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Creating Cultures of Student Success:

Insights from Hispanic-Serving Institution Computer Science Departments

By Anne-Marie Núñez 



Anne-Marie Núñez is the inaugural Executive Director of The Diana Natalicio Institute for Hispanic Student Success and Distinguished Centennial Professor at the University of Texas at El Paso. Her work addresses transforming postsecondary opportunity structures for minoritized communities. In her current research, she collaborates on several grants and networks to strengthen equity in geosciences and computing and to build capacity for talent development in STEM fields at Hispanic-serving institutions.

In Short

- Examining how departments in Hispanic-serving institutions (HSIs) construct supportive organizational cultures can offer insights on how other institutions can also build inclusive environments to promote minoritized student success, even in less diverse science fields.
- Studying the organizational behavior of HSI computer science departments committed to minoritized student success reveals that many faculty, administrators, and staff emphasize these students' assets and potential to develop talent in their discipline.
- Creating organizational structures where diverse departmental stakeholders share responsibilities to promote student success enables the development of multidimensional student support systems.
- These organizational behaviors demonstrate the potential to create sustainable cultures of student success, even in the face of unexpected disruptions like a global pandemic.

Minority-serving institutions (MSIs) are federally designated on the basis of mission or enrollment composition of racially minoritized groups, and they graduate disproportionately high shares of racially minoritized STEM students (National Science Board [NSB], 2022). Hispanic-serving institutions (HSIs), federally designated as having at least 25 percent full-time equivalent Latinx undergraduate enrollment, constitute over 70 percent of all MSIs. They enroll high shares of racially minoritized students, including two-thirds of all Latinx college students (*Excelencia in Education*, 2021). They also enroll more Black students than HBCUs and more Native American students than Tribal Colleges and Universities (Núñez et al., 2015).

Here, I show that studying organizational behavior in HSI computing departments—including computer science, computer engineering, information science, and computer information systems (National Academies of Science, Engineering, and Medicine [NASEM], 2018)—can offer important lessons for *all* departments about creating race-conscious and

equity-centered cultures of student success (Dowd & Bensimon, 2015; Malcom-Piqueux, 2020; NASEM, 2019). This discussion is based on research about the organizational behaviors of departments in the Computing Alliance of Hispanic-Serving Institutions (CAHSI), a network established in 2006. Led by the University of Texas at El Paso, CAHSI aims to grow and sustain a community of higher education institutions and other nonprofit, industry, and external partners committed to recruiting, retaining, and accelerating the progress of Latinx and other minoritized students in computing (CAHSI, n.d.). A National Science Foundation agencywide INCLUDES Alliance grant of nearly \$10 million recently enabled CAHSI to expand the alliance to include more than 40 HSIs and to strengthen student success practices in these institutions, creating the CAHSI INCLUDES Alliance network (Villa et al., 2019).

WHY STUDY HSI COMPUTING DEPARTMENTS IN RELATION TO STUDENT SUCCESS?

Like other MSIs, HSIs offer compelling sites to examine how various institutional and other stakeholders can share responsibility to create cultures of student success (NASEM, 2019). As noted earlier, HSIs comprise the largest number of MSIs, and Latinx students are the second largest racial/ethnic group, comprising about one-fifth of all undergraduates. Across all U.S. institutions in 2018, Latinx students earned 14.9 percent of all bachelor's degrees (National Center for Education

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Statistics, 2022). That year, Latinx earned just 11 percent of computing bachelor's degrees across all institutions, versus earning 42 percent of computing degrees at HSIs. Thus, because HSIs graduate nearly half of all Latinx bachelor's degree recipients in computing fields, they play a unique and critical role among all higher education institutions in preparing the computing workforce.

Among the challenges that Latinx in higher education face is the lack of Latinx faculty representation. The pipeline for Latinx faculty needs to be dramatically improved. This is especially true in computing fields. In 2018, just 2.8 percent of higher education computing faculty nationally were Latinx (NSB, 2022). Especially considering this lack of Latinx representation among faculty, promoting Latinx student success needs to be a shared responsibility distributed across many stakeholders.

As in other HSIs, departments in the CAHSI network graduate a disproportionately high share of Latinx bachelor's degree computing students (Villa et al., 2019). To do so, CAHSI departments have developed innovative "signature practices," including peer-led team learning, special problem-solving classes, collaborative undergraduate research experiences, departmental student leadership positions, professional academic clubs, scholarships, and professional conference attendance (Gates, Thiry, & Hug, 2016; Villa et al., 2019, p. 2). Beyond these specialized programs and practices, it is important to understand how broader organizational behavior in CAHSI departments contributes to student success.

