reviewed publications; 2) The IFN has a total of \$9.2M in approved competitive grants and has submitted a total of 21 new competitive proposals for the amount of \$12.7M to sustain the institute activities; 3) The IFN researchers mentored 271 students during the second year, a 32% increase over the previous year; 4) This year, the IFN researchers graduated six PhD students, all of them Hispanic females, one of them a former BDP Fellow; 4) The IFN has introduced over 4000 persons of all ages and backgrounds to nano science and technology, through its education and outreach component .

In addition, the RCSE coordinates the NSF sponsored The Alliance for Graduate Education and the Professoriate (AGEP) which provides support to doctoral STEM students and has in place an effective Mentoring and TA Training Program. AGEP fellows serve as mentors to undergraduate PR-LSAMP participants and to BD Fellows. Former BD Fellows have been awarded AGEP fellowships.

The coordination of these systemic initiatives by the RCSE has promoted the articulation of the pipeline as a unified and coherent effort, fostering a shared vision, the transfer of educational strategies, the cross-fertilization of efforts and the pooling of resources among all levels of the pipeline, leading to a synergistic effect that is critical for achieving lasting change.

IV. Activities and Findings for Year 3 of Phase IV

ACTIVITY #1: ENHANCING STUDENTS KNOWLEDGE AND SKILLS FOR GRADUATE STUDIES

Description of Activity #1:

The target of this activity are STEM students at UPR-Rio Piedras and UPR-Mayaguez, the two alliance institutions with graduate programs. Freshman STEM students will be selected (30 from UPR-Rio Piedras and 30 from UPR-Mayaguez) to participate in core skill workshops and seminars on frontier science and engineering topics to be offered at each institution during the 5-year grant period. This core of students will be tracked for progress as they move through the undergraduate pipeline, from entrance to exit, and enter graduate school to pursue a doctoral degree in a STEM field.

Findings for Year 3:

At UPR-Rio Piedras: Thirty-four STEM students are participating since their freshman year in this PR-LSAMP activity. They have just completed their third year of undergraduate studies, in this 5-year initiative. Twelve workshops/conferences were offered during academic year 2008-09. **Table 1** presents the topic of the workshops, the name of the resource professor, and the resource person's STEM field.

**Table 1
Workshops Offered at UPR-Rio Piedras, Academic Year 2008-09**

Workshop	Speaker	Area
Scientific Reading and Writing	Dr. Michelle Aide - UPR-Río Piedras	Biology
Successful Strategies for Studying for the GRE exam	Prof. Julio Rodríguez - UPR-Río Piedras	Science Education
Experiences in International Scientific Conferences	Bridge-to-the-Doctorate Fellows (5)	Various
Computational Modeling	Dr. Ricardo Cortéz, Tulane University Dr. Juan Restrepo, University of Arizona Dr. Pablo Negrón, UPR-Humacao	Computer Science and Mathematics
Natural History of Puerto Rico with Emphasis on Invasive Species	Dr. Rafael Joglar - UPR-Río Piedras	Zoology
The Concept of Distance and Scale in the Universe	Dr. José Alonso – UPR-Cayey	Radio Astronomy
Introduction to Freshwater Biology	Dr. Jorge Ortiz - UPR-Río Piedras	Limnology
Atomic Structure and Defect Behavior of Nanoparticles through Aberration-Free STEM, High-Resolution TEM and In-situ TEM	Dr. P.J. Ferreira - University of Texas at Austin	Physics
The Effect of Volcanic Activity on the Planet with an Emphasis on the Caribbean	Dr. Lizette Rodríguez - UPR-Mayagüez	Geology, Vulcanology
History and Development of the Material Science Discipline	Dr. Antonio Martínez - UPR-Río Piedras	Physics
Workshop on Analytical Chemistry at the Material Characterization Center in UPR-Río Piedras	Dr. Edgar Resto - UPR-Río Piedras	Physical Materials
Best Practices on Teaching and Learning Annual Conference	Dr. Jose Mestre, University of Illinois Dr. Robert Beichner, North Carolina State University	Physics Science Ed.
Total of 12 workshops/conferences	19 Presentors	Various

All participants completed successfully their third year of undergraduate studies and all 34 are working on a research project.

At UPR-Mayaguez: Forty students are currently participating in this 5-year initiative. Nine workshops were offered during academic year 2008-09. **Table 2** presents the topic of the workshops, the name of the resource professor, and the resource person's STEM field.

Table 2
Workshops Offered at UPR-Mayagüez, Academic Year 2008-09

Workshop	Speaker	Area
Sahara dust and its climatic and biological effects	Dr. Jasmine Detrés, UPR-Mayaguez	Marine Sciences, Biology
Effective Oral Presentations and Posters Presentations	Dr. Sandra Cruz Pol, UPR-Mayaguez	Chemical Engineering
Proposal Writing	Dr. Sandra Macksoud, UPR-Rio Piedras	Education
Best Practices on Teaching and Learning Annual Conference	Dr. Jose Mestre, University of Illinois Dr. Robert Beichner, North Carolina State University	Physics Science Ed
Nanotechnology	Dr. Magda La Torre, UPR-Mayaguez	Chemical Engineering
Fermionic Atom Systems in Optical Traps	Dr. Jeremy Armstrong - Lund Institute Sweden	Physics
Decoding the dark matter and the history of the Universe	Dr. Enectalí Figueroa - MIT	Physics
Nonstationary Stochastic Dynamics and Polymerization Dynamics	Dr. Rigoberto Hernández - Georgia Tech	Chemistry
The Social Challenge of Renewable Energy	Dr. Cecilio Ortiz, UPR-Mayaguez	Social Sciences
Total of 9 workshops/conferences	Total of 9 Presentors	Various

All students satisfactorily completed their third year of undergraduate studies, and 35 are working on a research project.

ACTIVITY 2 – MENTORED UNDERGRADUATE RESEARCH EXPERIENCE

Description of Activity #2:

During Phase IV PR-LSAMP will offer between 275 and 280 research stipends per year to an average of 200 students per year (a student may participate more than once in a given year) to participate in a mentored research experience. PR-LSAMP will provide participating PR-LSAMP undergraduate students a multi-faceted mentoring program at each institution, consisting of a Mentoring Coordinator, research mentors, and peer mentors. The Mentoring Coordinator at each institution will coordinate the mentorship strategies at each level (group mentorship through workshops, research mentorship, and peer mentorship). Research Mentors will be responsible for developing in PR-LSAMP students basic research skills, while participating in a given research project. Peer Mentors (a PR-LSAMP upper level student in the case of a 4-year institution and an AGEP graduate student or BDP Fellow in graduate institutions) will coach the PR-LSAMP undergraduate student through the stages of development while participating in the research experience and will also serve as a role model. The extent of the Mentored Research Program at each PR-LSAMP institution will vary depending on the number of students participating in research experiences and the number of research mentors.

Seminars will be offered during the academic year and the summer at each PR-LSAMP institution. A central part of this activity will continue to be the Puerto Rico Interdisciplinary Scientific Meeting (PRISM), the major local scientific forum for students from universities across the island to share their research projects and experiences with their peers and STEM faculty members. As part of this component, PR-LSAMP will also provide participants with travel stipends to present their research projects at national conferences.

