Fostering Students' Graduate Education Attainment and Success in Biomedical and Aerospace Engineering and Sustainable Agriculture

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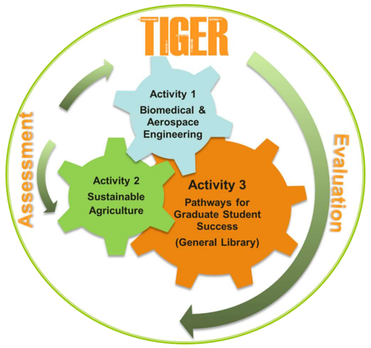
BACKGROUND

The Transformational Initiative for Graduate Education and Research (TIGER) upraises the institutional STEM environment, by cultivating experiential learning and field research for low-income graduate students working on biomedical and aerospace engineering, and sustainable agriculture.



PROJECT OBJECTIVES

ACTIVITY 1 **Expand Post-Baccalaureate Opportunities in Engineering Related to Biomedical and Aerospace**

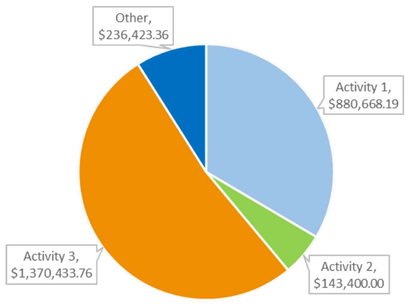
- Support four new graduate programs in the Engineering College and create three research educational core facilities
- Support outstanding program fellows to participate in summer internships at US universities and federal laboratories
- Promote attainment and successful completion of the postgraduate degree

ACTIVITY 2 **Enhance Graduate Research Experiences in Sustainable Agriculture**

- Enhance agricultural field facilities for graduate research
- Enhance graduate experiential learning through field research at the Alzamora Educational Farm
- Promote attainment and successful completion of postgraduate degrees

ACTIVITY 3 **Create Collaborative Pathways for Graduate Student Success**

- Create the Graduate Research and Innovation Center (GRIC) at the General Library
- Improve graduate participants' research experience and skills
- Establish a campus-wide eResearch Initiative



Budget 2014-2019

RESEARCH FACILITIES

The project enhanced graduate curricular activities by funding three new core research facilities: i) Center for Biomedical Engineering and Nanomedicine; ii) Center of Advanced Aerospace Engineering & Manufacturing Technologies; and iii) Thermal Processing Laboratory. TIGER also defrayed an expansion of the field research facilities of the Alzamora Educational Farm and the creation of the Graduate Research and Innovation Center (GRIC), a technology-infused, collaborative learning space at the General Library.

Center for Biomedical Engineering and Nanomedicine

This laboratory hosts research on biomolecular interactions of novel materials for medical applications. This unique training facility in Puerto Rico provides a forefront multidisciplinary and translational approach to biomedical research. The cutting-edge laboratory is furbished with cell culture suites, a spinning disk confocal laser scanning microscopy facility, and equipment necessary for nanomaterial synthesis, characterization, and cellular and molecular analytical equipment.

Center of Advanced Aerospace Engineering & Manufacturing Technologies

This center provides rapid manufacturing of low-volume 3D printed, CNC-machined, sheet metal, and soon injection-molded custom parts for prototyping and short-run production. As the ultimate training facility in the Caribbean, the center seeks to educate and motivate low-income Hispanic students to pursue a career related to aerospace engineering as well as in the biomedical fields.

Thermal Processing Laboratory

This new laboratory is dedicated to the processing of materials via specialized high temperature equipment. This is an expansion of the existing Advanced Materials Characterization Laboratory. The main piece of equipment is a split vertical tube furnace with 80mm OD quartz tube and vacuum flanges that is being used by TIGER fellows working on aerospace alloys in collaboration with Oak Ridge National Laboratories. The laboratory is supporting the newly established graduate program in Materials Science and Engineering.