The American Association for the Advancement of Science (AAAS, 2019) concluded that research on education reform in specific STEM disciplines is often not linked with higher education organizational research, inhibiting its capacity to transform learning environments. AAAS called for more research on specific STEM education practices within departmental and institutional contexts. Thus, my research team studied the organizational behavior of computing departments in the CAHSI network to better understand how they have created equity-oriented student success cultures in STEM.

METHODS

In 2018, I joined the CAHSI INCLUDES Alliance grant to investigate the question: *How does CAHSI departments' organizational behavior support Latinx and other minoritized computing students' success?* To address

this question, my team employed multiple case study methods (Yin, 2018). In 2020, we visited four departments for four days each, right before the pandemic emergency was declared. These departments constituted a purposeful sample of institutions with more developed implementation of CAHSI practices that would allow us to focus on organizational conditions that contribute to student success. We sought maximum variation in geographic region, institutional and departmental enrollment, demographics of minoritized students, and length of time as HSIs (Núñez, in press).

As part of these campus visits, we conducted 102 interviews with administrators (presidents, provosts, deans, and chairs), staff, faculty, and students about departmental efforts to advance Latinx student success. Sixty-nine observations of classes, professional clubs, faculty meetings, and related activities, as well as participant observations during CAHSI INCLUDES Alliance meetings, deepened our understanding of the departments' activities. We analyzed the large corpus of data using the constant comparative method to identify similarities and differences in organizational behavior patterns across departments (Strauss & Corbin, 1998). Drawing from multiple data sources and requesting feedback on preliminary results from the CAHSI network enhanced the trustworthiness of these data (Lincoln & Guba, 1985).

FOSTERING STUDENT SUCCESS

Stakeholders in these HSI computing departments developed cultures to foster student success in three ways: employing a talent-development mindset, creating organizational structures to share responsibility for student success, and building multidimensional student support. These approaches involved both organizational logics and behaviors that guided departmental activities in this direction. Examples are provided in Table 1.

EMPLOYING A TALENT-DEVELOPMENT MINDSET

Kezar (2018) suggested that addressing both organizational attitudes and structures is necessary to affect cultural transformation in higher education. In CAHSI departments, an emphasis on student talent development, rather than fixed ability, undergirded the structures and practices that supported Latinx and other minoritized students.

The traditional notion in U.S. higher education is that the amount of *resources* an institution garners or

TABLE 1. ORGANIZATIONAL BEHAVIOR TO DEVELOP CULTURES OF STUDENT SUCCESS IN HSI COMPUTING DEPARTMENTS

Employing a talent-development mindset	Creating organizational structures to share responsibility for student success	Building multidimensional student support
Assessing talent expansively to increase inclusion	Facilitating access to human and financial resources	Academic (curriculum, pedagogy, tutoring, research experiences)
Emphasizing importance of teaching's impact	Hiring student-centered personnel	Financial (scholarships, on-campus jobs, internships, basic needs)
Identifying and working with student assets	Engaging staff in meaningful ways	Social (faculty validation, peer support, community building)
Making it acceptable for students to fail and try again	Disaggregating and monitoring student enrollment and graduation data by race and gender	Cultural (language, family involvement, rituals)
Enacting flexibility in course accommodations for working and caretaking students	Employing student data to promote organizational improvement	Career (courses, conferences, internships, workshops)

the *reputation* it holds (e.g., in rankings) determines institutional excellence (Astin & Antonio, 2012). But in a talent-development approach, administrators, faculty, and staff orient the institution's mission toward cultivating student and faculty potential to the greatest degree possible (Astin & Antonio, 2012). Indeed, CAHSI departments emphasized their own, their units', and their students' potential to learn and grow together to promote student success (Núñez, in press).

Computing is a field in high demand, and sometimes departments have to turn students away (NASEM, 2018). In keeping with a talent-development mindset, however, one department assessed merit more broadly, admitting English language learners who were completing developmental language coursework but showed potential to succeed in the major. As a faculty member said, "If they can do the math, what does it matter that they are still learning English?"

Furthermore, many instructors, including award-winning faculty who were active in research, emphasized teaching as the central way they made a professional impact. Many used flexible pedagogical approaches to meet students where they were and to fully cultivate their skills. Some made temporal or testing accommodations for working and caretaking students; some held office hours on Saturdays or in the evenings. Others, even those who spoke only English, invited students to answer questions in the languages with which they felt most comfortable. Still others stressed that "it's

okay to fail, and to try and try again," even in a seemingly inflexible endeavor like coding. Faculty also described Latinx student assets such as being hard working and bilingual, drawing on those strengths in promoting student success.

