AC 2012-5578: A BRIDGE TO THE DOCTORAL PROGRAM STRATEGY FOR INCREASING LATINOS IN THE EARTHQUAKE ENGINEERING PROFESSORIATE

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A Bridge to the Doctoral Program Strategy for Increasing Latinos in the Earthquake Engineering Professoriate

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Introduction

Latinos are the fastest growing ethnic group in the U.S. and currently represent about 14.8% of the total U.S. population, making them the largest minority group. Furthermore, National Council of La Raza (NCLR) reports that 23% of children in the US are Latino [1]. Despite these statistics, Latinos are among the most underserved populations in higher education in the U.S., as they have the lowest rate of graduate school enrollment of any racial or ethnic group. Overall, Latinos earn about 4% of the engineering doctorates awarded in the US, and comprise less than 3% of the full time college faculty [2]. For the year 2010, Gibbons [3] reported that engineering degrees for Latinos at the BS, MS, and PhD levels represented 7, 6, and 5.2% respectively of the total number of degrees conferred in the US that year. As Figure 1 illustrates, the percentage of degrees for Latinos have been increasing moderately over the past 10 years, but clearly are still very low and remain disproportionally low compared to the population size that this ethnic group represents. This same reference reports that the percentage of Latino faculty in engineering is also low (about 3.6%), which includes faculty from the two largest engineering programs in Puerto Rico (UPR Mayaguez and Polytechnic University of Puerto Rico).

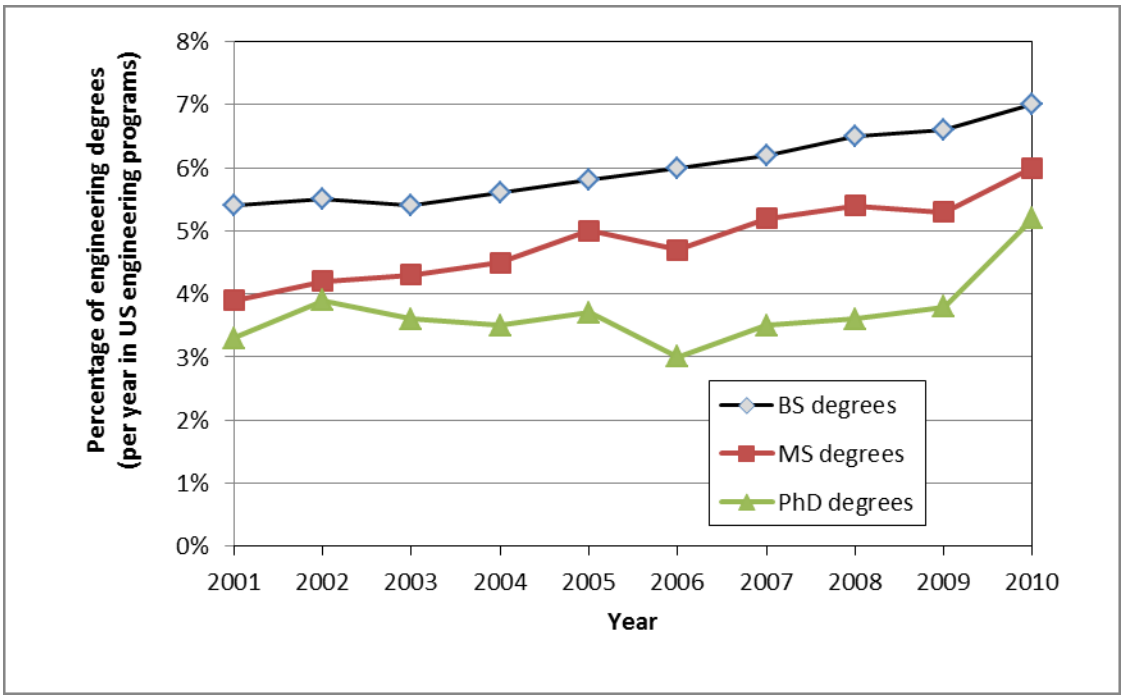

Figure 1 – Percentage of engineering degrees (all disciplines) in the US for Latinos (data from Gibbons, 2011)