Findings for Year 3:

All ten PR-LSAMP institutions have established the mentored research experience program. Each institution has a Mentoring Coordinator, responsible for coordinating the program and the group activities. **Table 3** presents the names of the Coordinators per institution.

**Table 3
Mentoring Coordinator by PR-LSAMP Institution**

PR-LSAMP Institution	Mentoring Coordinator	STEM Field
UPR-Rio Piedras	Javier Figueroa	Biology
UPR-Mayagüez	Carlos Rios Héctor Carlo	Biology Industrial Engineering
UPR-Humacao	Denny Fernández	Biology
UPR-Cayey	Belinda Román	Chemistry
UPR-Arecibo	Jose Arbelo	Biology
UPR-Bayamón	Alex Sloan	Biology
UPR-Aguadilla	Jesús Lee	Biology
Pontifical Catholic Univ.	Lizette Santos	Chemistry
IAU-Bayamón	Eduardo Pérez	Engineering
IAU-Metro	Rosa Brito	Chemistry

A total of 96 workshops were offered during academic year 2008-09. **Table 4** presents the workshops offered at each institution as part of the program. The institutions' calendar of workshops was posted in the PR-LSAMP web page, so students from the different PR-LSAMP institutions could attend those of their choice.

**Table 4
Workshops Offered by the Mentored Undergraduate Research Experience Program
Academic Year 2008-09**

Institution	Workshops Offered
UPR-Rio Piedras	Scientific Reading and Writing Successful Strategies to Study for the GRE Exam Experiences in International Scientific Conferences Computational Modeling Natural History of Puerto Rico with Emphasis on Zoology The Concept of Scale in the Universe Introduction to Freshwater Biology Atomic Structure and Defect Behavior of Nanoparticles through Aberration-Free STEM, High-Resolution TEM and In-situ TEM The Effect of Volcanic Activity on the Planet with an Emphasis on the Caribbean History and Development of Material Sciences Materials Characterization
UPR-Mayagüez	Data Base Search Applying to Graduate School Scientific Research Round Table Discussion Session How to Prepare an Oral Presentation How to Prepare a Scientific Poster Writing Scientific Research Articles Fermionic Atoms Systems in Optical Traps

Institution	Workshops Offered
	Learning How to Use the Computer End Note Program Preparing for the Puerto Rico Interdisciplinary Scientific Meeting How to Manage Difficult Behaviors Good Manners
UPR-Cayey	Materials Safety Data Methods Research Bioethics and Research SPSS Basics Dissecting A Research Paper Nanotechnology Research & Engaging the Public Choosing Our Mates: Is there a Science to It? Mathematical Modeling Analytical Reading and Thinking Skills Nanotechnology Workshop on Carbon Nanotubes
UPR-Arecibo	Security Rules in Research Laboratory I & II Design and Stages of a Research Project In Natural Sciences The New Data Base of Elsevier: Science Direct How to Make Effective Use of Scientific Articles Techniques In the Preparation of Chemical Solutions Sampling Techniques in Superficial Waters for the Analysis of metals, semi volatile organic compounds and bacteria Sensors Used for the Measurement of Physical-Chemical Parameters in Superficial Waters Writing Techniques How to Write a Scientific Article Experimental Design How to Prepare a Research Proposal How to Prepare and Present Statistical Results Oral Presentations Method and Techniques to Prepare Chemical Reagents Poster Preparation Bibliographic Writing Techniques
UPR-Bayamón	Model of Psychosocial Variables Related to Treatment Adherence in People with HIV Avoiding Plagiarism TBA Loyalty in Relationships Between Orchids and Fungi System Dynamics Perspective of Science How to Read and Write Scientific Articles The Hidden World of Fungi How to Make Effective Oral Presentations Nature and the Limits to Exponential Growth
UPR-Aguadilla	How to Design a Research Project Benchwork Preparatory Techniques Tips for Successful Interviews Summer Internship Opportunities Graduate Studies Opportunities Successful PowerPoint Presentations Tips for Successful Writing of a Personal Statement How to Prepare for Graduate School Standardized Tests "The Last Lecture": Oral Discussion of the Best Seller
Pontifical Catholic University	Laboratory Safety Successful Strategies to Study for the GRE Preparation of a Scientific Presentation Application for Graduate School

Institution	Workshops Offered
	Statistics: a Research Tool Ethics in Research Skills in Scientific Reading Conversational English for Science Students Scientific Research Symposium
UIA-Bayamón	Research Opportunities at NASA Centers Conversational English Reading and Writing Scientific Papers Preparing to Present at the Puerto Rico Interdisciplinary Scientific Conference STEM Career Day Meeting with NASA Research Students Summer Internship Opportunities Failures Detection in Dynamic Systems Applied Ethics Evolution: 200 years of Darwin Legacy Grid Computing Construction and Destruction of Bridges Vibrations in Buildings and Structure Failure
UIA-Metro	Orientation on Undergraduate Research Opportunities on Campus Time Management Laboratory Safety How To Read and Write Scientific Papers Developing Skills for Writing an Oral Presentation Data Base Management Concept Maps

Undergraduate Research Experiences sponsored by PR-LSAMP - PR-LSAMP awarded 372 stipends to STEM undergraduate majors to participate in mentored research experiences. Also, 248 stipends were awarded to the researchers to cover laboratory materials to be used by the students during their research experiences (\$200 per student), as shown in **Table 5**.

Table 5
PR-LSAMP Undergraduate Research Experiences
Academic Year 2008-09 and Summer 2009

Institution	Stipends Awarded to Students*	Stipends Awarded to Researchers for Lab Materials*	\$ Awarded to Students*	\$ Awarded to Researchers for Lab Materials*	Amount of Funds Awarded
UPR-Rio Piedras	92	50	\$73,600	\$10,000	\$83,600
UPR-Mayaguez	112	83	\$89,600	\$16,600	\$106,200
UPR-Humacao	22	8	\$17,600	\$1,600	\$19,200
UPR-Cayey	17	9	\$13,600	\$1,800	\$15,400
UPR-Bayamón	7	4	\$5,600	\$800	\$6,400
UPR-Arecibo	22	16	\$17,600	\$3,200	\$20,800
UPR-Aguadilla	12	12	\$9,600	\$2,400	\$12,000
UPR-Ponce	0	0			
Pontifical Catholic Univ.	29	22	\$23,200	\$4,400	\$27,600
IAU Metro	23	16	\$18,400	\$3,200	\$21,600
IAU Bayamon	36	28	\$28,800	\$5,600	\$34,400
TOTAL	372	248	\$297,600	\$49,600	\$347,200

* This figure is not headcount. A student and a researcher may participate more than once during the academic year and Summer research experiences. Funds reported include institutional funds for PR-LSAMP activities.

Summer 2008 Undergraduate Research Experiences Abroad

Through a concerted effort, PR-LSAMP has been extremely successful in securing undergraduate research experiences abroad for PR-LSAMP students. During the Summer of 2009, 19 students, as shown in **Table 6**, are conducting summer research off the island. In the case of the University of Texas at Arlington, the ten undergraduate students were accompanied by one Bridge-to-the-Doctorate Fellow, for a total of 11 participants at this site.

