WIP: Exploring the racialization of Latinos/as/xs in the U.S. Southwest and its implications on deficit ideologies in engineering education

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***Abstract*— This work in progress paper explores the historical impact of racialization and deficit ideologies on the education of Latinos/as/xs in the U.S. Southwest. It aims to provide evidence of how historical conceptualizations of race have impacted and continue to affect the education of Latino/a/x engineering students. Focusing on the research question of how racialization and whiteness influence the framing of deficit ideologies toward Latino/a/x engineering students, the larger study described here involves twelve self-identified Latino/a/x engineering sophomore and junior students from Hispanic Serving institutions (HSIs) and emerging HSIs. *Testimonios* were collected to uncover instances of racialization and the subsequent framing of deficit ideologies. A thematic analysis approach was used to identify emerging themes related to the forms of racialization experienced by students and the resulting educational challenges. Preliminary analysis reveals that racialization occurs in both engineering and non-engineering spaces, leading to a lack of recognition from administration, professors, and white students regarding the impacts of overt and covert whiteness that led to deficit thinking. The paper emphasizes the importance of counternarratives in engineering education and the need to validate and acknowledge the lived realities of Latino/a/x students stemming from historical racialization.**

Keywords—racialization, deficit ideologies, Latinos/as/xs, U.S. Southwest

I. Introduction

Taking a historical perspective is crucial to understand how broadening participation efforts in engineering have been affected by sociopolitical forces, which are often overlooked in engineering education research. Cases like *Rodriguez v. San Antonio Independent School District*, *Covarrubias v. San Diego Unified School District, and LULAC v. Richards*, to name a few, while not extensively examined in engineering education research, have had a significant impact on the unequal educational opportunities faced by Latino/a/x students [1]. These historical landmark cases continue to have an impact for Latino/a/x engineering students to this day. For instance, the *Rodriguez v. San Antonio Independent School District* case established the schema for the current unequal school financing system that dictates how schools should be funded [1]. The *LULAC v Richards* case sought to overturn decades of unequal access to higher education for Mexican Americans in the Texas borderlands, but the Texas Supreme Court ultimately ruled unanimously against the plaintiffs [1]. Although the *LULAC v. Richards* case eventually led to the establishment of the South Texas Border Initiative that provided financial support to institutions of higher education in Texas, the South Texas region continues to see limited success and academic achievement of Latinos/as/xs in the region [2].

Other historical factors, such as the introduction of Americanization through schooling, played a crucial role in shaping the education of Latinos/as/xs in the U.S. Southwest. Under this project of Americanization, the Anglos that settled in the U.S. Southwest sought to continue their nation-building project by eradicating Spanish from public education and make of Mexicans "American loyal citizens" [3]. Some impacts of the Americanization project included the normalization of corporal punishment in schools and the rejection of Mexican culture in all aspects of education. At same time, white supremacist views were also manifested in schools "as acts of violence, racial slurs and blatant discrimination" [3].

Furthermore, a process of racialization had been already present in the U.S. Southwest after the Treaty of Guadalupe Hidalgo was signed between Mexico and the United States, which provided the foundation for the justification of Americanization. Under the Treaty, Mexicans in the U.S. Southwest were promised U.S. citizenship after Mexico was forced to cede a significant portion of its territory following the Mexican American War [4]. However, only whites were granted citizenship at the time (as black slaves were not considered citizens), so Mexicans had to be classified as white to fulfill the treaty's promises [4]. Nonetheless, *de facto* segregation was a common practice socially, as Mexican Americans were socially perceived as non-whites despite their legal classification as whites. The U.S. Southwest had "attracted Southern white migrants who viewed dark-skinned peoples with suspicion and suspected they may have been tainted with African blood" [3], thus providing the foundations for the racialization of Mexicans and Mexican Americans in the U.S. Southwest. This

racialization process became the primary driver of segregation among Mexican, Mexican American, and Latino/a/x children in the U.S. Southwest and the subsequent educational inequities that ensued.

This sociopolitical background serves as the backdrop to better understand the current educational landscape of many Latinos/as/xs in the U.S. Southwest regarding engineering education. This work in progress paper describes the ways in which the racialization of Latinos/as/xs in the U.S. Southwest has historically impacted – and continues to impact – the education for Latinos/as/xs. Guided by the research question, *how and in what ways does racialization impact the engineering pathways of Latino/a/x students?*, this work in progress paper focuses on the historical construction of Latinos/as/xs as *de facto* non-whites and how students make meaning of these issues in their pursuit of an engineering education.

