

EXECUTIVE SUMMARY

UPRM proposes to integrate research experiences into the teaching laboratories through the implementation of guided research-oriented laboratory modules in introductory and advanced biology courses through the proposal titled Research Oriented Laboratory Enhancements by Module Development for Laboratories (ROLE-MODEL). These will be designed by experts in the respective disciplines and implemented in the teaching laboratories in general biology, genetics, botany, zoology, microbiology, immunology, and cell biology.

Previous initiatives in the department of Biology, funded through HHMI, created awareness for the need of research experiences for biology undergraduates. However, our own assessment made us aware that with our resources, we are only capable of providing research opportunities to ~100 of our total 1500 undergraduate students. The Bio2010: Transforming Undergraduate Education for Future Research Biologists emphasizes, precisely the need to provide undergraduate research experiences as early as possible in the education of science undergraduates.

Our proposal will allow our students to directly interact with tools otherwise available only – if at all – when participating in independent research projects. The new techniques offered via the modules include: protein and genome fingerprinting, digital scientific imaging, plant tissue culture, bioinformatics, biotechnology, and modern molecular genetic techniques. All modules will utilize molecular and structural research techniques needed to produce and in some cases ultimately publish genuine research results. The scientific insights accumulated via particular modules are expected to yield both traditional and web-based publications, as well as presentations in local and national education forums.

In addition to gaining invaluable practical up to date expertise, our students will develop skills in critical thinking, problem solving, teamwork, communication skills, computer literacy and its scientific applications, ethics and knowledge of contemporary scientific issues. Collaboration with faculty from the CEDIBI (Center for the Development of Information Literacy and Bibliographic Research) Initiative at UPRM's Library will further help develop students' information literacy skills.

Laboratory coordinators and teaching assistants will be trained both in modern research themes and teaching strategies to assure an effective implementation of the modules. The modules will be pilot-tested, and subsequently assessed and optimized before shifting to a full-scale implementation. The initial pilot laboratory sections will be team-taught by the professor and the teaching assistant guaranteeing correct delivery of the modules. Assessment of all activities in full scale implementation will be carried out throughout the grant period and actions taken accordingly.

During each year of full implementation, we expect a myriad of undergraduates and teaching assistants, approximately 2300 and 40 (some students may be impacted more than once), respectively, to be impacted by this HHMI program. Thus, regularly impacting 20% of UPRM's entire undergraduate student body. Because the proposed enhancements are distributed evenly across the curriculum, most students will be exposed to high-quality modules in multiple biological disciplines. All modules will be permanently incorporated into the curriculum.

Following the period of pilot testing, the modules will be disseminated through summer workshops to other undergraduates, high school teachers (Outreach Component), biology undergraduate students in the teacher training program (pre-service), as well as to -on and -off campus faculty (Faculty Development Component), particularly faculty devoted exclusively to teaching. The impacted educators will have a unique opportunity to participate actively in modern scientific developments and therefore enrich their classroom teaching, as well as promote scientific career choices among students.