Alzamora Educational Farm

This critical addition to the Alzamora Farm is intended to expand the research areas for graduate programs in agriculture. The field facility is now furbished with a new and improved irrigation system with automated control and backup power generation. Appropriate management of generated organic residues and allowed for a new Organic Farm Certification (9.3 acres). Because of its near-campus location, the farm allows research activities close to academic offerings and advising. Among the pertinent research fields impacted there are: sustainable agriculture, composting, urban agriculture, and alternative intensive food production systems.

Graduate Research and Innovation Center (GRIC)

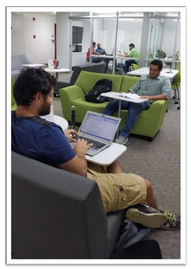
SERVICES

Guidance, training and support

Scholarly Communications
Data Management
Workshops & seminars
Virtual Reference
Style Manuals
e-Resources
Subject guides

TECHNOLOGY

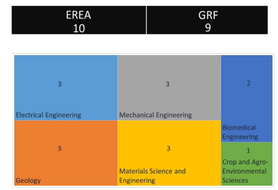
SPACE



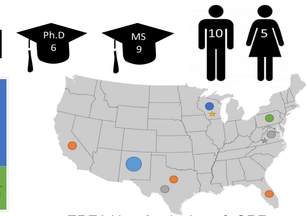
- A state-of-the-art area (2,970 sq. feet) designed and zoned explicitly into a variety of technology-rich spaces with built-in flexibility.
  - Cutting-edge computers and workstations with dual and large-screen monitors, WiFi connectivity, scanners coupled with other digital technologies
  - Access to a wide variety of software including UPRM Virtual Lab, e.g., Visual Studio, MatLab, ArcGIS, and Minitab
- Support collaborative and individual research activities. For example: Flexible and inviting spaces for both collaborative and independent work
- Institutional Repository to collect and preserve research products such as scholarly articles, posters, and theses or dissertations
- Graduate Research Fellows (GRF) and Extramural Research Experience Awards (EREA) participants, as key stakeholders, receive personalized guidance and tutoring through its services.

FELLOWSHIPS

UPRM expanded its post baccalaureate offerings in 2015 and 2016 to include doctoral programs in Bioengineering, Electrical Engineering, and Mechanical Engineering, and a masters of science program in Materials Science and Engineering. These four programs are supported by TIGER with assistantships to cohorts of low-income students (Graduate Research Fellows, GRF). In addition, other STEM students better their graduate training in research venues via the Extramural Research Experience Awards (EREA) that funds summer investigation in renowned universities and national laboratories in the mainland. As they return, recently acquired knowledge advances research approaches in their UPRM mentors' teams.

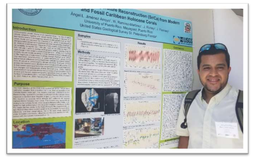


GWF & EREA Disciplines

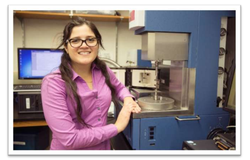


EREA Host Institutions & GRF Relocation After Hurricane Maria

ACHIEVING SUCCESS



Angel Jimenez
2ND EREA Fellow
M.S. thesis in Geology, May 2018
PhD at Mississippi State University



Normarieli Passalacqua
1st TIGER Fellow (December 2018)
M.S. thesis in Materials Science
PhD at Univ. of Wisconsin- Madison

Bioengineering Program
1ND Cohort of Master Students
May 2018 Graduation

Angelia Caro
1st GRIC GWF
M.S. thesis in Biology, May 2018

ONGOING EFFORTS

- Ensure the institutionalization of the program (2019-2021).
- Develop collaborations with other research projects to:
  - Guarantee long-term maintenance of facilities
  - Create leverage platform to expand infrastructure (new external funds obtained)
  - Increase academic offerings by developing new graduate programs (Ph.D. in Materials Science and Engineering in progress).

ACKNOLEDGEMENTS

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