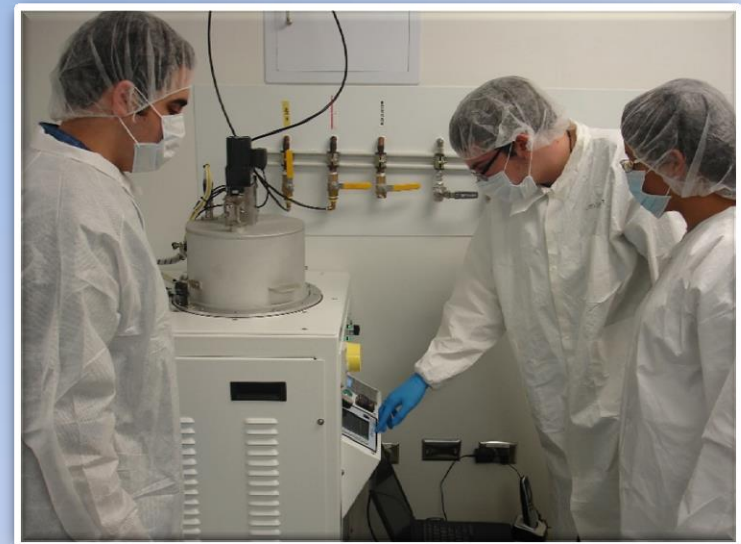
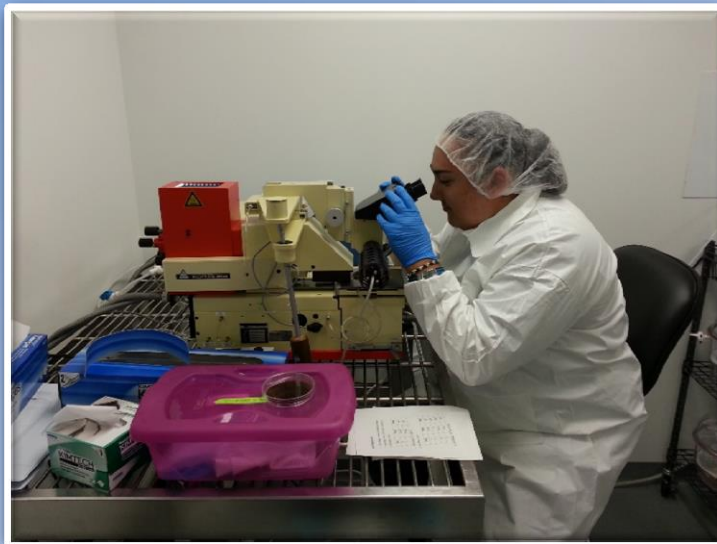


UPR Current Activities and the Vision for PR

Josee Vadrine, Luis G. Rosa, Rogerio Furlan
University of Puerto Rico at Humacao



Background

- Member of the NACK Project since it began in 2008.
- First Phase (NACK Center, 2008 - 2012):
 - Implementation of Penn State's Capstone courses Semester as Workshops at UPR-Humacao:
 - ✓ 6 courses offered as "stand alone" workshops (one per semester, free, 4.2 credits of continuous education)
 - ✓ Curriculum adaptation was necessary to offer workshops without a cleanroom using different equipment.

Background

- Established partnership with local governmental agency interested in developing a skilled nanotechnology workforce in Puerto Rico
 - ✓ A proposal for research and education was granted by PRIDCO, including funds for the construction of a cleanroom.
- Implemented a cleanroom for education and research
 - ✓ The project of a cleanroom was established with participation of Central Administration, and a company was hired for construction.

Main results 2008 - 2012

- Implemented a nanotechnology lab with a cleanroom certified as class 10,000, including micro- and nanofabrication infrastructure: *fume hood**, *DI water system**, *mask aligner**, *ellipsometer**, *optical microscope**, thermal evaporator, Dip-Pen Nanolithography, AFM, furnace, Solar Cell Analyzer, Wire Bonding. **sponsored by NACK*
- Issued 108 certificates by Continuous Education, as of June 2012.
- Published our accomplishments in the Journal of Nano Education (2012 edition).

