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Why Hispanic Engineers and Architects Matter

Hispanic-Americans have forged countless achievements throughout the history of the United States. Take any field, whether it's the arts, business, education, film, literature, media, government, military, religion, medicine, or theater, and in your research, you will discover many *profesionales* of Hispanic descent appearing in news headlines and academic publications pertaining to these categories. However, in an age of impressive technological advancement, especially in the development of engineering and architectural marvels, the respective Hispanic-American communities remain profoundly underrepresented. In turn, this underrepresentation creates what Professor of Spanish and Portuguese Languages and Literature at New York University, Mary Louise Pratt, terms a "contact zone." Viewing the engineering and architectural community as a "contact zone," in both professional and academic contexts, provides insight into how Hispanic-Americans in engineering and architecture are inadequately acknowledged, while the "dominant culture" of Caucasian and Asian engineers and architects is universally recognized.

First, to understand the Hispanic-American struggle for recognition in engineering and architecture in terms of a "contact zone," one must first comprehend the significance of a "contact zone." In her acclaimed keynote address delivered in Pittsburgh, Pennsylvania in 1990, entitled "Arts of the Contact Zone," Mary Louise Pratt defines the "contact zone" as "social spaces where cultures meet, clash, and grapple with each other, often in contexts of highly

asymmetrical relations of power…eventually I will use the term to reconsider the models of community that many of us rely on in teaching and theorizing and that are under challenge today" (Pratt, 1990, p. 487). Pratt's "contact zone" identifies the existence of a homogeneous community comprised of a subordinate group embedded in "asymmetrical relations of power," vying for acknowledgement from the superlative group by seeking to assert its inherent heterogeneity. Hispanic-American engineers and architects correspond with Pratt's "models of community…[that] under challenge today" because engineers and architects are stereotypically envisioned as Caucasian/Asian, and affluent. However, as the "contact zone" provides, engineers and architects don't entirely conscribe to this model due to the thriving augmentation of Hispanic professionals in these fields.

Within the core of her speech, Pratt discusses the 500-year-old epistle composed by Andean writer Guaman Poma de Ayala to King Philip III of Spain, which is surprisingly similar to how Hispanic-Americans are currently acknowledged in the engineering and architectural community. Given his multiethnic heritage of Spanish and Andean, Guaman Poma managed to ingeniously compile a letter to the medieval king in both Spanish as well as his native language Quechua, which "was not thought of as a written language" (Pratt, 1990, p. 486). Guaman Poma sought to argue the importance of a "Christian world with Andean rather than European peoples at the center of it – Cuzco, not Jerusalem" (Pratt, 1990, p. 487). Unfortunately, this epistle never actually reached the attention of the Spanish king, but by unknown reasons, it eventually ended up in the Danish Royal Archive in Copenhagen. Nonetheless, Guaman Poma's intentions were noble, as his manuscript was profuse with "veritable" evidence of the beauty of and value of Andean history and how it parallels Christian history in a unique manner.

Similarly, the contributions of Hispanic-American engineers and architects assume no inferiority to, but rather emulate, those of their Caucasian and Asian counterparts in the industry. According to the Lewis Research Center, which is an integral organization within the National Aeronautics and Space Administration, termed "NASA," two examples of incredible Hispanic engineers within aircraft propulsion and space propulsion include Rene Fernandez and Hamilton Fernandez-Ortiz. First, Rene Fernandez holds as BS in Engineering in Fluid and Thermal Science as well as an MS in Engineering, who "conducts supersonic and hypersonic wind tunnel testing using air flows from 1500 to 3500 mph to test the inlets of the National Aero-Space Plane." Second, Hamilton Fernandez-Ortiz holds a BS in Mechanical Engineering, working as "Operation Project Engineer at the Rocket Engine Test Facility. [He] schedules and plans research projects in rocket chemical propulsion." In sum, these two Hispanic engineers appear to be incredibly involved and passionate about their fields, and serve as inspirations to Hispanic students seeking to enter the professional world of engineering. However, not many of these engineers receive the attention they deserve for their groundbreaking contributions to the field. In history, the Hispanic legacy in engineering is not nearly as represented as exemplified by the number of influential contributions in the field in a book entitled "Hispanic Firsts," which documents over 500 achievements from all varieties of professional fields. Among all of these, only a total of eleven novel achievements pertain to science and technology from the early 17th century to 1995. For instance, one famous astronaut discussed in 1990 was "Mexican American Ellen Ochoa, [who] became the first Hispanic female astronaut. Ochoa earned both a master's degree and doctorate in electrical engineering from Stanford University" (Kanellos, 1997, p. 252). She, like the previously mentioned NASA engineers, is an example of a famous Hispanic individual who didn't receive enough recognition because I had never learned about her in any of