CREATING ORGANIZATIONAL STRUCTURES TO SHARE RESPONSIBILITY FOR STUDENT SUCCESS

Departmental personnel applied a talent-development mindset to create organizational structures that served and supported Latinx and minoritized students. They drew on a range of resources mobilized in the CAHSI network, including for the signature practices mentioned earlier. All departments strengthened faculty and student research capacity through undergraduate research experiences. Departmental stakeholders worked with faculty and students to access institutional, departmental, and/or external resources that enabled these intergenerational teams to collaborate. For example, at the institutional level, departmental personnel participated in university-wide research days where students could present their research to invited family members, as well as to faculty and other students. These departments and their institutions recognized the importance of family involvement in developing culturally supportive programming for Latinx students (Núñez, in press). Faculty, administrators, and staff from CAHSI

departments and other HSIs also met regularly to discuss implementation and improvement of these key student success practices.

Instructors and administrative leaders both emphasized the importance of teaching as a professional responsibility and focused on hiring faculty with strong teaching skills. Doctoral-granting HSI departments sometimes “grew their own” faculty by hiring their own doctoral graduates who had institutional experience, a commitment to supporting Latinx students, and the disciplinary training to serve as instructors. Further, administrators created environments in which staff were empowered to strengthen equity-oriented organizational practices (Rivera & Núñez, 2022). For instance, staff were invited to participate in faculty meetings and to bring student concerns as well as information about student professional opportunities to the table.

Departments regularly reviewed data to identify racial and gender gaps in enrollment and graduation (e.g., Dowd & Bensimon, 2015). Subsequently, they developed practices to promote success for minoritized students in race-conscious, gender-conscious, and intersectional ways (Malcom-Piqueux, 2020). Departments identified a lack of parity in Latinx enrollment (vs. the entire university) and created CAHSI clubs, hiring paid student advocates to build community and peer support for Latinx and other minoritized students. Such clubs organized events like hackathons, drawing hundreds of participants to develop skills and networks in the profession. A lack of gender parity influenced some departments to strengthen opportunities for women and create chapters of professional associations like the Association of Computing Machinery for Women, while others developed intergenerational K–12 and college networks of women to educate other women about computing.

Identifying a lack of parity between the enrollment of Latina and Latino students led departments, with the support of a national nonprofit, to create scholarships specifically for Latinas. To reach students beyond the CAHSI network, members of these departments designed a mentoring workshop for Latinas at a national Latinx-focused computing conference. They also met regularly with other successful HSI departments to learn effective practices for serving and supporting particular groups of minoritized students (Núñez, in press). Departmental personnel

shared responsibility for student success by developing structures to build collaborative research opportunities, strengthen teaching, engage staff to advance equity efforts, and collectively review data to inform and strengthen equity-centered practices.

BUILDING MULTIDIMENSIONAL STUDENT SUPPORT

Through these organizational processes and structures, departmental personnel cultivated a shared responsibility to promote support across multiple dimensions: academic, financial, social, cultural, and career. Although not all students we spoke with expressed a uniform sense of support in their departments, each encountered at least two of these five forms of support. This underscores the importance of addressing minoritized students holistically.

In terms of curricular structure, departments aimed to offer gateway, rather than gatekeeping, classes into the major. Regular classroom instruction and research experiences both involved collaborative learning, and peer tutoring strengthened student skill building. Students were encouraged to participate in research experiences, which are important for pursuit of undergraduate science and beyond, especially for minoritized students (Carpi et al., 2017).

Likewise, departments coordinated an array of options for financial support, including full or partial scholarships, funding to attend conferences, and access to paid internships and on-campus jobs with opportunities to engage in the major. This was especially critical for Latinx students, who are more likely than other students to work for pay during college (Núñez & Sansone, 2016). Financial support can free students to engage more deeply with their majors and, in some cases, offset the need to work. More flexible, student-centered approaches to financial support can also enable students to employ funds in the ways most useful to continuing their educations (e.g., purchasing books, buying food, or obtaining transportation) (Núñez & Sansone, 2016).

Departmental personnel cultivated social support by continually building relationships and trust with students. Students appreciated that instructors and staff checked in with them, knew their names, communicated about professional opportunities,

and were available to offer academic and professional development. In other words, this social support led to students also accessing academic and professional development. Students experienced validation (Rendón, 1994) that expanded their sense of community and belonging in the department and discipline.

In terms of cultural support, some faculty and staff used Spanish to communicate with students who were more comfortable expressing themselves in that language; those who did not know Spanish were open to students communicating with peers in Spanish and taking multiple pathways to an answer. Rituals like *Día de los Muertos* were applied to celebrations of well-known Latinx and minoritized figures in computing. Course assignments included generating a program to translate text from English to Spanish.

