Rethink Summer Student Research [1]

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By: Franklin A. Carrero-Martínez/Science Magazine Department of Biology, University of Puerto Rico, Mayagüez, Mayagüez, PR 00681, USA. E-mail: franklin.carrero@upr.edu [2] Research and training at institutions serving minority students may suffer as top students leave for other schools each summer. For academic researchers and educators, summer months are often among the most productive times of year. Unfortunately, at many minority-serving institutions (MSIs) that serve a high proportion of underrepresented minorities (URMs), the summer often brings a “brain drain” that threatens to erode capacity for conducting research. Summer research programs (SRPs) recruit students from MSIs to spend a summer working at a research-intensive university. SRPs can expose students to resources and experiences they may not as easily access at their home MSI. Among benefits to host institutions, SRPs help fulfill some “broader impacts” (i.e., nonresearch, such as education and outreach) that are required by many funders. MSI faculty may benefi t from skills the SRP students bring back. But this brain drain can undermine the ability of MSI faculty to effectively teach research skills and to develop talent among a diverse pool of students. In 2008, ~25% of U.S. science, technology, engineering, and math (STEM) baccalaureate degrees awarded to URM students were from MSIs (1). These institutions enroll ~30% of all URM students (2). Although the percentage of URMs earning baccalaureate degrees has declined (1), those who complete their degrees show Ph.D. graduation rates similar to non-Hispanic white counterparts (1). Many MSIs are among the leading STEM bachelor’s degree–granting institutions for Hispanic and African American students who complete Ph.D. degrees (3). But whereas interest in diversity underlies undergraduate SRPs, questions remain about intended recruitment and retention of URM students in graduate programs. Despite a steady increase in graduate program graduation rates over the past decades (4), URM participation in STEM graduate programs is lower than expected on the basis of U.S.

demographics (5). Erosion of the Capacity to Develop Talent Despite SRP's benefits, they may hinder the ability of talented individuals to access the skill set required to succeed in research careers. Institutionalized "one-way bridges," like SRPs, can siphon well-trained talented students from MSIs. As a result, research goals of MSI faculty may not advance as well as they could; well-trained personnel are key to producing good-quality data that become the basis for publications and grant applications. In turn, reviews of research grant applications from MSIs may criticize productivity levels, the amount of preliminary data, and the adequacy of academic environments to implement research programs. Such perceptions of MSIs may erode funding for facilities, equipment, and supplies. A vicious cycle may unfold Adequately supported MSI faculty can develop talent among URM students with high potential, but lacking research experience. Early exposure to research (6) and long-term experiences (6, 7) have been correlated with outcomes such as persistence in research careers. Applicant training is a key element in successful grant applications. Early and consistent access to research mentors and adequate resources may provide cumulative advantages (8). Although it is not clear what factors contribute to differential success rates for URM faculty in obtaining research funds (8, 9), lack of funding in turn affects the overall capacity to develop and nurture local students, leading to a shortage of well-qualifi ed, diverse talent. Ensuring Long-Term Sustainability Although some promising programs exist (10), we must invest in sustainable development of talent across a wider spectrum of academic institutions. This requires a shift away from the prevailing system at research-intensive institutions (11) and MSIs (12) to provide research-intensive experiences for all students. Collaborations between research-intensive institutions and MSIs could be rebalanced for more "two-way bridge" partnerships. For example, there are well-equipped MSI research facilities supported by initiatives from funders such as the National Institutes of Health and National Science Foundation (e.g., Spelman College's Center for Health Disparities Research and Education, and the Ponce School of Medicine–Moffitt Cancer Center Partnership). Thoughtful integration of research and teaching training activities, guided by aligned interests, may allow a postdoctoral fellow to receive training in teaching at a MSI partner school. Graduate students may gain valuable experience in communicating science (13) and acting as mentors to URM colleagues at partner MSIs. Students who act as role models demonstrate increased learning and tend to make stronger commitments to their studies (14). Students from MSIs will share experiences with groups at SRP host institutions. This may increase their sense of belonging, shown to help students overcome the uncertainty (15) that discourages many from pursuing a STEM career (16). The benefits of diversity at all stages of the academic pipeline (17) are well documented and recognized by funding agencies (10). Amid calls for supporting MSIs to expand their effective recruiting and retention rates (18), while establishing basic indicators of student outcomes to enable institutions to assess their effectiveness (12), now is the time to rethink our approach to developing a diverse, talented STEM workforce. References and Notes 1. National Science Foundation (NSF), Women, Minorities, and Persons with Disabilities in science and Engineering: 2011 (NSF, Arlington, VA, 2011). 2. X. Li, Characteristics of Minority-Serving Institutions and Minority Undergraduates nrolled in These Institutions (NCES 2008-156, U.S. Department of Education, Washington, DC, 2007). 3. National Academies and Institute of Medicine, expanding Underrepresented Minority participation: America's Science and Technology Talent at the Crossroads (National Academies Press, Washington, DC, 2010). 4. NSF, Doctorate Recipients from U.S. Universities: 2009 (NSF, Arlington, VA, 2010); www.nsf.gov/statistics/ [3] nsf11306. 5. P. Einaudi, Science Resources Statistics InfoBrief (NSF11-319, NSF, Arlington, VA, 2011). 6. S. H. Russell et al., Science 316, 548 (2007). 7. A. L. Zydney et al., J. Eng. Educ. 91, 151 (2002). 8. D. K. Ginther et al., Science 333, 1015 (2011). 9. L. A. Tabak, F. S. Collins, Science 333, 940

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Links
[1] https://www.cienciapr.org/en/external-news/rethink-summer-student-research?language=es [2] mailto:franklin.carrero@upr.edu [3] http://www.nsf.gov/statistics/