

2023-10-10

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Recommended Citation

MEJIA, Joel Alejandro, "Exploring Racialized Ideologies About Latino/A/X Engineering Students In The United States Southwest Region" (2023). *Research Papers*. 111.

https://arrow.tudublin.ie/sefi2023_respap/111

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Exploring racialized ideologies about Latino/a/x Engineering Students in the United States Southwest Region

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Conference Key Areas: *Equality Diversity and Inclusion in Engineering Education, Recruitment and Retention of Engineering Students*

Keywords: *Latinos/as/xs, sociopolitical context, testimonio, racialization*

ABSTRACT

Although efforts in the United States (U.S.) to improve the participation and representation of minoritized populations in engineering have increased, there is a stagnant representation of Latinos/as/xs in engineering spaces. Given that a historical context of engineering education for Latinos/as/xs in the U.S. is limited in the engineering education research literature, this paper provides a description of the historical educational landscape of Latinos/as/xs in the U.S. Southwest region and connects that sociohistorical context to the current realities of Latinos/as/xs in the region through their *testimonios*. The U.S. Southwest is home to the largest Latino population in the U.S., who also happen to be predominantly, and historically, Mexican and Mexican American. Thus, this research paper focuses primarily on this region since it is also the location where most of the Latino/a/x engineering students reside and attend school. This paper draws from the theoretical framework of racialization to explore the ways in which racialized ideologies about Latinos/as/xs emerged from an orchestrated process of Americanization, linguistic violence, and deficit thinking that continues, to this day, to impact Latino/a/x engineering students. Implications of this study suggest that recognizing the role of racialized ideologies in shaping engineering education spaces may serve to help engineering educators

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identify the ways in which historical and sociopolitical forces are (re)enacted, perpetuated, but also challenged.

1 INTRODUCTION

1.1 Historical Racialization in the U.S. Southwest

The thought of Manifest Destiny in the United States led to the ideology that Americans must move westward to spread their ideas of American exceptionalism. It was this principle that led to the annexation of Texas and the eventual Mexican American War of 1846. These events also shaped the social dynamics of the U.S. Southwest and the educational landscape that – to this day – continues to impact Latinos/as/xs² in the region. At the time, a large number of Mexicans and Mexican Americans inhabited in the U.S. Southwest and were part of a thriving community. After the Mexican-American War ended in 1848, Mexicans who remained in the United States were promised citizenship under the Treaty of Guadalupe Hidalgo. However, as the law at the time only allowed white individuals to obtain citizenship (black slaves in the U.S. were not considered citizens at the time), Mexicans had to be classified as white to receive citizenship, effectively racializing them (Donato and Hanson 2012). Nevertheless, in the eyes of the new settlers, Mexicans and Mexican Americans were not considered white socially. That is, Mexicans and Mexican Americans were white on paper but socially non-white, thus, relegating them to a second-class citizen status (Donato and Hanson 2012; Menchaca 1997).

This racialization process became even more apparent as Anglo settlers took control of policies that were harmful to Mexicans and Mexican Americans (San Miguel 1999). The settlers believed in converting them into American exceptionalism through a process of Americanization, and encouraged this process through English-only education and emphasizing a common American identity (San Miguel 1999). Eventually, the process of Americanization along with language subtraction, IQ testing, and vocational training were used as justifications to create segregationist practices that led to differential education between 1880 and 1930 (Gonzalez 2013; MacDonald 2004; Valencia 2010a). Although there was some resistance from the Mexican and Mexican American community, primarily through the establishment of their own *escuelitas* that supported bilingual education, the pervasive policies began to dominate the educational discourse in the region (San Miguel 1999; MacDonald 2004; San Miguel 1987; Goetz 2020).