my previous history classes; I had only learned about Caucasian and Asian astronaut pioneers in the field, but never Hispanic, thus showing how they are underrepresented even in history.

In the academic environment, college courses dedicated to science, technology, engineering, and mathematics, also regarded as "STEM" education, are characterized by their inherent difficulty in challenging students to analyze a given problem and produce quantifiable results to use in real-world applications. Moreover, when one imagines an intelligent math or science student, Pratt's stereotypical "model of community" applies because one would typically visualize a Caucasian or Asian student before a Hispanic student. This model does not suggest Hispanic students aren't able to perform as well in math or science as Caucasian or Asian students, but because they don't exactly match the aforementioned mold, which deems them underrepresented in academia.

From childhood, Hispanic children aren't exposed enough to STEM subjects, which envelops them within the engineering community "contact zone" in an academic context from the beginning of their academic career without being granted a choice. The children could be compared to the indigenous Andeans in Guaman Poma's depictions of their harsh treatment by the Spanish *corregidores*, or mayors, during the rise of the new Spanish empire because both groups are at an inherent disadvantage by the "dominant culture," including Caucasian/Asian educators and the Spanish conquerors, respectively. By exposing young Hispanic students to to these technical fields of interest, the children can cultivate their interest in pursuing a career in engineering or architecture over an extended period of time through-out their academic careers. However, socioeconomic factors inhibit the feasibility of such a progressive action. R. Christensen et al. (2014) in their article published in journal titled "Computers of Human Behavior," contended, "According to the U.S. National Center for Education Statistics (2011),

low-income and minority youth lack foundational skills in science, technology, engineering, and mathematics [STEM]. Moreover, according to the National Research Council (2011), 'there are significant gaps in achievement between student population groups: the Black/white, Hispanic/white, and high-poverty/low-poverty gaps are close to 1 standard deviation in size'" (p. 174). Since the Andeans did not possess the military prowess and technological sophistication of the Spanish, a Spaniard may have pitied their "lack [of] foundational skills," just as Hispanic students are traditionally viewed as "low-income and minority youth," which is linked to the notion that their knowledge of STEM subjects is inadequate to pursue a STEM career due their racial or socioeconomic status. However, this notion is unequivocally misguided, because the majority of Hispanic students are entrenched in their families' financial crises or modest upbringings with little to no opportunity of advancing their status. In a middle-class Hispanic household, in which I was personally raised in, when provided the necessarily tools for success and motivation, Hispanic students can perform just as well as their peers in any difficult academic subject.

Subsequently, exemplary Hispanic-American academic performance in the "contact zone" between Hispanic engineering students and Caucasian and Asian students is reduced according to the number of Hispanic students in a given classroom setting. According to Dr. Darnell Cole, Associate Professor of Education with an emphasis in higher education and educational psychology at the University of Southern California, as well as Ms. Araceli Espinoza, Cole's research assistant, in their 2008 article published in the Journal of College Student Development, "the main premise supporting this study…suggested that Latino' students will perform better academically when they have cultural congruity with their chosen academic major" (Cole and Espinoza, 2008, p. 286). The concept of "cultural congruity" is especially

