

**Symposium on Undergraduate Nano-Education:
"Addressing the Challenges of Nanoscale Science & Engineering Education"**

Presentation: "Integrating Nanoscience Concepts and Skills in Upper Undergraduate Laboratories"
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Presenter Biography:

Manuel Gomez is the Director and founder of UPR's Resource Center for Science and Engineering, which has operated since 1980 with an NSF grant that has been continuously funded since then by NSF and other federal agencies. The Center's mission is to nurture and promote educational and research programs that will increase K-16+ students' learning in STEM fields and promote competitive research in Puerto Rico. He also directs the Puerto Rico Louis Stokes Alliance for Minority Participation (PR-LSAMP) project and the Puerto Rico Alliance for Graduate Education and the Professoriate (PR-AGEP) program. He co-directs the Institute for Functional Nanomaterials (IFN), an NSF grant of \$13M, for a three-year period, involving 40 researchers in a strategic alliance with four National Laboratories. He is the Chair of the Puerto Rico EPSCoR State Committee, Co-PI of the EPSCoR program, and Professor of Physics.

He was the Director of the Partnerships for Innovation (PFI) and Puerto Rico Statewide Systemic Initiative (PR-SSI) projects. As the PR-SSI Director, he pioneered the K-12 systemic reform in science and mathematics in more than 800 Puerto Rico schools. As EPSCoR and PFI Director, he has worked closely with entrepreneurs and the high-tech industry to promote technology transfer, commercialization, and innovation in Puerto Rico. He was also Dean of UPR-Rio Piedras' College of Natural Sciences and the Vice President for Research and Academic Affairs of the UPR System.

In addition to his many publications and conference presentations in the fields of physics, materials science, as well as educational reform, Dr. Gomez has served on panels and advisory committees of the National Research Council (NRC), American Association for the Advancement of Science (AAAS), National Institute for Science Education (NISE), and NSF on issues dealing with the systemic reform of education. He has been active in the establishment of a science and technology policy for economic development in Puerto Rico, co-authoring the Science and Technology Policy for Economic Development that was approved by the Governor of Puerto Rico in 1996.

Abstract:

The current state of the teaching laboratories in advances courses is outdated. The curriculum teaches the core concepts and occasionally new applications. The laboratories lack modern infrastructure, modern equipment and innovative experiments that promote problem solving skills. The development of new experiments, bringing the most recent results in research in nanoscience and technology, will open a window to motivate students to pursue graduate careers in nanoscience in addition to providing the fundamentals to excel in industrial setting. By replacing outdated experiments in the established curriculum with experimental activities in nanoscience and technology the Laboratory Courses will be brought into the 21st Century milieu. Moreover, the development of new curricular materials that employ the new approaches and tools will vividly show and explore the fundamentals of science and will familiarize students with modern research topics and techniques. Alignment of the Physical Chemistry and Modern Physics curriculum and the results of this alignment with the "Big Ideas" identified by NCTL, was completed previous to the design of new laboratory experiences in order to ensure that the targeted concepts and skills are properly developed, while introducing them to a new area of expertise. This project has catalyzed the development of four new laboratory experiences and has fostered two new collaborations with Cornell University and University of Buffalo to implement materials already developed for this level. Assessment of student learning is underway and dissemination of these materials will be done via the IFN website and collaborators' web-based libraries.