Table 6
Summer of 2009 Undergraduate Research Experiences Abroad

Name of Student	Research Site	Research Area
Eva Rubio Marrero (UPR-Mayaguez)	Biomufacturing Training and Education Center North Carolina State University	Industrial Biotechnology
Amilcar Torres (UPR-Rio Piedras) Eframir Franco Díaz (UPR-Humacao) Vianca Maldonado (UPR-Humacao) Moisés García Rosa (UPR-Mayagüez) Jennifer Carpena (UPR-Rio Piedras) Carlos A. Calderón (UPR-Humacao) Amnerys Castro (UPR-Humacao) Cristina Padilla (UPR-Rio Piedras) Antonio Huguet (UPR-Rio Piedras) Giovannie Acevedo (UPR-Rio Piedras) Natalia Ayala (UPR-Rio Piedras)	University of Texas, Arlington	Computational Modeling of Electromagnetic Solar Storms
Milena Bobea (UPR-Rio Piedras) Greichaly Cabrera (UPR-Humacao)	National Institute of Standards	Physics

Name of Student		Research Site	Research Area
Clara L. Cruz	(UPR-Rio Piedras)	and Technology (NIST)	Computer Sciences
Melissa Dávila	(UIA-Metro)		Electrical Engineering
Eliezer Ferrá	(UIA-Bayamón)		Electrical Engineering
Stephanie Montalvo	(UPR-Rio Piedras)		Computational Mathematics
Britzy Rivera	(PUCPR)		
Abner Ayala	(UPR-Mayagüez)	University of Illinois Urbana Champaign	Computer Engineering
Leishla M. Cruz	(UPR-Mayagüez)	University of Wisconsin, Madison	Chemistry
Sergio E. García	(UPR-Mayagüez)	Purdue University at West Lafayette, Indiana	Electrical Engineering
José Cruz	(UPR-Mayagüez)	Geroge Church lab at Harvard Medical School	Life/Biological Sciences
Laura Almodóvar	(UPR-Mayagüez)	University of Maryland	Life/Biological Sciences
Joshua Bonet	(UPR-Rio Piedras)	Iowa State University	Mathematics
Orlando Soto	(UPR-Mayagüez)	Massachusetts Institute of Technology	Life/Biological Sciences
José G. Montoyo	(UPR-Mayagüez)	University of Wisconsin, Madison	Life/Biological Sciences
Suehelay Acevedo	(UPR-Mayagüez)	University of Wisconsin, Madison	Life/Biological Sciences
Juan Nieves	(UPR-Mayagüez)	University of Wisconsin, Madison	Life/Biological Sciences
Iliane Miranda	(UPR-Mayagüez)	University of Georgia (UGA)	Life/Biological Sciences
Adriana Rivera	(UPR-Rio Piedras)	University of Nebraska, Lincon	Chemistry

These students will share their summer research experiences with other PR-LSAMP students in a scientific seminar to be held in the Fall of 2009.

The Puerto Rico Interdisciplinary Scientific Meeting – The Puerto Rico Interdisciplinary Scientific Meeting (PRISM) is the annual islandwide forum for undergraduate and graduate STEM students to present their research projects to their peers and STEM faculty members. For the past 17 years PR-LSAMP has co-sponsored this activity with the local chapter of the American Chemical Society and the AGEP Program. The 2009 PRISM was held at the University of Puerto Rico, Rio Piedras Campus. A total of 351 STEM students, 246 undergraduate and 105 graduate students (296 in the sciences, 45 in engineering, and 10 in mathematics) from the different PR-LSAMP institutions presented their research projects to an audience of 400 students and faculty members, for a record number of 795 participants.

The invited plenary speaker was Dr. Rigoberto Hernandez, Professor of Chemistry and Biochemistry at Georgia Tech. Dr. Hernandez obtained a Ph.D. in Chemistry from University of California at Berkeley.

His current projects involve questions pertaining to the chemical reaction dynamics of thermosetting polymers and living polymers, the diffusion of mesogens in colloidal suspensions and liquid crystals, the transport and control of adsorbates on a surface, the binding dynamics of proteins, the structure and transport in gas-expanded liquids and the dynamics of protein folding and rearrangement. The title of his conference was ***“Using Chemical Tools to Make Sense of Molecular, Economic and Social Networks”***.

Travel to Scientific Meetings

During 2008-09 PR-LSAMP provided a total of \$18,120 in travel stipends for students to present their research projects in national conferences. Thirty-two (32) STEM students from six (6) PR-LSAMP institutions benefited from this PR-LSAMP initiative. Examples of national forums attended are the AAAS, ACS, and AIChE. **Table 7** presents by institution the number of students that received travel stipends and total amount of funds awarded.

Table 7
Travel Stipends Awarded to STEM Undergraduate Students
To Present Research Projects at National Scientific Conferences in 2008-09

Institutions	Number of Participants	Funds Awarded (\$)
UPR Rio Piedras	12	\$7,470
UPR Humacao	5	\$3,150
UPR Mayaguez	10	\$5,000
UIA Bayamon	3	\$1500
UPR Cayey	1	\$500
UPR Arcibo	1	\$500
Total	32	\$18,120

NIST Summer Internships

Since Phase I the National Institute of Standards and Technology (NIST) of the U.S. Department of Commerce, has been providing summer research experiences to PR-LSAMP students. During the summer of 2009, seven students, from four different PR-LSAMP institutions participated in the 9 to 12 week summer Internship Program. NIST provided a total of \$53,341 to cover stipends, housing, and travel expenses. This internship provides students with the opportunity to work in research projects with mainland STEM students and nationally recognized researchers. **Table 8** presents the name of the participants and their research field.

Table 8
NIST Summer of 2009
Name of PR-LSAMP Participants, Institution and STEM Field

Name of Student	Institution	STEM Field
Milena Bobea	UPR-Rio Piedras	Physics Mathematics
Greichaly Cabrera	UPR-Humacao	Computational Mathematics
Clara L. Cruz	UPR-Rio Piedras	Computer Science
Melissa Dávila	Interamerican University of PR	Chemistry
Eliezer Ferrá	Interamerican University of PR	Computer Science
Stephanie Montalvo	UPR-Rio Piedras	Physics Mathematics
Britzy Rivera	Catholic University of PR	Biology
Total 7 students	Total of 4 institutions	Various

Pfizer Fellowships

PR-LSAMP joined efforts with Pfizer Corporation and four students in 2008-09 received a Pfizer fellowship for studies in Pharmaceutical Sciences, as shown in **Table 9**. Fellowships cover their cost of studies and research.

Table 9
Pfizer 2008-2009 Fellowship Recipients and Institution

Name	Institution
Kristie Laboy	UPR-Mayagüez
Joshua León	UPR-Mayagüez
Myrna Otaño	UPR-Río Piedras
María C. Rivera	UPR-Mayagüez

FaST (Faculty and Student Teams) Program

PR-LSAMP received a \$25,500 Supplemental award to participate in the DOE FaST Program. With these funds one professor and three of his students are working this summer (2009) at Argonne National Laboratory: Dr. Eduardo Ortiz, a Computer Engineering professor at UPR-Mayaguez, and three of his students Jaime Alvarez, Rafael Colon and Daniel Diaz are working with Dr. Guenter Conzelmann.

