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Board 266: Enhancing Transfer Pathways in Computing: An NSF Project Progress Report

Dr. Narges Norouzi, University of California, Berkeley

Narges Norouzi received her MS and Ph.D. from the University of Toronto, focusing on applied deep learning. She has since been involved in working on applied machine learning projects with a focus on biology and education. Her CS education research focuses on using artificial intelligence in the classroom to close the equity gap and leading student-centered programs that promote equity and access. Her work has been supported by the Defense Advanced Research Projects Agency (DARPA) and the National Science Foundation (NSF).

Dr. Carmen Robinson, University of California, Santa Cruz
Kip Tellez, University of California, Santa Cruz

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Abstract

Our project, known as "University of California's Servingness," is dedicated to establishing a robust transfer pathway in Computing between Community Colleges and the University of California's system. The primary focus of our endeavor is to advance the transition from merely enrolling racially diverse students to genuinely serving them in ways that foster greater persistence, graduation rates, and career placement. We posit that universities can better exemplify the concept of "serving" Hispanic and Latinx, Black, Indigenous, and People of Color (BIPOC) students who attend predominantly white institutions by investing in effective transfer pathways. Eligibility for our program extends to students who meet two or more of the following criteria: being the first in their family to attend college, experiencing socio-economic challenges, and hailing from historically underrepresented groups in terms of both gender and race/ethnicity.

Motivating Rationale

The 2007 Rising Above the Gathering Storm National Academies report sounded initial warnings about the US' precarious economic preeminence and competitive edge in science, technology, and innovation. Since then, the outlook has not measurably improved[1]. A strong STEM workforce sustains a robust U.S. economy and supports our national security[2,3]. Diversity in STEM generates a variety of perspectives and approaches to scientific and technological innovation, better reflects the global and culturally diverse economies of the 21st century, and produces diverse science and engineering role models[4]. Because of their racially diverse enrollments, The National Academies of Sciences and Engineering Minority Serving Institutions: America's Underutilized Resource for Strengthening the STEM Workforce report (2019) identifies that HSIs can contribute diversity to STEM.

Of the estimated 569 U.S. HSIs, most are two-year institutions. 68% of HSIs are public, and only 17 are R1 research institutions[5]. Laanan in[6] argues that where students begin their education ultimately directs their educational path, career goals, and trajectory. Over 1,132 two-year colleges in the U.S. instruct 12.8 million students and enroll a diverse group of students[7], typically from lower Socioeconomic Status (SES) backgrounds. They accept higher numbers of academically underprepared students who experience "less time on campus due to work commitments, less faculty interaction, and fewer attempted hours"[8]. Transfer barriers include lack of academic preparation, financial resources, institutional factors, and lack of college-student fit. These factors play themselves out at our institution, a selective and predominantly white university, which joined the ranks of HSIs within the past ten years and is still developing comprehensive support systems for diverse STEM transfer students, recently adding a program focused on the transfer and reentry population. This project is institutionally relevant, as equity in Computing enrollment, retention, graduation, career entry, and graduate school acceptance metrics are markers of institutional success.

Computing as a discipline is competitive and portrayed as meritocratic. The assumption is that students can attain academic accomplishments and career success if they work hard enough. Such assumptions rarely consider that students from historically marginalized backgrounds also work hard but may still be unable to reach their academic and professional goals because of information gaps, financial constructs, or other structural postsecondary "pipeline" issues. Black students have been marginalized throughout America's history. Plessy v. Ferguson (1896) upheld racist Jim Crow laws that caused generational damage to racialized minorities and women. It was not until the 1954 Brown vs. Board of Education decision that separate but equal laws were overturned[9]. These historical facts have a bearing on current racial inequities in STEM degree attainment. We know they contribute to the stereotype threat, which predicts student underperformance when reminded of negative racial stereotypes[10], and "impostor syndrome," which stimulates subconscious stress in alienated students, reducing academic achievement despite preparation[11].

1 Project Goals

The summary of the project aims and associated research questions are as follows:
Framework Development and Implementation: We focus on adapting, refining, and implementing a servingness framework to identify and eliminate institutional barriers for Transfer students in Computing, particularly at Hispanic-Serving Institutions (HSIs). This involves both qualitative and quantitative assessment of servingness to facilitate the identification of policies, procedures, and structures that may act as supports or barriers for students from racially diverse backgrounds. It also includes comparing the support practices and services at our University with those at institutions where servingness models are already in effect.

Strategy and Improvement: We seek to enhance servingness in Computing by identifying strategies that support racially equitable persistence and graduation for Transfer students. This entails adapting the servingness framework specifically for HSIs within Computing programs that serve Transfer students and using strategic adaptations to deliver impactful servingness practices.

Assessment and Impact Evaluation: We will assess the effectiveness of the adoption of the servingness framework, policies, and practices in advancing equitable graduation rates, graduate school placements, and career placement rates for Transfer students in Computing. This includes evaluating critical initiatives that improve racial equity in Computing degree persistence, graduation, career success, and graduate school placement, as well as analyzing how each servingness initiative affects transfer students' perceptions of overall institutional servingness. Additionally, it explores whether HSIs can reliably use servingness as an index to measure equity in Computing education for their programs and services, including equitable Transfer pathways.

Current Developments and Preliminary Studies

Through this NSF-funded project, we have been actively working to dismantle institutional barriers, adapt computing curricula at our partner institutions to local contexts, and, most importantly, elevate degree attainment and career placement by providing students with invaluable research experiences. A pivotal component of our project is the implementation of a summer program tailored to transfer students from our collaborating community colleges. This program aims to equip these students with crucial summer research experiences that deepen their understanding of computing research areas and smooth their transition into upper-division courses, all while stimulating their interest in pursuing advanced studies at the graduate level.

Given the growing availability of summer bridge programs for students in STEM fields at four-year institutions, it has become essential to assess the impact of such programs on a wide range of academic and non-academic indicators[12]. In this poster presentation, we will share our project's progress, experiences, and valuable lessons learned. Our objective is to illustrate the tangible impacts of our program on academic success metrics, psychosocial well-being, and department-level goals.

Moreover, we looked into the transformation in participants' perspectives concerning non-academic indicators to determine whether this transformation varies across the two program modalities: online and in-person. To achieve this, we employed A/B testing and a thorough evaluation of pre- and post-program score distributions[13,14]. In particular, we focused on two key research questions:
RQ1) The overall effect of the program on students' non-academic indicators.
RQ2) The differential impacts of online versus in-person program modalities.

Our preliminary results indicate that the summer bridge program positively influenced many non-academic indicators. However, the impact varied depending on the program's modality. While both online and in-person modalities were beneficial, the in-person program demonstrated a more significant positive impact. Particularly notable was the improvement in students' sense of belonging to the STEM community and their awareness of available resources.

We conclude that both modalities have merits, but in-person programs might offer more substantial benefits in certain non-academic areas. Given the limited funding, the study underscores the importance of carefully considering the choice of program modality to maximize the impact on student outcomes. Future research is suggested to explore the program's impact on academic performance and to design a hybrid model that combines the strengths of both online and in-person approaches.

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