II. Conceptual Framework

A. Racialization and education

Racialization is a multifaceted social phenomenon with far-reaching consequences for individuals, communities, and societies. It entails the allocation of racial identities and hierarchies to distinct groups, influencing their experiences, opportunities, and resource appropriation [5]. Racialization encompasses the societal construction and attribution of racial categories and significance to individuals or groups, influenced by perceived physical, cultural, or ethnic traits [5]. Racialization also dictates what perspectives, attributes, values, behaviors, and linguistic practices as well as ways of knowing, doing and being are accepted by the majority. Racialization also involves intricate power dynamics since “othering” is essential for those hierarchical structures to exist [6].

Between the 1880s and the 1920s, Mexicans and Mexican Americans in the U.S. Southwest faced ongoing resistance to both racialization and Americanization, but it was during this period that educational disparities became normalized. Racialization was fueled by a prevailing sentiment of inferiority towards these groups, resulting in the implementation of differential education in public schools [7]. The normalization of these disparities was supported by practices such as IQ testing, vocational training, and the perception that Spanish language was inferior [8, 9]. Donato and Hanson [4] further argue that the differential education experienced by Mexican Americans in the U.S. Southwest was a result of segregationist practices rooted in the racialization of Mexicans. This racialization portrayed them as culturally deficient, mentally inferior, and socially inferior [7]. Unfortunately, this historical context and its sociopolitical implications are often overlooked in engineering education research when examining the persistently low participation rates of Latinos/as/xs in the field.

B. Racialization, Americanization, and deficit ideologies

Throughout the history of the United States, marginalized communities, particularly those outside the norm (i.e., white, Eurocentric), have been viewed as disruptive to the process of Americanization within schools [10]. This perspective extends to the field of engineering, where deficit ideologies persist even when not explicitly named. Established within the education system in the U.S. Southwest, deficit models have utilized various labels to categorize individuals from diverse backgrounds, framing them in terms of shortcomings and deficiencies [11]. These labels, such as Limited English Proficiency (LEP) students, disabled students, inner-city students, or remedial students, have consistently positioned students of color as inferior and in need of remediation. This deficit-oriented perspective seeps into curriculum development, lecturing styles, and exam preparation. As a result, minoritized populations experience a predetermined pattern of being perceived as less capable than their counterparts who do not carry these limitations [12-14]. However, it is important to recognize that these limitations are primarily a product of racialization, biased perceptions, and societal systems, rather than inherent qualities of the individuals themselves.

Latino/a/x engineering students continue to face the consequences of these negative perceptions, including deficit ideologies, racialization, and assimilation through subtractive schooling, which aims to erase language and cultural aspects deemed undesirable [15]. Educational institutions, including higher education, have historically adopted a top-down approach to enforce Americanization in classrooms. Stereotypes propagated in popular texts have erroneously described Mexican Americans as lazy, violent, dirty, unambitious, and promiscuous [8]. Teachers were instructed on how to Americanize Mexican students, and the classroom became a site for enforcing Americanization by expecting students to conform to "desirable behaviors" while ridiculing and criticizing their own traditions, racial identities, and culture [8]. An example of this Americanization process is observed in the presentation of engineering to Latino/a/x students, where Western-oriented, value-neutral ideologies prevail, emphasizing capitalism, objectivism, and meritocracy as the core values that all engineers should embrace [16-19].

III. Methodology

In this section, I describe the methodology for the study described in this paper. It is important to mention that this work in progress is part of a larger ethnographic study involving both Hispanic Serving Institutions (HSIs) and emerging HSIs.

A. Context of the study

The data analyzed in this study originates from qualitative data collected from 12 participants attending a public HSI classified as a highly research-active R1-level university according to the Carnegie Classification of Higher Education Institutions [20], a private teaching-focused emerging HSI, and two public R1 emerging HSIs. Geographically, two of the institutions were located in Texas and two in California. The selection of these sites was based on their significant representation of Latinos/as/xs in the U.S. Southwest, particularly those identifying as Mexican, Mexican American, and Chicano/a/x [9]. Moreover, these locations were chosen for their historical significance in terms of legislation, policies, and political actions that have influenced K-16 education for Mexicans, Mexican Americans, and Chicanos/as/xs in the U.S. Southwest [1]. Hence, the data collection sites not only provide the setting for the study but also offer the necessary sociopolitical context for the analysis of the data. While the student populations at each institution exhibit considerable diversity, their engineering programs adhere to similar

accreditation standards, disciplinary norms, institutional structures, and curricular frameworks. Variations across campuses may stem from institutional contexts such as organizational structure as well as the diverse backgrounds of the students attending these schools, encompassing factors like socioeconomic status, accessibility, transnational experiences, and bilingualism.