Career support emerged as an especially novel finding because, in contrast to other forms of support, it has been discussed minimally in higher education research (Núñez, in press). Courses to prepare for jobs, with assignments like résumé and interview preparation, were included as electives and, in some cases, required. Professional clubs were also central to student experiences. Some were campus branches of national associations; others were formed by students, such as in one department where students came together to learn more about gaming and, in the process, strengthen their teamwork skills. Students in these clubs helped plan regional and national events to connect with employers and professional opportunities.

In addition to strengthening many of these campus-based clubs, CAHSI network resources enabled departments to fund students to attend national conferences on diversity in computing, including Great Minds in STEM (focused primarily on Latinx students), Grace Hopper (for women), and the Tapia Conference (focused on multiple forms of diversity). Participants met computing professionals from their own backgrounds, some for the first time, and several expressed the importance of seeing individuals from their ethnic and cultural backgrounds represented in computing fields. Employers also attended, and many students who interviewed with them obtained paid internships or permanent employment.

CAHSI's established signature practices related to peer tutoring, peer-led team learning, and student clubs also laid the foundation for strengthening

institutionalized and grassroots peer academic support networks during the pandemic (Hug Jurow, & Thiry, 2021). Students described how faculty and peers frequently checked in with them to inquire about support needs. The provision of such care required extensive human labor from diverse departmental stakeholders. Departmental mindsets and structures, together with multidimensional student support implemented prior to the pandemic, set the stage to support students, even as their lives were disrupted.

IMPLICATIONS AND RECOMMENDATIONS

This inquiry demonstrates how a sustainable culture of student success can be developed in academic departments, even in one of the least diverse academic fields, and even in institutions with fewer resources than is typical (NASEM, 2019). This study provides an idea of what equity-centered institutionalized practices and student success cultures look like in computing departments.

None of the departments in this study were at a well-resourced public flagship institution. In fact, the strategies in Table 1 could be applied in many HSI and non-HSI departmental and institutional contexts. All personnel can cultivate a talent-development mindset (Astin & Antonio, 2012) that incorporates intentionality to promote minoritized students' success (NASEM, 2019). Department leaders can hire instructors, including adjuncts, nontenure-track faculty, and former doctoral students, who have worked at the institution and who demonstrate talent-development mindsets and excellent teaching skills (Núñez, in press). And diverse staff—who can link students with on-campus and departmental opportunities and may be more approachable than faculty—can offer identity role models when faculty themselves are not diverse (Rivera & Núñez, 2022).

Departmental leaders and faculty can stay attuned to how the use of resources is geared toward student success, and leaders can ensure that such resources are accessible to faculty through regular communication, flexibility in assembling resources to construct opportunities, and staff support for implementation. Likewise, institutional leaders can work with departments to pool resources and establish partnerships to promote student success. They can ensure that university-wide scholarship opportunities are communicated

clearly to department leaders and staff and therefore made more accessible to students. Matching departmental funds with university funds can create additional equity-centered opportunities—for example, by enabling faculty to hire students on research projects.

These practices demonstrate strategies that could and should be sustained. This is evidenced by how the departments were able to pivot and address student needs in the pandemic. To address student challenges in the pandemic, these departments improved access to physical facilities like labs, technological tools, and (as needed) food pantries, to provide students with the basic foundation to pursue their studies. They also developed virtual internships and research experiences that, beyond enhancing students' health during the pandemic, could be more accessible to working students with less flexible schedules and those who cannot relocate. Many students expressed how these practices enhanced their capacity to navigate challenges in the face of the pandemic (Hug, Jurow, & Thiry, 2021).

Organizational research in departmental and disciplinary contexts enhances the understanding of how equity-centered organizational cultures and structures are created and sustained. It also illustrates how stakeholders with diverse roles develop, enact, and share practices to support student success. The guiding assumption of talent development—that diverse organizational actors hold potential and responsibility to cultivate talent—undergirds the capacity for all of these actors to build departmental structures that facilitate collaborative student success efforts. Strengthening and

diversifying sources of student support creates holistic scaffolding within the department and institution to promote student success. Beyond a focus on departmental contexts, the organizational research described here can enhance understanding and practice to enact institutional transformation toward racial and gender equity in science fields (AAAS, 2019) and in HSIs (Núñez, in press). Because external resources are also critical to support institutional equity-centered efforts in HSIs (Núñez et al., 2021), federal policies and state, foundation, and corporate-sector investments in HSIs and MSIs show great potential to advance equity in science fields and higher education more generally. □

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