1.2 Americanization and Racialization

The Americanization project in schools has traditionally viewed cultures of individuals who are considered to be on the margins of engineering, such as non-whites and non-Europeans, as destabilizing forces (MacDonald 2004; Blanton 2003). This has resulted in deficit ideologies (i.e., the idea that students come to school with inherent deficits from home) and racialization, leading to an assimilation process through subtractive schooling that aims to strip away language and culture from these

² In this paper, I use the term Latino/a/x as an all-encompassing inclusive term to refer to individuals that self-identify with any (but not limited to) of the following categories of Latin-American descent: Latino, Latina, Latinx, Chicano, Chicana, Chicanx, Hispanic, Latin American, Mexican American, Mexican (Villanueva Alarcón et al. 2022).

students. In the past, schools, including institutions of higher education, have taken a top-down approach to Americanize classrooms by propagating stereotypes and tropes about Mexican Americans, such as laziness, violence, dirtiness, lack of ambition, and promiscuity (Valencia 2010b, 1997; Valencia and Solórzano 1997). Teachers were taught to Americanize students, and classrooms became places where children were expected to emulate "desirable behaviors" while ridiculing their own traditions, racial identities, and culture (Blanton 2003). One example of this Americanization process is the presentation of engineering to Latino/a/x students through Western-oriented, rigorous, value-neutral ideologies, promoting capitalism, objectivism, and meritocracy as the values that all engineers should adopt (Cech 2013; Slaton 2015; Riley 2008, 2017), while at the same time ignoring other ways of knowing, doing and being (Mejia et al. 2018; Wilson-Lopez et al. 2016).

The Americanization process, as described by Valencia (1997), has been rooted in racist discourses that were intertwined with economic and colonial interests, leading to the racialization of Latinos/as/xs and the creation of a system of advantages and disadvantages (Menchaca, 1997). These interests became part of sociopolitical forces that restricted access to bilingual education, imposed tracking, and reduced school funding, resulting in negative impacts on the education of Latinos/as/xs, which we still see in engineering education today. This paper draws from the concepts of deficit ideologies and racialization to explore how these continue to exist in engineering spaces and how they impact students' lived realities. The paper is guided by the question: *How and in what ways do Latino/a/x students in the U.S. Southwest continue to experience racialization in engineering education?* The purpose is to reveal how political, historical, personal, and educational spheres are interconnected, where clashes occur, new meanings are made, and identities are formed.

2 THEORETICAL FRAMEWORK

2.1 Racialization as a Theoretical Framework

Racialized ideologies are beliefs, attitudes, and practices that assign different values and opportunities to individuals based on their perceived racial identity (Bonilla-Silva and Forman 2000; Zuberi and Bonilla-Silva 2008). These ideologies are often rooted in historical and social contexts and can perpetuate systems of oppression and inequality. Some examples of racialized ideologies include colorism, which values lighter skin tones over darker ones, and white supremacy, which promotes the belief that white people are inherently superior to people of color (Dixon 2019; Charles 2021). Some of these beliefs also include the idea that English (in the U.S. context) should be the *lingua franca*. Racialization is also the "racial logic that delineates group boundaries" (Gonzalez-Sobrinio and Goss 2019, 507) to determine "otherness." Rosa (2019) argues that racialized ideologies are not just abstract beliefs, but are enacted through language and other forms of communication. These can be reinforced through media, everyday discourses, actions, education, and other cultural institutions. They can influence access to resources, such as education and

healthcare, and contribute to disparities in wealth and power (Bonilla-Silva 2017). In this paper, I use the theoretical framework of racialization to demonstrate the ways in which Latino/a/x engineering students continue to confront racialized ideologies in the U.S. Southwest as the result of the historical influence of the Americanization process, particularly in terms of negative perceptions of Latinos/as/xs, their apparent academic ability, and linguistic practices. I also use these concepts to demonstrate the inner agency of these students and the ways in which they reject dominant discourses as they move through their engineering programs.

3 METHODOLOGY

3.1 Context of the study

This paper, which is part of a larger study, analyzes data collected from a multi-sited case study that was conducted at four universities (three public and one private) in the U.S. Southwest classified as Hispanic Serving Institutions and Emerging Hispanic Serving Institutions (meaning at least 25% of the students population self identifies as Latino/a/x) during the years 2020 to 2023. The universities are located in Texas and California, the states that currently serve the largest number of Latino/a/x engineering students. These locations were chosen because they have the highest populations of Mexicans, Mexican Americans, Chicano/a/x, and Latino/a/x individuals in the region, and because historical local policies and political actions have affected education for these groups (Valencia 2008). Although the student populations at each institution are diverse, the engineering programs follow similar accreditation rules, disciplinary norms, institutional structures, and curricular canons. The study recruited 22 self-identified Hispanic and Latino/a/x engineering undergraduates who expressed interest in contributing to research about Latinos/as/xs in engineering. Most participants were first-generation college students of Mexican descent, with some using terms like Latino/a/x, Hispanic, or Mexican American to identify themselves; thus, demonstrating the diversity that exists within the Latino/a/x community (Revelo, Mejia, and Villanueva 2017). The participants came from various engineering disciplines, with mechanical and biomedical engineering having the highest representation.