A total of 12 self-identified Mexican, Mexican Americans, and/or Latinos/as/xs were considered for this work in progress paper. The participants were followed for 2 years to better understand their life histories and educational trajectories with a focus on their engineering journeys.

B. Data collection and analysis

The larger stud relied on various data sources including *pláticas*, focus groups, journey mappings, document analysis, and community walks. However, this work in progress paper primarily relies on data gathered from *pláticas* with the participants. A series of individual interviews in the form of *pláticas,* which are informal talks or conversations held in a safe space [21]. The use of *pláticas* aimed to establish a balanced relationship between the researcher and the participant, promoting trust and openness [21]. Creating *confianza* (trust) was crucial in ensuring that participants felt comfortable sharing their *testimonios* [22, 23] (personal narratives) about their experiences in engineering. Participants engaged in up to six *pláticas,* which lasted between 40 to 90 minutes each. These *pláticas* were conducted in both English and Spanish, often incorporating translanguaging and code-switching practices. The discussions during the *pláticas* focused on various aspects such as participants' upbringing, family dynamics, language policies and practices at home, family values, as well as their experiences in K-12 schooling and engineering.

To ensure participant confidentiality, the *pláticas* were anonymized, and Sonix (a transcription software) was used to transcribe the *testimonios*. The transcriptions were then imported into NVivo 12 for a coding process that involved inductive, axial, and deductive coding [24]. In the initial stage of inductive coding, recurring topics were identified by contrasting the students' *testimonios* and making note of them in memos [24]. The concepts of racialization and Americanization were employed to analyze instances where participants encountered different sociopolitical realities, challenged prevailing deficit ideologies, and demonstrated agency through acts of resistance. This initial analysis revealed recurring topics that were further examined through axial coding to establish connections and generate broader themes [24]. The codes were compared with social practices (i.e., behaviors, attitudes, beliefs) and political structures (i.e., policies, norms, conventions) to uncover how racialization manifested in the actions of those involved in engineering spaces. These codes were then organized into distinct themes, offering an overview of the commonalities found among the *testimonios*. In the results section, the emergent themes are discussed, and relevant excerpts from the *testimonios* are presented to illustrate how racialization impacts the engineering journeys of Latino/a/x students.

IV. Preliminary Results and Discussion

A. Undermining and questioning intellect

Participants frequently discussed the challenges of navigating engineering spaces while being constantly challenged about their ability to become engineers. That is, being perceived by other students, professors, and administrators as "not having what it takes" to be engineers. This entailed receiving messages, conveyed through symbols, language, and practices, that positioned them as transgressors in those spaces, making them feel unwelcome and out of place. For instance, Santiago, a first-generation Latino materials engineering student, shared his experience of grappling with his identity and how others perceived him in the lab where he conducted research. He recounted a particularly difficult interaction with a doctoral student who was supervising his work. Santiago described the encounter in the following manner:

> *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… But because of that first experience I feel a lot of pressure because people may think that I am the representation of all Latinos because there are not many of us.*

This excerpt highlights how participants internalized the prevailing deficit discourses of engineering and how negative experiences in engineering spaces can shape distorted expectations for Latino/a/x students. In terms of observable behaviors, the attitude displayed by the PhD student aligns with findings from prior research in engineering education, which emphasize the challenges of belongingness and the need for individuals to prove their worth in engineering spaces [23-28]. Santiago's testimonio also exemplifies the power dynamics inherent in engineering spaces and the detrimental effects they can have on students. Additionally, Santiago later reflected on the negative associations attached to having a non-white body in predominantly white spaces [29], emphasizing the importance of not being perceived as a representative of all Latinos and challenging stereotypes. This reflection demonstrates Santiago's awareness of the deficit ideologies prevalent in academia towards Latino/a/x individuals. Overall, Santiago's experience was not unique, since all participants mentioned how they constantly need to reclaim their own space in engineering, and his *testimonio* serves as a representative account of the challenges and pressures faced by Latino/a/x engineering students as they navigate the complexities of their ethnic and engineering identities in spaces where they are subjected to racialization.