ACTIVITY #3 – ROLE MODEL SEMINARS

Description of Activity #3:

Role Model Seminars will be established at each participating PR-LSAMP institution to provide students an opportunity to hear and meet nationally renowned scientists, local researchers and scientists, and engineers working in industrial settings in Puerto Rico. The program will have a dual purpose, to enhance students' academic preparation through the scientific topic to be covered by each speaker, and to have the speakers serve as role models. Speakers will share pivotal events and influences on their educational, personal and scientific careers, such as significant events that shaped their decision to remain in school and conduct studies in a scientific or engineering field; mentors; major influences, such as research experiences or participation in scientific fairs, and particularly, obstacles encountered and how they overcame them. Following this presentation designed to establish rapport with the students, speakers will cover a scientific topic based on his/her field of research. Former and current PR-LSAMP BDP Fellows will attend these conferences to also serve as role models and share with undergraduate students their graduate experience.

Findings for Year 3: Role Model Seminars Offered by PR-LSAMP, Academic Year 2008-09

Speaker	Title of Conference	Site	Audience
Joaquín Medín Physics	System Dynamics a Conceptual approach: System Thinking and System Behavior	UPR –Río Piedras	BDP Fellows
Hernán Santos Geology	Geology of the Caribbean Plate-History and Techtonics	UPR- Río Piedras	PRLSAMP Students
Rigoberto Hernández Chemistry	Polymerization Dynamics	UPR- Río Piedras	BDP Fellows and Chemistry Faculty and Graduate students
Rigoberto Hernández Chemistry	Using Chemical Tools to Make Sense of Molecular, Economic and Social Networks	UPR- Río Piedras	Undergraduate and graduate students, faculty and general public from PR-LSAMP institutions
Ramón López Physics	Space Weather: Solar Storms and Solar Wind and their Impact on the Earth Magnetosphere	UPR-Mayagüez and Río Piedras	BDP Fellows, PRLSAMP students and STEM students
Cedar García Marine Biology	Phylogeny and Systematics of Caribbean Coral Reefs	UPR-Río Piedras	BDP Fellows
Wilson Ramírez Geology and Paleontology	Paleontology of the Coral Reefs of Lago Enriquillo, Dominican Republic	Lago Enriquillo, Dominican Republic	BDP Fellows

ACTIVITY #4: THE ANNUAL BEST PRACTICES CONFERENCE ON TEACHING AND LEARNING

Description of Activity #4:

PR-LSAMP offers the Annual Best Practices Conference on Teaching and Learning. Approximately 200 STEM faculty members attend this event. Local and national resources are selected to present their successful teaching and learning strategies. The event continues to sustain the network of support developed among STEM faculty members from the different PR-LSAMP institutions. This network is also reinforced electronically through the PR-LSAMP Website.

Findings for Year 3:

For the past six years PR-LSAMP has been sponsoring an annual conference on Best Teaching and Learning Practices to Improve Students' Academic Performance. The conference was held on October 24, 2008. We had two main speakers, Dr. Jose Mestre, from the University of Illinois at Urbana, addressed two topics: "Cognitive Research and Active Learning: A Review of the Current Literature on How People Learn" and "From Expert-Novice Reasoning to Classroom Practice: Pure and Applied Studies of Physics Cognition". Dr. Robert Beichner, from North Carolina State University, presented "The Student-Centered Active Learning Environment for Undergraduate Programs (SCALE-UP) Project".

BD Fellows from the different cohorts attended the activity together with 27 STEM undergraduate students, and 101 STEM faculty members for a total of 166 participants.

ACTIVITY #5 - THE BRIDGE-TO-THE-DOCTORATE PROGRAM

The thrust of this activity is to motivate former PR-LSAMP students to continue graduate studies in a STEM field. The BD Program offers 12 fellowships annually (except for Year 1 when only 10 fellowships were awarded) for the first two years of graduate studies. In August 2003 PR-LSAMP received its first Supplemental Award to initiate the Bridge-to-the-Doctorate Program. In this annual report results from Cohorts 1 to 5 are presented, as funds were provided as a supplemental award to PR-LSAMP. As of August 2007, BDP became a separate program, and results for Cohort 6 were reported in a separate report, as per NSF instruction.

Findings for the BD Program – The First Five Cohorts

The Bridge-to-the-Doctorate Program awarded 58 fellowships to the first five BDP Cohorts (2003-2007). Fifty six Fellows are in the pipeline for the Ph.D. Fellows represent all STEM disciplines, as shown on **Table 10**.

Table 10
Number of BD Fellowships by STEM Discipline

STEM Discipline	Fellowships
Chemistry	28
Biology	12
Engineering	7
Physics	6
Marine Sciences	3
Mathematics	2
Total	58

Table 11 shows per Cohort, the number of fellowships and the scientific conferences attended by the Fellows.

**Table 11
Fellows and Scientific Conferences attended by BDP Cohort**

Cohort	Fellows	Scientific Conferences
1	10	112
2	12	66
3	12	115
4	12	89
5	12	38
Total	58	420

Tables 12-16 show the Fellow's progress in the PhD pipeline by Cohort.

Cohort #1 (2003-05) - Ten BD fellowships were awarded. **Table 12** shows Cohort #1 Fellows' progress in the PhD pipeline.

**Table 12
Cohort #1 (2003-05) BD Fellows' Progress in the PhD Pipeline, June 2009**

Fellows	STEM Field	Degree Date
Azlin Biaggi	Physics	PhD 2008
Betzaida Castillo	Chemistry	PhD August 2009
Agustín Díaz	Chemistry	PhD December 2009
Karilys González	Chemistry	PhD 2010
Daniel Caballero (1 year award) and Michelle Cartagena substituted Daniel in year 2	Chemistry	Daniel PhD 2010 Michelle PhD 2010
Marilyn García	Chemistry	PhD 2010
Yamaris Pacheco	Chemistry	PhD 2010
Jessica Oyola	Chemistry	PhD 2010
Luzed Díaz	Biology	PhD 2011
Omar Cruz	Chemistry	Opted for a job in industry

Cohort #2 (2004) - The twelve Cohort #2 Fellows began graduate studies in August 2004. **Table 13** shows Cohort #2 Fellows' progress in the PhD pipeline.

Table 13
Cohort #2 (2004-06) BD Fellows' Progress in the PhD Pipeline, June 2009

Fellows	STEM Field	Graduation Date
Luis A. Rodríguez	Civil Engineering	MS 2007 / Working in Industry
Luis González	Civil Engineering	MS 2007 / Working in Industry
Miguel González	Chemistry	MS 2007 / PhD 2011
Laura Granell	Biomedical Science	MS 2007 PhD 2013 Yeshiva University
Priscilla Santiago	Chemistry	MS 2007
Deborah Acevedo	Chemistry	MS December 2009
Yeira Padilla	Chemical Engineering	PhD December 2009
Yashira Estrada	Marine Sciences	MS 2010
Olga Abreu	Marine Sciences	MS 2010
Yaritza Maldonado	Marine Sciences	MS 2010
Madalis Casiano	Chemistry	Opted for Employment
Lourdes Cabello	Chemistry	Opted for Employment

Cohort #3 (2005) – Fellows from Cohort #3 began graduate studies in August 2005. **Table 14** shows Cohort #3 Fellows' progress in the PhD pipeline.