3.2 Data collection and analysis

Although the larger study utilized various data sources, including *pláticas* (Guajardo and Guajardo 2013), focus groups, document analysis, and community walks, this paper focuses mainly on data from *pláticas* with participants. As the principal investigator, the author of this paper conducted individual meetings with participants in the form of *pláticas* to establish a relationship of trust between the researcher and the participant (Guajardo and Guajardo 2013; Saavedra and Esquiedo 2020). *Pláticas* resulted in *testimonios*, which are first-hand accounts of lived experiences voiced from the critically reflexive perspective of the participant (Beverley 2004; Delgado Bernal, Burciaga, and Carmona 2017; Delgado Bernal, Burciaga, and Flores Carmona 2012; Huber 2009). The *pláticas*, which lasted from 40 to 90 minutes and were conducted in both English and Spanish, explored various aspects

of the participants' upbringing, education, and experiences in engineering. The resulting *testimonios* were then de-identified to ensure confidentiality and transcribed verbatim using Sonix. These transcriptions were then coded using NVivo 12 to identify recurring topics and themes that shed light on the intersection of language, gender, education, and culture in the participants' engineering journeys. These intersections were important because they are telling cases of the instances of racialization experiences by the participants (Rosa 2019; Flores and Rosa 2015; Zentella 2017). The themes are described in the results section, along with *testimonio* excerpts that illustrate the surface actions impacting the experiences of Latino/a/x engineering students.

3.3 Researcher's positionality

I identify as a Mexican American engineering educator who comes from a low-socioeconomic background, and I am also bilingual in Spanish and English. I have experienced racialization myself through schooling in the U.S. Southwest in the form of educational differentiation when I was not allowed to take upper-level math because of my "broken" English, and in engineering for not being considered a "true" engineering because of my ethnicity. These experiences helped me frame the research I present here and provided me with the tools to engage in a more humane research approach that honors the linguistic practices of the participants. My aim is to amplify the voices of Latino/a/x engineering students, recognize them as creators of knowledge, and (re)frame educational equity in engineering. I reject the idea that these students have inherent deficits that must be *fixed* because this kind of thinking marginalizes them instead of creating a supportive environment for them. I advocate for acknowledging and honoring the lived experiences of those who have been historically left at the margins, and integrate decolonizing research methodologies to promote liberative practices in engineering education.

4 RESULTS

Data analysis showed that participants encountered in their engineering pathways instances of racialization through the enactment of different actions, beliefs, and attitudes of others. The findings suggest that issues like racialization of ethnic identities, questioning of ability, and language subtraction continue to permeate education in the U.S. Southwest and negatively impact Latino/a/x engineering students. The following sections provide an overview of the results obtained from the analysis of the data. Please note that the participants self-identified for this study and those terms (i.e., Hispanic, Latino, Mexican American, etc.) are used to describe the participants and their *testimonios*.

4.1 Racialization of identities

One of the common racialization experiences the participants talked about involved confronting racialized ideologies with teammates when working in groups. Carlos, a Mexican American electrical engineering student, for example, commented on the questioning that he received constantly when working with other white classmates:

I can't say that it's specifically because I'm Mexican or not, but – In that situation, I guess I would like to believe so...But I can definitely say, like, there's been cases where I wanted to work with people and they've given me like a look, a smirk, or a mark. I'm not sure if it's because, like, the way I'm dressed, the way I look, maybe the color of my skin. Like, I never got those questions, but I never really cared. I never really cared. I just kind of like, okay, whatever. Like, I'll go work somewhere else, and then I just do my own thing

Carlos mentioned how racialization often took the form of actions and attitudes (e.g., looks, smirks, marks), as well as constant questioning of others about their presence in that space. While these events may have had a negative impact on Carlos, he decided to move on and do work on his own.