B. Language subtraction

A recurring theme in the data was the influence of language subtraction on the education of Latino/a/x students and their experiences in engineering. The participants expressed their frustration with the language subtraction they faced throughout their education and how it affected their relationships with family and community members. Moreover, they also talked about how engineering spaces often are perceived as environments where English should be the *lingua franca*. They also highlighted the detrimental effects and discriminatory implications of the instructions given by teachers concerning the languages spoken at home. To illustrate, Lara, a first-generation Mexican American environmental engineering student, recounted an incident involving her mother and a teacher who discovered that Lara's mother spoke Otomí, her native Mexican indigenous language:

> *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?*

Lara's account resonates with the experiences shared by other participants in their *testimonios*. Among the participants, six of them had parents who spoke indigenous languages such as Garifuna, Mixteco, Zapoteco, Maya, and Otomí. Similar to Lara, all of these participants recounted instances where teachers or school staff advised their parents to cease speaking Spanish or their native languages, citing concerns about confusion and detrimental effects on their education. In the given excerpt, Lara also raises a thought-provoking question about why languages spoken at home are deemed inferior and not recognized for academic credit in school.

C. Inferior access to resources

Although all participants expressed that they believe they avoided comparing themselves to others, they confessed they could not help but notice stark differences in schooling among peers who came from different income households. All participants emphasized the impact that unequal access to resources had on their education. It is well known that schools in the U.S. have been impacted by how school financing has dictated the future of Latino/a/x students since the landmark case of *Rodriguez v. San Antonio Independent School District* [9]. This landmark case defined how schools would be financed through property taxes, leaving poorer communities unable to advocate for better resources for their schools [1]. All the participants reflected on the impacts of unequal school financing, recognizing that it created a huge obstacle when entering engineering programs. For instance, Leo, a Mexican American mechanical engineering student, reflected on the lack of resources,

> *I usually try not to compare myself because […] we all have different experiences in high school. After talking to so many people about their high school experiences, I'm like, 'oh, I didn't have that.' I'm like, 'okay, I didn't have the resources that I needed to know, to have the same skill level'*

During a later conversation, Leo recounted an incident where he found himself among a minority of students (mostly students of color) who had not previously been exposed to MATLAB during their high school years. This lack of familiarity with the software left Leo feeling like a hindrance in class and group work, as he struggled to keep up with his peers. Through his *testimonio*, it becomes evident that this educational disparity and missed opportunity had a negative effect on Leo's ability to engage in the social and cultural aspects of his engineering program, resulting in feelings of isolation. Leo was eventually pushed out of the engineering program after he received no support from professors and administrators who saw him as not wanting to "make an effort" and characterized as "lazy" when the reality was that the was struggling financially and did not have the resources other students had to stay on track, such as "private tutoring" as Leo later mentioned during a follow-up *plática*. These mischaracterizations of students as not wanting to do the hard work [25] or simply called lazy [8] have been historically used to justify even more differential and subpar education in the form of vocational schooling under the premise of inferiority [7].

V. Implications and Future Work

It is worth noting that the points made in this work in progress paper and obtained from these preliminary results are part of a system in which engineering is completely embedded. The values, practices, behaviors and deficit ideologies stem from a longstanding racialization of Latinos/as/xs. Negative stereotypes and the notion that speaking a language other than English could lead to confusion are influenced by external factors rooted in a history of subtractive schooling practices. Harmful policies, such as the ban on bilingual education and reduced support for low-income, first-generation students, continue to affect Latino/a/x students in the U.S. Southwest. The geographical location of the four institutions in this study is significant, as the U.S. Southwest has historically presented challenges in education for Latinos/as/xs, including within the field of engineering. While it cannot be conclusively determined if the cultural landscape of engineering is solely responsible for the negative experiences of Latino/a/x engineering students, it is important to recognize the role that location and history play in shaping perceptions and treatment within engineering programs. Deficit ideologies surrounding Latinos/as/xs have persisted over the years and are further exacerbated by new sociopolitical forces manifested through policies and legislation. Future work will analyze these issues, with a particular focus on the systemic nature of deficit ideologies and racialization, and the impact of doing work in engineering education research using *testimonios*.

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