Table 14
Cohort #3 (2005-07) BD Fellows Progress in th PhD Pipeline, June 2009

Fellows	STEM Field	Graduation Date
Ana Longo	Biology	MS 2008 / PhD 2014 Cornell Univ.
Damaris Suazo	Chemistry	MS June 2009 / PhD 2014
Francisco Solá	Physics	PhD August 2009
Pamela Medina	Biology	MS December 2009
Félix Araujo	Biology	MS December 2009
Yisaira Díaz	Chemistry	PhD 2010
Giselle Flores	Chemistry	PhD 2010
Manuel Rivera	Physics	MS 2010
Sofia Burgos	Biology	PhD 2010
José González	Biology	PhD 2010
Enid Contés	Chemistry	PhD 2011
Yazmín Martínez	Physics	Opted for employment

Francisco Solá completed his PhD in Physics (material science and nanotechnology) in a record of 4 years, and was recruited by the NASA Glenn Research Center as a junior research scientist in the Electron Microscopy Facilities.

Enid Contes is participating in the STI Summer Internship Program/NASA Science and Technology Scholar Program at the Ames Research Center. She is working in gas detection using functionalized carbon

nanotubes sensors under the tutelage of Dr. Jing Li. Dr. Li's lab is one of the world leading labs in gas detection nanopores. She is also working on the development of novel and efficient sensors fundamental to support the aerospace industry.

Cohort #4 (2006) – The twelve Cohort #4 Fellows began graduate studies in August 2006. **Table 15** presents Cohort #4 Fellows' progress in the PhD pipeline.

Table 15
Cohort #4 (2006-08) BD Fellows' Progress in the PhD Pipeline, June 2009

Fellows	STEM Field	Graduation Date
Iván López	Physics	MS May 2008 / PhD 2012
Mariely Hernández	Mathematics	MS December 2009
Pablo Hernández	Biology	MS December 2009 / PhD 2013
Fernando Piñero	Mathematics	MS December 2009
Bárbara Casañas	Chemistry	MS 2010
Francheska Ruíz	Ecology	MS 2010
Edward Avilés	Chemistry	PhD 2011
María del Mar García	Chemistry	PhD 2011
Jesúan Betancourt	Chemical Physics	PhD 2011
Yanira Enríquez	Chemistry	PhD 2011
Griselle Hernández	Chemistry	PhD 2012
Pamela Vallejo	Chemistry	PhD 2012

Cohort #5 (2007) – Cohort #5 Fellows began graduate studies in August 2007. **Table 16** presents Cohort #5 Fellows' progress in the PhD pipeline

Table 16
Cohort #5 (2007-09) BD Fellows' Progress in the PhD Pipeline, June 2009

Fellows	STEM Field	Graduation Date
Ruth Hidalgo	Mechanical Eng.	MS December 2009
Carlos A. Rodríguez	Biology	MS 2010
Manuel Delgado	Biology	PhD 2011
Karinél Nieves	Chemistry	PhD 2011
Denisse Soto	Chemical Eng.	PhD 2011
Dionne Hernandez	Chemistry	PhD 2012
Ismael Alicea	Chemistry	PhD 2012
Ida Pantoja	Biology	PhD 2012
Ana R. Cameron	Chemical Eng.	PhD 2012
Damián Reyes	Chemical Eng.	PhD 2012
Juan Burgos	Physics	PhD 2014 Michigan State Univ.
Rosalyn González	Biology	On leave for health reasons

Dionne Hernandez is conducting research this summer under the guidance of Dr. Kristen Kearns, a world renown scientist in the field of material sciences at the Air Force Research Laboratory (AFRL). Only a few top graduate students across the nation are selected each year by this research academy. Dionne is conducting research in the cutting edge area of carbon nanotubes applied to silicon batteries anodes.

Denisse Soto is taking this summer the course on “Mesoscopic Simulation of Dynamics Fluids at the University of Wisconsin-Madison. This course is offered to the ten top graduate students across the nation. Upon completion of this course, Denisse will have the knowledge to perform simulations of many situations necessary for her research thesis.

Supporting BDP Activities for Cohort #5 Fellows

Table 17 shows the activities offered by PR-LSAMP during 2008-09 to Cohort #5 Fellows during their second year of graduate studies.

Table 17
BD Supporting Activities for Cohort #5 Fellows, Academic Year 2008-09

Topics	Resources
How to make effective oral presentations and posters	Dr. Gerardo Morell, UPR-Rio Piedras
Geology of Puerto Rico	Dr. Hernán Santos, UPR-Mayagüez
BDP Fellows visit the Laboratories of IFN Researchers at UPR-Mayagüez	Dr. Nelson Cardona, UPR-Mayagüez Dr. Carlos Rinaldi, UPR-Mayagüez Dr. Aldo Acevedo, UPR-Mayagüez Dr. Oscar M. Suárez, UPR-Mayagüez
Summer Research Experiences at the University of Texas at Arlington	BDP Fellows
Best Practices on Teaching and Learning Annual Conference	Dr. Jose Mestre, University of Illinois Dr. Robert Beichner, North Carolina State University
Introduction to Proposal Writing	Dr. Sandra Macksoud - UPR-Rio Piedras
Computational Modeling	Dr. Ricardo Cortéz, Tulane University Dr. Juan Restrepo, University of Arizona Dr. Pablo Negrón, UPR-Humacao
Field Trip “Geology and Natural History of Puerto Rico Central Mountain Region”	Dr. Hernán Santos, UPR-Mayagüez Dr. Wilson Ramírez, UPR-Mayagüez Dr. Eugenio Santiago, UPR-Rio Piedras
Field Trip to Monserrate Island to Study the Volcanic Activity in the Caribbean	Prof. Javier Figueroa – UPR-RCSE Dr. Lizette Rodriguez, UPR-Mayaguez
Graduate School Opportunities at Harvard University	Harvard Visiting Professorsf
Fermionic Atom Systems in Optical Traps	Dr. Jeremy Armstrong - Institute Lund Sweden
Nonstationary Stochastic Dynamics and Polymerization Dynamics	Dr. Rigoberto Hernández - Georgia Tech Institute
Space Weather	Dr. Ramón López - University of Texas at Arlington
Puerto Rico Interdisciplinary Scientific Meeting	Dr. Rigoberto Hernández - Georgia Tech Institute
Field Trip to Isla Magueyes Marine Laboratory to Study Coral Reefs	Prof. David Cuevas, UPR-Mayagüez
Research on Fossil Coral Reefs at Laguna Henriquillo, Dominican Republic	Dr. Wilson Ramírez - UPR-Mayagüez

Conferences Attended by Cohort #5 Fellows during their Second Year of Graduate Studies

Table 18 presents the scientific conferences attended by BD Cohort #5 Fellows during their second year of studies.