Other participants mentioned the racialization of their identities based on their looks and the general idea in the U.S. context that race is a black/white binary (Donato and Hanson 2012). This perception also ignores the fact that Latinidad is not within that black/white binary, but it exists in a complex system that cannot see beyond that framing. Eva, a Honduran American biomedical engineering student, commented on the issue of this binary and the questioning of Latinidad:

I tell people that I'm Hispanic. And then a lot of the times I get the question: how? Because I don't look like it. And then I have to explain to them, I guess you could say it's like, "oh, both of my parents are from Honduras, but, like, there's white and black here in Honduras – there's white and black over there. And my dad's black and my mom's white." But they were both born in Honduras. Born and raised in Honduras.

4.2 Questioning of ability

Participants indicated that they were constantly policed and questioned about their abilities in engineering. Following the old tropes and stereotypes of "laziness" and "lack of intellectual abilities" (Valencia 2010b, 1997), participants confronted the idea that Latinos/as/xs did not have the knowledge or abilities to engage in engineering. For instance, Nuria, a Mexican American general engineering student, commented on the actions and attitudes encountered in her computer science class:

My first computer science class was with Dr. [Kahn] and it was fine...prior to college, I had four years of experience in coding. So, I felt like going into that class I was going to do very well and I did do very well. But, I guess, I kind of wish that he was...he acknowledged my experience more. I felt like he like favored a lot of the, I guess, like, white students over me.

She later went on to comment as she tried to answer questions in class, she was constantly dismissed in favor of white male students. She observed what she described as preferential treatment and rarely acknowledged the insights she provided in class resulting in frustration, anger, and the belief that she did not belong in engineering.

In a separate *testimonio*, Santi, a Latino mechanical engineering student, reflected on the negative experience he had in a laboratory with a graduate student when the graduate student tried to challenge his knowledge about chemistry:

The first time I joined a research lab, a PhD student – he was very demeaning – he would tell me my data is crap. And I remember that time when he grabbed a pencil and told me “show me that you can do this calculation” – of like, a molar concentration – “show me that you can actually do this, because I don't think you can.” Here I am like my first time trying to do research, and really trying my best, and he is like telling me, like, “you are not a researcher, you can't do this, if you show me you can do this then we can proceed.” So, I am scared of coming into the lab.

4.3 Language subtraction

Another theme in the data was that of language subtraction (San Miguel 1999; Ek, Sánchez, and Quijada Cerecer 2013; Martinez 2017), where students noticed the discriminatory undertones toward speaking languages other than English. Not only was speaking Spanish at home a point of contention for educators, but the fact that participants also spoke other indigenous languages at home. For example, Lara, a Mexican American environmental engineering student, reflected on how her teachers told her mother not to speak to her in another language that was not English because she would get “confused:”

So, growing up [the language spoken at home] was only Spanish. A little bit of English. Only when I had to do homework. Sometimes my mom speaks in Otomí, which is something I grew up talking, but I don't talk it anywhere just because, like, in elementary school, one teacher told my mom like, “Oh, she's not going to learn English and she's not going to do well in school if you keep teaching her another language,” which I find it funny because by the time you get to high school, you need to have that, like, that credit of having another foreign language. And I was just like, why? Why do they do this to us? Why surpass us?

This excerpt shows the long-held Americanization belief that language confusion can happen when growing up in a bilingual home (MacDonald 2004; Zentella 2017). It is also important to note that participants in this project recognized the dissonance that exists because students are asked to fulfil a second language requirement for graduation, but only Indo-European Language classes (i.e., French, Portuguese, German, etc.) are offered and credited as second language. Lara's experience was one common trend among all participants where language subtraction and policing were common. Moreover, it is important to note that the presence of Spanish as the only language (besides English) spoken at home has changed over the years. The U.S. Southwest demographics have changed and more indigenous languages are present. For instance, in this study, there were at least 6 participants that indicated speaking indigenous languages at home including Mixteco, Zapoteco, Maya, Otomí, Qhechua and Garifuna.

Another impact of historical language subtraction in the region was the fact that participants lost the learning of the language because of repressive actions in schools. Alberto, a Hispanic mechanical engineering student, reflected on the implications of historical language subtraction:

Growing up my mom was very fluent with Spanish and English, but she only talked to us in English, which was a bummer because now I struggle and I don't speak Spanish...I know back in the early or within the 1950s, the mid 1900s, that it was still in school, like, you couldn't speak Spanish, a lot of the students, they really – I mean, of course, white students and teachers really pushed for students not to speak Spanish in school. And I know even some people got picked on for it. You know, one of my aunts, two of my aunts actually got picked on for it. So, they stopped speaking Spanish altogether at school.