Participation in the NACK Network

- Further develop the Puerto Rico's Hub by interacting with industries, other UPR campuses , private universities, community colleges, and governmental agencies.
- Establish collaborations with institutions in the Caribbean and in Latin America.
- Incorporate nanotechnology as part of our Associate Degree in Electronics Technology program.
- Continue offering the nanotechnology workshops using the cleanroom.
- Establish effective outreach to the US Hispanic community, offering instructional and recruitment material in Spanish.
- Foster general interaction with NACK Network core partners.

Main Accomplishments

- Two nanotechnology courses were approved and incorporated in our Associate Degree in Electronics Technology and will be offered in the Spring 2014 semester
 - Industrial Nanotechnology
 - ✓ Fundamentals of nanotechnology, safety and hygiene, vacuum systems, and materials
 - ✓ Fabrication processes and characterization techniques
 - ✓ Micro- and nanostructures and applications
 - Laboratory of Industrial Nanotechnology
 - ✓ Safety and hygiene in the cleanroom, simulation and operation of vacuum systems
 - ✓ Optical microscopy, ellipsometry, profilometry, SEM, and AFM
 - ✓ Thermal evaporation, sputtering, RIE, micro-and nanolithography, solar cell fabrication and characterization, synthesis and characterization of nanoparticles and nanofibers

Main Accomplishments

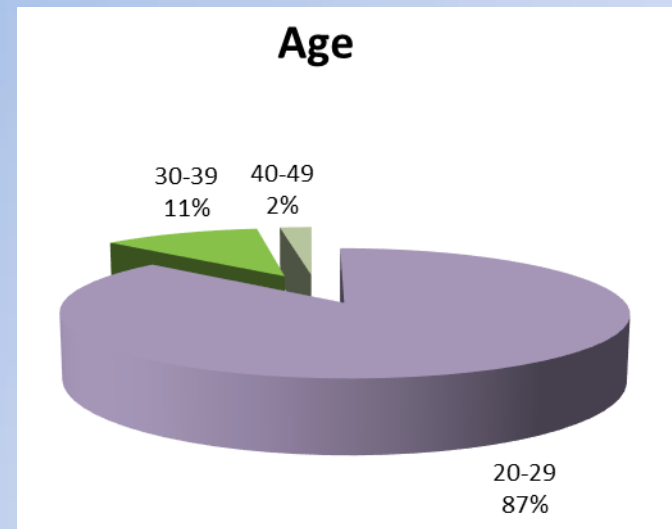
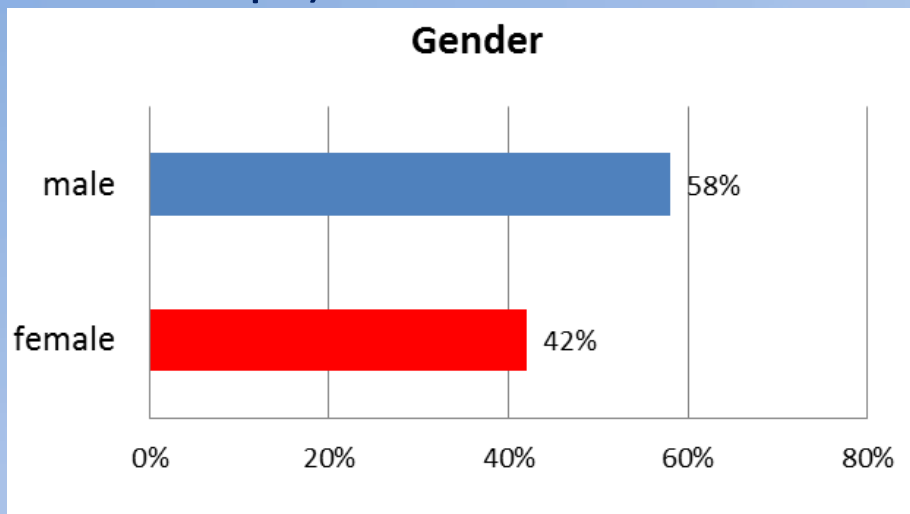
- A certification in nanotechnology was approved and will be offered through Continuous Education
 - Self-sustainable program
 - 1 year (3 courses per semester; 14 weeks)
 - Can be used to train industry's employees
 - Can be used by other institutions as part of their programs
- An Advisory Committee was established
 - Help define relevant skills needed by local industry; evaluate our nanotech activities
 - We are looking for volunteers to expand this committee