Table 18
Scientific Conferences Attended by Cohort #5 Fellows
Academic Year 2008-09

Name	Conference	Site	Date of Travel
Ana Cameron	The XV International Congress on Rheology – The Society of Rheology 80 th Annual Meeting	Monterey, CA	August 3-8, 2008
	Hougen Symposium on Frontiers of Liquid Crystals	Madison, Wisconsin	April 23-24, 2009
	The 2009 NSTI Nanotechnology Conference and Trade Show	Houston, Texas	May 3-7, 2009
Rosalyn González	2008 Annual Meeting of American Society for Biochemistry and Molecular Biology	San Diego, CA	April 5-9, 2008
Ruth Hidalgo	TMS 2008 Annual Meeting and Exhibition	New Orleans, LA	March 8-12, 2008
	TMS 2009 Annual Meeting	San Francisco, CA	February 14-19, 2009
Karinel Nieves	Spring 2009 National Meeting and Exposition	Salt Lake City, UT	March 22-26, 2009
Damián Reyes	The AIChE National Student Conference	Philadelphia, PA	November 16, 2008
	21st North American Catalysis	San Francisco, California	June 7-12, 2009
Denisse Soto	The 11 th Conference on Electrorheological Fluids and Magnetorheological Suspensions	Dresden, Germany	August 25, 2008
	Mesoscopic Simulation of Dynamics in Complex Fluids	Univ. of Wisconsin Madison	October 17-October 22, 2008
Ida Pantoja	109th General Meeting American Society for Microbiology (ASM)	Philadelphia, Pennsylvania	May 17-21, 2009
Dionne Hernández	215th Electrochemical Society Meeting	San Francisco, California	May 24-29, 2009
Carlos A. Rodriguez	Joint Meeting of Ichthyologists and Herpetologists	Portland, Oregon	July 22-27, 2009
Juan Burgos	Third Joint Meeting of the Nuclear Physics Division of the American Physical Society and The Physical Society of Japan	Big Island, Hawaii	October 13-17, 2009

Visits to High Schools

Each BDP fellow visited annually a public high school participating in the PR-LSAMP Pre-College-to-College bridging component. As part of the workshops conducted by PR-LSAMP on Saturdays at the selected schools, the visiting BDP fellow shares with students their high school and undergraduate experiences, including preferred courses, teachers and professors that were their role models, and insights on how to succeed in a university environment. But most importantly, they serve as role models to these high school students, and motivated them to pursue careers in STEM fields.

V. Undergraduate STEM Education

During academic year 2008-09 PR-LSAMP institutions secured a total of \$25.8M to enhance, strengthen, and sustain their STEM Programs. **Tables 19 to 26** present the educational initiatives initiated or continued at each PR-LSAMP institution. Projects are presented by funding source and amount of funds assigned for that year.

Table 19 - UPR-Aguadilla

Project Description	Sponsor	Amount of Funds
From School Desk to Scientist Work Bench: Birth of a Scientist	US DoE	\$195,196
CECIMAT	PR DoE	\$825,000
EPA Environmental Educational Grant	EPA	\$49,861
Introduction to Solar Energy System	Private Funds	\$22,620
TOTAL		\$1,092,677

Table 20 - UPR-Arecibo

Project Description	Sponsor	Amount of Funds
Donation to student members from the UPRA ACS SA Chapter to attend the 237th ACS National Meeting & Exposition, Salt Lake City, UTAH	Various	\$350
Donation of materials to support laboratory courses from the Biology and Physics-Chemistry Departments.	Abbot Biotechnology Ltd.	\$35,000
Creation of Algebra Videos	UPR-Arecibo	\$5,390.89
Development and analysis of a mathematical model to measure frequency of the use of words	UPR-Arecibo	\$7,046.68
Laboratory Enhancement and Curricular Revision for the Veterinary Technology Program	USDA & UPR-Arecibo	\$75,000
Collaboration through Technology Initiatives to Enhance Academic, Student and Library Support Services (TV-COOP)	US DoE - Title V Program	\$700,000
Integrated Science Multiuse Laboratory (ISMuL)	NASA	\$24,000
Integrated Science Multiuse Laboratory (ISMuL)	NASA	\$50,000
ACS National Meeting Travel Grant (NMTG)	ACS	\$300
Grant for chemical technology students to travel to the 237th ACS National Meeting & Exposition	UPR-Arecibo	\$1,500
Grant for chemical technology students to travel to the 237th ACS National Meeting & Exposition	UPR-Arecibo	\$1,000
Minority Travel Awards three undergraduate Students and one Faculty Advisor	Society of Toxicology (SOT)	\$7,500

Project Description	Sponsor	Amount of Funds
Project for Talented Students (Center for Academic Excellence)	PR-DoE and UPR-Arecibo	\$100,000
Enhancing Science and Math Learning through the Integration of Research and Technology (ENCIMAIT)	USDoE;Math & Science Partnership (MSP) & UPR-Arecibo	\$750,000
Curricular and Professional Development Activities to support Associate Degree in Biotechnology Operations	NSF-ATE	\$50,000
TOTAL		\$1,207,087

Table 21 - UPR-Cayey

Project Description	Sponsor	Amount of Funds
Research Infrastructure for Minority Institutions	NIH	\$835,681
Howard Hughes Program	HHMI	\$40,000
2008 Exceptional Research Opportunities program (EXROP)	HHMI	\$4,500
Technological Training and Development Center for the Community	PR DoE	\$936,865
Institute to Support Community Learning Centers	PR DoE	\$478,034
Title V Hispanic Serving Institutions	US DoE	\$590,542
Research Infrastructure for Minority Institutions (Dra. Isar P. Godreau)	NIH	\$835,681
Science Education Alliance-SEA	HHMI	\$75,000
TOTAL		\$3,796,303

Table 22 - UPR-Rio Piedras

Project Description	Sponsor	Amount of Funds
Advanced Instrumentation For Enhancement Of Nanotechnology Education	US DOD	\$258,000
Center For Research Excellence In Science and Technology	NSF	\$158,298
Brain Recombination Processes In Learning and Memory	DHHS	\$228,218
Support for University Biomedical Excellence	DHHS	\$166,321
Strengthening Institutions-Hispanic Serving Institutions	USDoE	\$542,333
Puerto Rico Math And Science Partnership (MSP)	NSF	\$5,663,738
Sub-award from The PR-MSP	NSF	\$51,838
Research Experience For Teacher LTER	NSF	\$74,000
Developing A Sustainable Education And Research Agenda At El Verde Field Station	NSF	\$17,328
Development of a Contextual and the Integrated Curriculum for Elementary School Level	PR-DoE	\$1,182,012
Saturday Academies for Talented 10 to 12 Students in Public Schools	PR-DoE	\$138,605
Teaching Ecological Complexity Through Field Science Inquiry	Portland Univ.	\$24,899
TOTAL		\$8,505,590

Table 23 - UPR-Mayaguez

Project Description	Sponsor	Amount of Funds
35 Scholarships to 195 STEM students	Various	\$522,225
Summer Transportation Institute for High School Students	FHA	\$65,435
Summer Research Internship for Undergraduate Students	US Army	\$430,000
Workshops and Orientations on Surveying and Topography for High School Students and Teachers	CIAPR	\$15,000
Pre-Engineering Program for High School Students	Various	\$42,000
Mechanical Engineering Summer Internship	Various	\$13,000
NOAA UPRM Educational Partnership: Summer Internship on Meteorology	NOAA	\$50,000
Undergraduate Research Summer Program	Lockheed Martin	\$10,000
PREM: Research Experience for Undergraduate, High School students and Teachers	NSF	\$32,000
CREST: Research Experience for Undergraduate and High School Students and Teachers	NSF	\$52,460
Student Preparation for International Competitions in Mathematics	AMS	\$7,500
Science on Wheels	NSF	\$114,000
REU: Chemical Engineering	NSF	\$89,000
Research Experience for Undergraduate and Outreach Activities for High School Students and Teachers in the areas of Electronics, Radars, Weather, and Solar Energy	NSF	\$44,000
IAP: Undergraduate Research	Various	\$38,000
PR Weather Camp for 17 students and Bridge to program in Atmospheric Science and Oceanographic for 12 students.	NOAA	\$1,000
Six week Internship for 4 undergraduate students at the University of Rhode Island and two at UPR-Mayaguez	FHA	\$18,000
Total		\$1,543,620