College engineering programs must respond to the demand for graduates by improving the recruitment and retention of underrepresented student populations, including underrepresented minorities (URM) and women. Unfortunately, Latino/a, African American and Native American students are not present as students (or faculty) at engineering institutions or in the workforce in proportions that are similar to their presence in the larger US population. This "New American Dilemma," aptly labeled by John Brooks Slaughter, former President and CEO of the National Action Council for Minorities in Engineering (NACME) [4], represents one of the most pressing problems to be addressed in engineering education, and more broadly, the social and economic future of the United States. This paper presents a bridge to the doctorate program (BDP) model that intends to increase participation of underrepresented groups' in the professoriate. Specifically, the focus of the proposed BDP is on Latinos in the field of earthquake engineering. However, the proposed model can be adapted to other URM groups or fields.

Importance of student-faculty relationships for retention and student success

It is our hypothesis that increasing the number of Latino faculty in engineering should have a positive impact in increasing retention of Latino engineering students, as interaction with engineering faculty of similar ethnicity is believed to positively influence student attitudes toward engineering and intentions to stay in engineering. This hypothesis is based in the large body of empirical research indicating that interaction with faculty is one of the most salient factors in student engagement and success.

Interaction with faculty is defined as an important institutional experience in modeling of student retention, as per Tinto [5]. Research demonstrates that the nature of interaction with faculty may differ for URM students, who may be reluctant to initiate contact with predominantly White faculty [6,7]. Another way to frame how interaction with faculty is important for retention relates to social capital frameworks [e.g., 8,9,10] that define ties to institutional agents (faculty, staff, administrators) as links to important information needed to navigate and succeed in the college environment. The effects of student-faculty interaction on student grades, particularly for URM student groups, have been the subject of a growing body of research. It has been suggested that faculty interaction specifically has a crucial influence on the success and retention of first generation college students [11]. Cole and colleagues found that perceived support from faculty members contributed to better grades for African American and Latino students [12], and particularly, for Latino science, technology, engineering and math (STEM) majors [13]. Further, perceived quality of relationship with faculty and frequency of talking contributed to higher grade point averages (GPA) for Latino students [13]. Conversely, negative feedback and lack of study assistance were negatively associated with grades [13]. Dika [14] found that perceived quality of relations with faculty were particular important in predicting grades for first-generation Latino

students. Since many URM students are also first generation college attendees, it follows that benefits would be found in specially structuring freshman and sophomore experiences which include or promote opportunities for interaction with engineering faculty of the same ethnicity.

The proposed multi-institutional BDP model

To address the inequity mentioned above, a BDP program is proposed to help increase the size and diversity of the graduate student population. The BDP program described herein was initially proposed as part of an NSF research project funded within the Network for Earthquake Engineering Simulation (NEES) program, but it can be applied as a model for any multi-institutional research proposal. The proposed BDP model, based on the participants of the NSF proposal, is shown schematically in Figure 2. As shown in this figure, the proposed BDP is centered around the University of Puerto Rico at Mayaguez (UPRM), a predominantly Latino institution, and involves connecting the Latino students from UPRM with academic institutions in mainland USA which in this case are the ones corresponding to different PIs participating in this NSF funded research. However it can include other institutions. As shown in this figure, the BDP model involves first obtaining an MS degree in earthquake engineering at UPRM. The target student population for this first stage will be graduates from the undergraduate program at UPRM or URM students from other engineering programs in Puerto Rico or mainland US. A good potential source for recruiting high performing URM students is the successful NSF program Louis Stokes Alliance for Minority Participation (LSAMP). To enhance student retention in the program, the PIs from the mainland institutions involved in the program would actively participate in the research that students conduct towards their MS degrees. This participation can be in the form of summer research experiences where BDP fellows can spend 8 to 12 weeks working with one of the PIs at one of the US institutions; and/or by inviting the

mainland US PIs to be active members of the MS thesis committee of BDP fellows. This first stage, via initial graduate studies at the master's level at UPRM, ensures that UPRM also plays an active role in research, and helps continue strengthening its graduate programs. The second stage of the BDP program is to pursue a PhD at one of the mainland US institutions but by including active participation of the UPRM faculty involved in the first stage.