Main Accomplishments

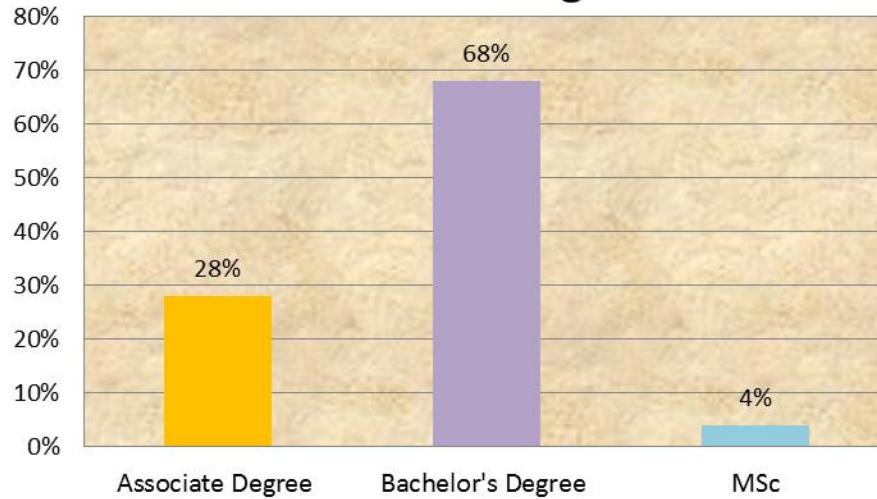
- Translation of Instructional Material
 - Establish a network of collaborators for translating instructional material
 - ✓ E. Fachini, E. Cruz, C. Prado (UPR-Rio Piedras)
 - ✓ E. Romero (Turabo University)
 - ✓ A. Rincón (Inter American University of Puerto Rico - Bayamon Campus)
 - ✓ M. Santiago (UMET – Cupey)
 - A Glossary and 10 “Introductory Level Modules” were translated to Spanish (www.nano4me.org; Educators; Educators Resources)
 - Translation of Capstone Semester Courses is in progress
 - Two brochures of the National Nanotechnology Initiative were translated to Spanish (Energy and Nano brochures)

Main Accomplishments

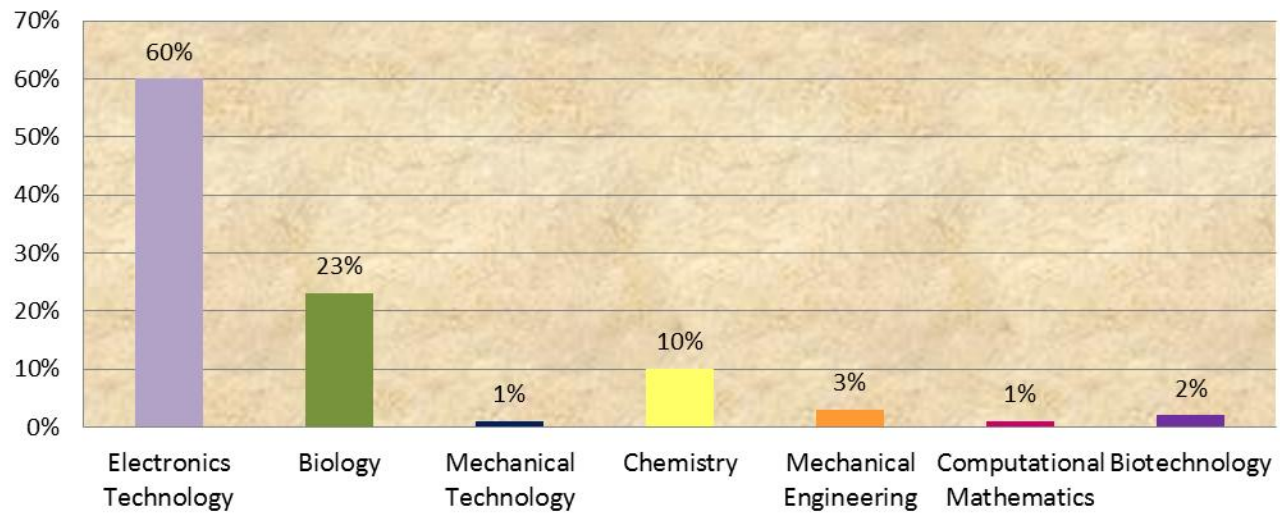
- Nanotechnology workshops offered through Continuous Education
 - We are offering the 9th workshop, using the cleanroom (as of May 2013)
 - Estimation of ~ 156 certificates will be issued by December 2013 (average of 17 certificates per workshop)
 - Population impacted : 90 participants (considering all workshops)