5 DISCUSSION

The study suggests that Latino/a/x engineering students continue to face racialization in engineering spaces, particularly evident instances of “otherness” (Gonzalez-Sobrinio and Goss 2019). As the world of U.S. engineering continues to be dominated by Americanization ideals of meritocracy (Cech 2013; Slaton 2015), rigor (Slaton 2010; Riley 2017), objectivity (Cech 2013, 2014), competitiveness (Faulkner 2007; Tonso 2007, 2006), and hypermasculinity (Tonso 1996, 2007; Faulkner 2000; Hacker 2017), Latino/a/x engineering students will continue to confront racialized ideologies about who engineers are and who they should be. Recent decisions by the Supreme Court of the United States regarding affirmative action (Nadworny 2023) will widen even more the gap that has been created in higher education rooted in historical racialization.

As shown by the results, participants continue to encounter issues related to the subtraction of language and linguistic practices in higher education, and have to confront the perception that English proficiency is often necessary to excel academically. The data also shows that racialization is complex and multifaceted, showing that it is not something from the past and that it is still very alive in the U.S. Southwest. Latino/a/x engineering students also experience the results of decades of the Americanization process, such as historical discrimination, language subtraction and schooling differentiation (Valenzuela 2010). The old tropes and stereotypes such as portraying Mexican Americans as lazy, criminal, and uneducated (Gonzalez 2013) are still present in engineering spaces, as indicated by the *testimonios* of the participants. Language discrimination and perceived accents (Flores 2019) have also been subject to discrimination and prejudice, with the particular banning of the use of Spanish and indigenous languages in schools as indicated by participants like Lara and Alberto.

Latino/a/x engineering students were also often excluded from the category of “engineer” – as demonstrated by the testimonios of Nuria and Santi – where their legitimacy in engineering was often questioned as well as their ability, and were

instead assigned a racial category based on their perceived ethnicity or nationality. San Miguel (1999); Valencia (2010a) argued that these instances of questioning of intelligence come as a result of old tropes where IQ testing was utilized to frame Mexican Americans in the U.S. Southwest as unable to perform academically due to their perceived deficits. These examples illustrate how Latinos/as/xs have been and continue to be racialized in the U.S. Southwest, and how these processes have had a profound impact on their experiences and opportunities in society.

6 SUMMARY

The study suggests that racialization in the U.S. Southwest is a process that continues to impact how Latinos/as/xs reach educational parity and equity in engineering spaces. The research also provides a description of the *testimonios* of Latinos/as/xs that *are currently enrolled* in engineering programs. This paper also invites those who are currently serving Latino/a/x engineering students, to engage in reflexive practices to critically analyze the role that deficit ideologies play teaching, how we perceive students from multicultural backgrounds, and whether or not we create spaces where linguistic practices are valued instead of being silenced. It is also an invitation to Hispanic Serving Institution and emerging Hispanic Serving Institutions in the U.S. Southwest to analyze what servingness constitutes (Garcia 2020), the role of bilingualism in engineering education, and the support systems that are created to provide equitable access to engineering.

If the goal of engineering education in the U.S. Southwest is to broaden the participation of Latinos/as/xs, then we must (re)examine how ideologies, behaviors, policies, conventions, and norms in engineering intersect and shape the trajectories of Latino/a/x engineering students. This study emphasizes the need to understand the racialized experiences of Latino/a/x engineering students to provide better environments for learning and professional development. The sociopolitical realities of Latino/a/x engineering students are shaped by the negative stereotypes and policies developed toward Latinos/as/xs. The study calls for institutions of higher education, as specifically engineering, to reconsider how deficit ideologies emerging from racialization impact students. Challenging our own racialized ideologies – regardless of geographical location – is an act of resistance to ensure that engineering educators and institutions are accountable for their actions. Future work emerging from this research study will provide professional development workshops for faculty, students and staff that engage participants in reflexive practices to ameliorate the impacts of racialization and deficit ideologies through pedagogy.

ACKNOWLEDGEMENTS

I would like to thank the participants of this study for sharing their *testimonios*. This material is based upon work supported by the U.S. National Science Foundation under Grant No. 1944807 and No. 2151404. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation.

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