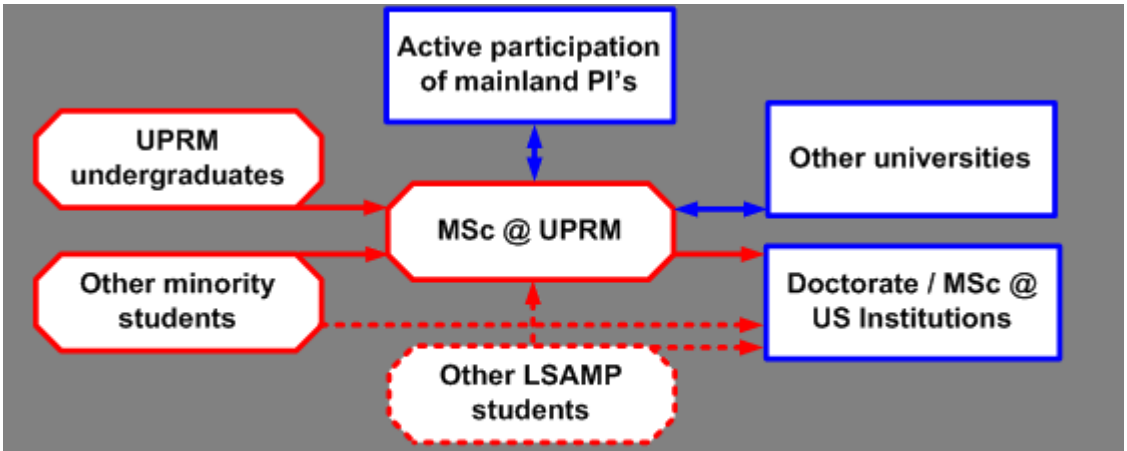

Figure. 2: **Proposed "Bridge to the Doctorate Program" (BDP) Model for Hispanic Students.**

The proposed BDP model can be partially funded within a large multi-institutional research grant, but ideally funding should be complemented by means of education grants from DOE or NSF, or with institutional funds from the participating institutions. For example, NSF has implemented a series of programs seeking increase of URM participation on engineering graduate degrees and the professoriate (e.g., the Alliance for Graduate Education and the Professoriate – AGEP for URM students; ADVANCE for women, and the Alliance for Minority Participation - AMP).

Implementation of the proposed BDP has been difficult within a 3 year project with limited funding. However, we believe the idea is worth disseminating as the benefits of the proposed BDP can be multifold. First, it can help increase the size and diversity of the graduate

student population in the participating institutions. Second, it can prepare highly trained minorities to fill the ranks of the earthquake engineering profession (or the chosen field); and third, it can provide a pool of qualified applicants for professorate positions in the selected field. The selection of a target URM group for the BDP is important because of previous research demonstrating that mentors of a shared ethnicity positively impact student's academic performance and retention [15]; however, it cannot be assumed that a person, just by being part of a minority group, is sensitized to the general problems of under-representation and will be an effective advocate for minority education. Thus, our approach will include training opportunities for faculty to ensure their awareness of underrepresentation along with effective mentoring strategies.

Summary and Conclusions

This paper presented a proposed Bridge to the Doctorate Program to help increase URM in engineering professoriate. The specific target of this effort, which is tied to an ongoing NSF research grant, is Latino civil engineering students, with the aim to increase Latino faculty in the field of earthquake engineering. However it can be applied to any URM population or engineering field.

The simple BDP model described in this paper is believed to have good potential for success. The proposed BDP is in the early implementation stages as part of an ongoing NSF project with a selected focus on attracting graduate students from Latino groups to doctorate programs in participating Research I universities on the mainland US. The approach to set up the BDP was modeled after the successful NSF program Louis Stokes Alliance for Minority Participation (LSAMP). A key component of the BDP was the partnership with an institution (UPRM) with a large population of the target URM (Latinos). Important features of the program

are the active participation of UPRM in research, exchange between students and faculty at UPRM and mainland US universities, and participation of external faculty members on graduate committees.

Implementation of the project is in its initial stages, and the authors are keen to share their experiences and learn from other engineering educators who have designed and administered similar initiatives.

Acknowledgements

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