Academic Degree



Academic Program



Vision for Puerto Rico

- We established initiatives that can be replicated in PR (Associate Degree curriculum; nanotech workshops)
- Our nanotech certification, offered through Continuous Education Program, can be used by other institutions/programs to complete their curriculum following PENN State's model
- Specific courses of the certification program can be used to train people from industry, according to their needs
- Our cleanroom model (simplified version of PENN State's model can also be replicated, although our facility is open to be used by the community
- This collaboration should be extended to other institutions in the Caribbean and in South America

Acknowledgements

PENNSTATE

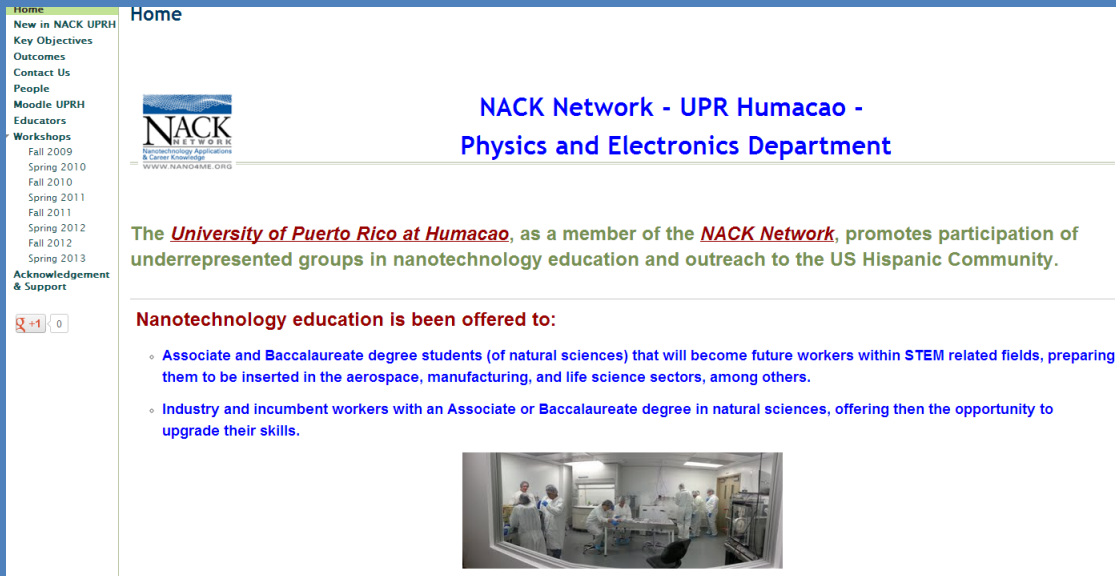


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**NACK Network - UPR Humacao -
Physics and Electronics Department**

The *University of Puerto Rico at Humacao*, as a member of the *NACK Network*, promotes participation of underrepresented groups in nanotechnology education and outreach to the US Hispanic Community.

Nanotechnology education is been offered to:

- Associate and Baccalaureate degree students (of natural sciences) that will become future workers within STEM related fields, preparing them to be inserted in the aerospace, manufacturing, and life science sectors, among others.
- Industry and incumbent workers with an Associate or Baccalaureate degree in natural sciences, offering then the opportunity to upgrade their skills.



<https://sites.google.com/site/nackupr>



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