Table 24 - UPR-Humacao

Project Description	Sponsor	Amount of Funds
UPRH MARC Undergraduate Research Training Program	NIH	\$468,227.00
Minority Biomedical Enhancement at UPRH (RISE)	DHHS	\$500,000.00
PENN-UPR Partnership for Research and Education in Materials (PREM)	NSF	\$570,000.00
RUI: Conducting Polymer Nanofibers for Device and Sensor Applications: Motivating undergraduate students into research in Materials Science	NSF	\$101,000.00
Understanding the Nature of the Metallic State in Conducting Polymers, a Crucial Step in the Fabrication of Enhanced Polymer Based Electronic Devices	DOD	\$211,006.00
Minority Science and Engineering Improvement Program (MSEIP)	US DoE	\$73,706.00
UPRH Biomedical Research Improvement Program (MRBS-SCORE)	DHHS	\$411,995.00
Student Support Services	US DoE	\$367,011.00
Programa UpWard Bound	US DoE	\$250,000.00
Collaboration through Technology Initiatives to Enhance Academic and Student	US DoE	\$241,391.00
Ronald Mc Nair Post Baccalaureate Achievement Program	US DoE	\$225,562.00
PR Math and Sc. Part. (ALACIMA)	NSF	\$200,000.00
Improving Academic Outcomes for Science and Math Students Through a Technology- Based Consortium Program	US DoE	\$80,861.00

Undergraduate Research in Mathematics as a Strategy to Increase Academic Achievement and Motivate Students to Pursue Studies in Mathematics	NSA	\$258,985.00
IDeA Network for Biomedical Research Excellence (INBRE)	NIH	\$601,925.00
Talent Search Program	US DoE	\$257,769.00
TOTAL		\$4,819,438

Table 25 – UIA-Bayamon

Project Description	Sponsor	Amount of Funds
Mechanical Engineering Manufacturing Laboratories	Microsoft PR	\$300,000
Academic Laboratories: Acquisition of Three Software Licenses for Installation in 50 computers at the Academic Labs		\$50,000
Vehicle Designing Competition	Infotech Aerospace Services	\$1,000
MRI: “Acquisition of a Full-Wave Interferometric Digital radio System for Space Research and University Education”	NSF	\$226,025
"IDea Network of Biomedical Research" INBRE	NIH	\$166,903
Institutional Funds to Enhance PR-LSAMP	UIA	\$100,000
Student Support Services Program	USDE	\$375,528
Puerto Rico Space Grant Consortium	NASA	\$16,325
MRI: Acquisition of a Gas Chromatograph/Mass Spectrometer (GC/MS) for Research and Teaching in Science and Engineering	NSF-MRI	\$140,342
Title II-B “Mathematics and Science Partnerships Program MSP-21 Phase II”	PR-DoE	\$549,940
TIGRE: “The Interamerican Geospace Research Experiment”	NASA	\$10,500
TOTAL		\$1,936,563

Table 26 - Pontifical Catholic University of P.R.

Project Description	Sponsor	Amount of Funds
MSEIP-An Online Lecture and Laboratory Experience in General Chemistry without Compromising Academic Rigor for Nontraditional Students	US DoE	\$132,610
Puerto Rico Space Grant Consortium-NASA	NASA	\$12,978
Renovation of an Existing Building into a Biotechnology Research Center	US DoC	\$2,800,000
TOTAL		\$2,945,588

Grand Total	\$25.8M
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VII. Contributions to the Development of Human Resources

In academic year 2008-09, PR-LSAMP institutions awarded 2,661 baccalaureate degrees in science, technology, engineering, and mathematics (STEM) disciplines. Since 1991, **PR-LSAMP institutions have awarded a total of 50,062 BS degrees in STEM fields, making a significant contribution to the STEM workforce.** Table 27 presents the number of STEM degrees awarded per academic year, and Table 28 the number of BS degrees awarded in 2008-09 by PR-LSAMP institution.

Table 27
Total Number of BS STEM Degrees Awarded by Academic Year

Academic Year	Number of STEM BS Degrees Awarded
1990-91	1,709
1991-92	1,840
1992-93	1,896
1993-94	2,086
1994-95	2,281
1995-96	2,674
1996-97	2,754
1997-98	2,726
1998-99	2,789
1999-00	2,771
2000-01	2,893
2001-02	3,094
2002-03	3,207
2003-04	3,123
2004-05	3,106
2005-06	3,124
2006-07	2,654
2007-08	2,674
2008-09	2,661
TOTAL	50,062

Table 28
BS Degrees Awarded by PR-LSAMP Institution in Academic Year 2008-09

Institution	Year 2008-2009
University of Puerto Rico	1,996
Pontifical Catholic University	75
Inter American University	590
TOTAL	2,661

Table 29 presents the number of BS degrees awarded per STEM discipline in Academic Year 2008-09.

Table 29
STEM Baccalaureate Degrees Awarded by Discipline in 2008-09

STEM Discipline	BS Degrees Awarded
Chemistry	250
Physics/Astronomy	100
Mathematics	36
Life Science	218
Computer Science	12
Engineering	770
Geosciences	1136
Agricultural Sciences	34
Environmental Sciences	105
TOTAL STEM Disciplines	2,661

Enrollment in STEM Disciplines at PR-LSAMP Institutions

Table 30 shows undergraduate STEM enrollment from 1991 to 2008. **Table 31** shows undergraduate enrollment by STEM discipline in the Fall 2008, and **Table 32** presents STEM undergraduate enrollment by institution.

Table 30
Total Undergraduate STEM Enrollment By Academic Year
at Participating PR-LSAMP Institutions

STEM Undergraduate Enrollment	Academic Year
12,572	1991-92
14,557	1992-93
14,818	1993-94
16,344	1994-95
19,139	1995-96
23,159	1996-97
24,767	1998-99
23,476	1999-00
23,427	2000-01
26,524	2001-02
27,529	2002-03
27,068	2003-04
28,299	2004-05
27,993	2005-06
23,825	2006-07
23,975	2007-08
25,471	2008-09

Table 31
FT/PT Undergraduate Enrollment at PR-LSAMP Institutions By STEM Discipline
Fall 2008

STEM Discipline	Undergraduate Enrollment Fall 2008
Chemistry	2184
Physics/Astronomy/Electronics	1080
Mathematics	539
Computer Science	2816
Geosciences	127
Engineering	6198
Life Sciences	11,121
Environmental Science	451
Agricultural Science	955
TOTAL ALL STEM DISCIPLINES	25,471

Table 32
Undergraduate STEM Enrollment by PR-LSAMP Institution Fall 2008

Institution	STEM Enrollment Fall 2008
UPR-Río Piedras	2732
UPR-Mayaguez	8229
UPR-Humacao	1015
UPR-Cayey	860
UPR-Bayamón	1569
UPR-Arecibo	869
UPR-Aguadilla	966
UPR-Ponce	621
Inter American University	7368
Pontifical Catholic University	1242
TOTAL	25,471

Baccalaureate Graduates that Continue Graduate Studies

If we track the baccalaureate origin of the nationwide PhD recipients, the National Opinion Research Center (NORC), which reports Ph.D. data, shows for the years 2002 to 2007 that:

- 17% of the Hispanics (U.S. citizens) that obtained a **PhD in a Natural Science** field nationwide, received their BS degree from a PR-LSAMP institution (344 out of 2,025). UPR-Río Piedras and UPR-Mayaguez are the leading baccalaureate institutions of U.S. Hispanic Ph.D.'s in Science.
- 20% of the Hispanics that obtained a **PhD in Engineering** nationwide, received their BS degree from a PR-LSAMP institution (98 out of 487). UPR-Mayaguez is the leading baccalaureate institution of U.S. Hispanic Ph.D.'s in Engineering.

