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Building Postsecondary Pathways for Latinx Students in Computing: Lessons from Hispanic-Serving Institutions

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Abstract
While the COVID-19 pandemic has transformed the use of technology in education and the workforce, a shortage of computer scientists continues, and computing remains one of the least diverse STEM disciplines. Efforts to diversify the computing industry often focus on the most selective postsecondary institutions, which are predominantly White. We highlight the role of Hispanic-Serving Institutions (HSI) in gradating large numbers of STEM graduates of color, particularly Latinx students. HSIs are uniquely positioned to leverage asset-based approaches that value students' cultural background. We describe the practices educators use in the Computing Alliance for Hispanic-Serving Institutions, a network of 40 HSIs that work together to improve postsecondary educational experiences for students in computing fields. We conclude with recommendations for federal, state, and local education leaders.

Building Postsecondary Pathways for Latinx Students in Computing:
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The 2020 pandemic has disrupted educational administration and the workforce, increasing the importance of technology. Yet, a shortage of computer scientists continues, and computing remains one of the least diverse STEM disciplines. Social, political and ethical concerns about technology, including its applications in public surveillance and violations of individual privacy have intensified. These issues have especially adverse effects on communities of color and often lead to calls to diversify the computing industry. Such efforts tend to focus only on the most selective postsecondary institutions, which are predominantly White. As a National Academy of Sciences, Engineering, and Medicine 2019 report has indicated, without significantly supporting Minority-Serving Institutions (MSIs) in developing STEM talent, efforts to diversify STEM disciplines and computing will fail.

Hispanic-Serving Institutions (HSIs), 2- or 4-year not-for-profit institutions that enroll at least 25% full-time undergraduate Latinx students, constitute about three-quarters of all MSIs. They enroll more Black students than Historically Black Colleges and Universities (HBCUs) and more Native American students than Tribal Colleges and Universities (TCUs), as well as higher shares of low-income and first-generation college-going students. Latinx are now the largest population of color in the U.S. and in U.S. postsecondary education. Over one-quarter of K-12 students in public schools are Latinx, and Latinx are projected to constitute 27.5% of the U.S. population by 2060. Supporting degree completion at HSIs is thus one critical way to contribute to a more diversified computer science and technology workforce.

National surveys indicate that Latinx students are among the most likely demographic groups to report that they are experiencing challenges in shifting to online learning in the pandemic, including increased concerns about finding a quiet place to study, losing their jobs, financing their college educations, or taking care of their families. HSIs have also been at a disadvantage in receiving relief from federal funding via the CARES Act, given funding formulas that emphasize full-time enrolled students, which compose fewer students in HSIs than in other institutions. Even before the pandemic, HSIs were, on average, operating with two-thirds of the resources of the typical U.S. higher education institution.

Given these conditions, and the fact that postsecondary enrollments of Latinx, Black, and Native American students declined significantly in Fall 2020, the pandemic will likely exacerbate the inequalities students of color face in higher education. New federal funding is clearly needed, but how should such investments be directed? Most obviously, the federal government will need to fill holes in state budgets that resulted from the pandemic-induced economic downturn. Without that stimulus, both K-12 and postsecondary school systems will see substantial declines in funding. Federal legislators must also work to address longstanding inequities in postsecondary education finance. To help level the playing field for students, new investments must be targeted to students of color and the institutions and programs that best serve these groups, including Minority-Serving and Hispanic-Serving Institutions.

The U.S. Congress can include earmarks in new stimulus bills and rely on federal agencies to support additional investments. For example, the National Science Foundation HSI program,

launched in 2017, is designed to enhance undergraduate education in science, technology, engineering, and math programs at HSIs. This new initiative acknowledges that HSIs are particularly well positioned to serve Latinx students in ways that value the assets such students bring to campus and promote culturally engaging environments.

But what does it mean to do culturally engaging work in STEM at an HSI? Where can we look for successful models in computing education? The institutions in the Computing Alliance of Hispanic-Serving Institutions (CAHSI), a network of over 40 HSIs, have consistently graduated a higher than average share of Latinx bachelor's degree recipients in computing since 2000. Using the conditions of collective impact framework, the network of institutions serves Latinx students by helping to foster connections between peers in computing classes in ways that build academic, interpersonal and leadership skills. In particular, the CAHSI, a networked community, applies asset-based frameworks to recruit and retain Latinx in computing. For example, the network offers the effective educational practice of undergraduate research opportunities and applies Latinx values through its Affinity Research Group model, which brings together intergenerational groups of scholars including faculty and students at different stages. As such, this model leverages Latinx students' value of *familismo*, which reflects strong family ties and emphasis on family caretaking in Hispanic culture.

Another program adopted by CAHSI network institutions, Peer-Led Team-Learning, engages high-achieving Latinx computing students as tutors in computing classes with lower student success rates. Peer leaders receive training on how best to support students taking computing classes and build necessary skills to complete coursework successfully. Because Latinx students are more likely than other demographic groups in college to work for pay, and may need more flexibility in their schedules, peer tutoring is typically offered at flexible times. In response to the pandemic, this tutoring was offered online, and new virtual undergraduate research experiences using the Affinity Research Group model were implemented by approximately 30 faculty and 50 undergraduate students from across CAHSI institutions.

These CAHSI signature practices employ cooperative learning approaches that emphasize the development of community and collaboration – rather than competition. Studies of these programs show that Latinx computing students gain a sense of community that is familiar, comforting, and supportive for Latinx students in computing and engineering fields, and that participation in these groups is associated with increased student self-esteem, academic performance, and capacity to transition into the workforce. The relatively quick transitions into virtual platforms for these programs in the late spring and summer of 2020 illustrates CAHSI's responsiveness to its students' needs and its commitment to sustaining culturally engaging science learning opportunities in computing. Because the Latinx community highlights particularly strong social, relational, and familial orientations, CAHSI works to create mutually beneficial and trusting relationships among students, faculty, and staff members in these opportunities, whether instruction and support is in-person or online.

As the new Administration enters the White House facing a global pandemic and looming recession, investments in both K-12 and postsecondary education will be critical. Investments meant to support postsecondary success among students of color should look to Minority-Serving Institutions for successful models and allocate resources to these institutions to continue

to strengthen their capacities to serve and support students in STEM fields. A recent Center for American Progress analysis indicate that, to move closer to parity to other MSIs in terms of federal funds received per student, HSIs need $1 billion more in federal funding than they currently receive. This funding should not come at the expense of that directed toward other MSIs but serve to further build capacity to sustain successful strategies to raise Latinx attainment in STEM and other fields. Sustaining culturally engaging programs like those in CAHSI will be key to affording more underrepresented students the necessary opportunities to pursue computing degrees, and, in the longer-term, to diversifying the technology workforce.

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