important because when Hispanic students interact with peers of similar backgrounds and feel a sense of acceptance and belonging to their situation, they are much likelier to perform higher in their STEM courses. This is prevalent within the engineering community "contact zone" because specific courses in physics or chemistry become exceedingly challenging, for instance, and students doubt their competence and drop the class in large quantities. However, Hispanic students develop a higher sense of persistence in remaining in their engineering program with adequate encouragement and support from their peers, or in the following case, instructors, with whom they can identify connections with on a significant level. Hispanic engineering and architectural students who "emphasize the role of a faculty member as instrumental to their success" are exceedingly motivated to succeed adversities, whether personal or educational, and complete their college degree programs (Cole and Espinoza, 2008, p. 287). Occasionally, the involvement of a faculty member in his/her students' educational attainment is capable of transcending the conventional boundaries of exclusivity and stereotypes espoused by the "contact zone" in the engineering and architectural community, especially if each student is granted equal attention with sole regard to skill development. As a result, if cultural congruity and instructor involvement are present in the academic environment, Hispanic students are much less likely to engage in a constant struggle for acknowledgement from their peers or instructors, and are less likely to drop out of their engineering/architecture programs.

Furthermore, Hispanic engineering and architectural students exercise significantly different attitudes toward their major compared to other races, which can affect their future professional reputation and relationships. Being Hispanic, I sometimes feel compelled to work more diligently within my civil engineering program in order to achieve the same level of recognition as my Caucasian and Asian peers, even though about a sixth of the program is

composed of Hispanic students. According to student journalist Keyonna Summers of the News Center at the University of Nevada, Las Vegas, "the university is tied for second in the publication's annual Best Ethnic Diversity listing released today, a jump from sixth last year. UNLV has placed in the top ten for the past five years" (Summers, 2015, p. 1). The high level of diversity at UNLV, combined with my high school engagement in civil engineering, and close proximity to home, allowed my personal experience within the engineering community "contact zone" to rank significantly greater than the majority of Hispanic engineering/architectural students who are faced not only with the common challenges of the unfamiliar university environment, but also with discovering a sense of "cultural congruity" within their individual programs, which I have been fortunate to find.

While it could be argued that students from any ethnicity should set aside emotions and use their previous academic achievements as motivation to succeed in college, this is not entirely accurate, especially not in understanding why Hispanic-American engineering and architectural students are underrepresented. In a more detailed analysis of additional factors of persistence in college, L. Hang Shim, et al. (2014) compared Latino/a engineering students with their white male and female counterparts in what causes them to persist in their respective fields. "Specifically, higher SAT quantitative scores and high school class rank accounted for approximately 25% of the variance in academic success and persistence in engineering." Pratt's "contact zone" is exceedingly applicable because only a quarter of Hispanic students tend to persist in engineering or architecture in justifying their previous academic accomplishments in obtaining good SAT scores and a high class rank as useful to completing their degrees and entering the professional world.

Finally, while the Hispanic community is quite accomplished in a number of career fields, there remains a large deficiency of Hispanic architects and engineers. As a result, the community of Hispanic STEM professionals, including architects and engineers, stands as a prominent example of Mary Louise Pratt's "contact zone" because Hispanic professionals are not typically envisioned to uphold the same competence in their respective careers as Causasian engineers and architects, and due to socioeconomic/political circumstances that are deeply ingrained in Latin American history. While as a community, the contact zone will never be fully erased from society's ingrained prejudices, it is important to remember that Hispanics did not choose to be subjected to such conditions. It is possible to rise out of them to create an optimistic future for themselves with the proper environment that fosters encouragement and a sense of "cultural congruity" to propel a greater number of Hispanic students to obtain competitive STEM degrees in architecture and engineering. Finally, the Hispanic culture has been widely regarded for its accomplishments in non-STEM fields, and it can grow to become just as renowned in designing the next most sustainable form of urban infrastructure or discovering the next breakthrough in automotive technology if society realizes that Hispanic architects and engineers truly matter more than ever.

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