Table 33 shows the leading U.S. Baccalaureate Institutions of U.S. Hispanic Ph.D.'s in the natural sciences for the 2002-2007, and **Table 34** for engineering fields.

Table 33
Top 25 Baccalaureate Institutions of U.S. Hispanic PhDs (U.S. Citizens Only)
Natural Sciences 2002-07

Baccalaureate Origin Institution	Degrees Awarded	
1. University of Puerto Rico – Rio Piedras	130	PR-LSAMP Institutions UPR-Rio Piedras = 130 UPR-Mayaguez = 119 UPR-Humacao = 35 UPR-Cayey = 20 UPR-Medical Sciences = 16 Pontifical Catholic U. = 12 IAU at San Germán = 7 UPR-Aguadilla = 5 Total = 344
2. University of Puerto Rico – Mayaguez	119	
3. University of California – Berkeley	46	
4. University of California – Davis	36	
5. University of California – Los Angeles	36	
6. University of Puerto Rico – Humacao	35	
7. University of Texas at Austin	32	
8. University of Florida	32	
9. New Mexico State Univ. Main Campus	30	
10. Univ. of California – San Diego	30	
11. Univ. of New Mexico – Main Campus	25	
12. University of Arizona	29	
13. Texas A&M University	28	
14. University of Miami	28	
15. MIT	26	
16. University of Texas El Paso	25	
17. Cornell University	24	
18. University of California Irvine	24	
19. University of California – Santa Cruz	24	
20. University of New Mexico – Main Campus	24	
21. The University of Texas at San Antonio	22	
22. Florida International University	21	
23. Rutgers University	21	
23. University of Puerto Rico – Cayey	20	
24. Harvard University	19	
25. Stanford University	19	
Total Top 25 Institutions	905	
Total Doctorates Granted to Hispanics	2,025	

Source: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates, Williams-Kim@norc.org.

Other institutions in Puerto Rico with BS graduates that went on to receive a PhD during this period of time were: UPR Medical Sciences Campus (16); Pontifical Catholic University (12), Inter American University at San Germán (7), and UPR-Aguadilla (5). In summary, from the top 24 of Hispanic doctorate recipients, institutions in Puerto Rico accounted for 38% of the baccalaureate origins of the Hispanic PhDs in the natural sciences, and 17% of all institutions.

Table 34
Top 19 Baccalaureate Institutions of U.S. Hispanic PhDs (U.S. Citizens Only)
Engineering 2002-07

Baccalaureate Origin Institution	Degrees Awarded
1. University of Puerto Rico – Mayaguez	89
2. MIT	19
3. University of Texas at El Paso	17
4. University of California – Berkeley	15
5. University of Florida	15
6. Texas A&M University	11
7. California Polytechnic State U. – San Luis Obispo	9
8. University of Texas at Austin	9
9. University of Illinois at Urbana	9
10. University of Puerto Rico – Rio Piedras	9
11. Cornell University	8
12. University of California – Davis	8
13. Florida International University	7
14. Georgia Institute of Technology	7
15. Rensselaer Polytechnic Institute	7
16. Purdue University – Main campus	6
17. University of Houston	6
18. University of Maryland at College Park	6
19. John Hopkins University	5
20. New Mexico State University - Main Campus	5
21. University of California – San Diego	5
22. University of Miami	5
23. University of New Mexico – Main Campus	5
24. University of South Florida	5
Total Top 24 Institutions	287
Total Research Doctorates in Engineering	487

Source: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates, Williams-Kim@norc.org

At the local level, the University of Puerto Rico's three graduate institutions, UPR-Rio Piedras, UPR-Mayaguez, and UPR-Medical Sciences awarded 52 PhD degrees in science and engineering in 2009. **Table 35** presents the number of PhD degrees awarded by these three campuses in 2008-09 by science and engineering field. **Table 36** presents the number of PhD degrees awarded by the three campuses from 1990 to 2009.

Table 35
Number of PhD Degrees Conferred in 2008-09 by UPR System

Institution	Number of PhD Degrees	Science and Engineering
UPR-Rio Piedras	21	Chemistry (10) Biology (8) Chemical Physics (2) Mathematics (1)
UPR-Medical Sciences	7	Microbiology (2) Biochemistry (5)
UPR-Mayaguez	24	Marine Sciences (6) Engineering (10) Applied Chemistry (6) Computer Science (2)
Total	52	

Table 36
Number of PhD Degrees Conferred by the University of Puerto Rico
by Science and Engineering Field from 1990 to 2009

Academic Year	Number of PhD Degrees Conferred
1990	14
1991	9
1992	9
1993	17
1994	12
1995	10
1996	17
1997	16
1998	31
1999	22
2000	25
2001	36
2002	32
2003	30
2004	23
2005	31
2006	48
2007	29
2008	51
2009	52
TOTAL	514

VIII. Dissemination, Publications and Products

Dissemination

The PR-LSAMP Web Page

The PR-LSAMP web page (www.prlsamp.org) describes the PR-LSAMP program, including the calendar for the current year activities; information on past, current, and up-coming main events, such as the Puerto Rico Interdisciplinary Scientific Meeting and the Annual Best Practices Conference on Teaching and Learning. It also includes the PR-LSAMP Annual Reports with detailed descriptions on the activities and findings, and the data on enrollment and degrees awarded by institution.

The electronic data base system of the PR-LSAMP Web Page provides for: 1) electronic registering for all PR-LSAMP activities; 2) an electronic file on STEM researchers; 3) electronic evaluation of PR-LSAMP participants in undergraduate research experiences by the researchers; 4) electronic evaluation of all applications by the staff for compliance with PR-LSAMP requirements; 5) sending e-mails in group format; 6) electronic letters of recommendations and certification of work; 7) immediate access to individual data of PR-LSAMP participants, and 8) statistics on enrollment and degrees for any given year.

Other Dissemination Efforts

PR-LSAMP Liaison Officers, STEM faculty members and PR-LSAMP undergraduate and graduate students continue to be our best spoke-persons for the project as they attend and/or present their research projects in national scientific conferences

Publications

The PR-LSAMP Newsletter

A Newsletter is published twice a year and disseminated to all institutions in Puerto Rico and to LSAMP institutions nationwide. It includes the highlights of the activities and main events. Also, special issues are produced to cover significant events, such as the Bridge-to-the-Doctorate Fellowship Program

The PR-LSAMP Annual Report

A copy of the PR-LSAMP Annual Report is sent to the Presidents, Chancellors, Deans and Department Directors of all the PR-LSAMP institutions. A copy is also sent to the PI of the LSAMP institutions nationwide.