

Conocimiento as a Framework: Promoting a Culturally Affirming Identity Development for Latinx Engineers

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Introduction

This NSF-funded study follows an anthropological approach to (re)define how Latino/a/x engineering students develop their consciousness while uncovering the multiple intersectional identities that dispel the myth of the Latino/a/x monolith. The overarching goal of this qualitative study is to generate knowledge on how Latino/a/x engineers make meaning of their experiences and the adversity they face throughout their engineering pathways, and how these meanings may provide a heightened sense of agency to persevere as they acknowledge themselves as holders and creators of knowledge.

This project has focused on four major activities: (1) develop and expand the methodological practices that explore the development of *conocimiento* (consciousness) among Latino/a/x engineers while centering on their intersectionalities; (2) explore the different forms in which institutional practices may perpetuate or alleviate the adversity faced and perceived by Latino/a/x engineering students; (3) analyze the pathways of Latinos/as/xs in engineering to unravel traditional academic ideas of who may be considered a producer of knowledge; and (4) explore the ways in which the incorporation of *conocimiento* as a framework can provide more humanizing approaches to the education and research of Latinos/as/xs. This paper focuses primarily on the first major activity, which is to explore a theoretical framework that provides a more holistic view of identity and consciousness development for Latino/a/x engineering students. A theoretical background research was conducted to elaborate a robust theoretical framework for this study. This activity consisted in drawing from Sociology, Education, Anthropology and Cultural Studies, with a primary focus on Gloria Anzaldúa's *conocimiento* framework [1], *Testimonio* theorizing [2-6], and multi-sited ethnographic methods [7, 8]. Research methodologies and protocols have also been developed in consultation with the advisory board and experts in the area of Chicano Cultural Studies to develop protocols that are culturally responsive and help address the research questions. Thus, this paper provides a framework and illustrations that challenge dominant narratives about who gets to produce knowledge and what counts as knowledge when considering conceptualizations of identity formation.

Conocimiento as a Framework

This research emerges from the need to consider sociopolitical contexts in engineering education in order to make transformative strides in the broadening participation of Latinos/as/xs in engineering. The historical struggle of Latino/a/x access to quality, culturally-relevant public education is evidenced today through their systematic exclusion from engineering fields [9]. The banning of the Spanish language in schools, the over-disciplining of Latinx students, and a Eurocentric curriculum [10-13] demonstrate that educational contexts are by no means neutral sites of knowledge production, but rather serve as sites of social reproduction that privilege Eurocentric norms, values, and culture. If the problem of Latino/a/x

underrepresentation in engineering is to be adequately addressed, the problem must first be understood.

The engineering “rules” are not implicit nor isolated instances [14-16], they are legitimized and made explicit through engineering education research which sets the parameters regarding what kind of engineering narrative matters. While there is a broad range of research that addresses Latino/a/x students, the current approaches are devoid of the insider perspectives and methodologies created by Latino/a/s individuals. This serves to further marginalize historically underrepresented students from engineering as hierarchical classifications place value on what kinds of knowledge are deemed worthy and which are not. This type of engineering and research gatekeeping could potentially erase students of color different ways of knowing and meaning-making practices – a process de Sousa Santos describes as epistemicide or epistemological injustice [17, 18].

This study proposes to use Anzaldúa’s seven stage theory of *conocimiento* as a lens and set of concepts to explore the narratives of Latino/a/x engineers [1, 19]. *Conocimiento* consists of seven stages: el arrebató, Nepantla, Coatlicue, el compromiso, Coyolxauhqui, a clash of realities, and spiritual activism. The entire *conocimiento* process is a change in mindset and rationale through a recursive process. The initial stage, el arrebató, involves a series of clashes that allow the individual to think about reality in different ways[1]. El arrebató contributes to the realization that everything is connected and there are no extremes. The goal is to learn to connect ideas that most people perceive as separate including, but not limited to, the dimensions of imaginal, spiritual, and political [19]. Once one begins to think in this way, individuals become a nepantlero/a. A nepantlero/a is a guide or mentor that can help others flung into Nepantla. The goal is to push those in Nepantla to discover this type of connective thinking focused on holistic knowledge and breaking down identities in their unique way [1, 19]. The role of a nepantlero/a is based on nurturing and cultivating a way of thinking – not teaching those stuck in nepantla in the way they achieved the new style of thinking.

As more and more individuals become Nepantleros/as, they begin to share experiences. Each person has created new connections, new understandings, and a new level of respect for others’ ideas. These people who have crossed Nepantla are more willing to cross each other’s worlds and learn from each other, which describes the Coatlicue stage [19, 20]. If ideas differ, they will discuss and go through the process together. This new concept is the idea of Nos/otras or us/them. The barrier that is constantly built up in our society pitting people against each other can be connected as well. Criticism is met with collaboration and even more barriers can be broken down through el compromiso [19]. One then becomes self-reinvented and begins to suture all those previously dismembered identities – a process called Coyolxauhqui [21]. In Coyolxauhqui, this new script is discovered and immediately challenged with being different from the dominant culture leading to a clash of realities. This forces the individual to stay true to their new script testing their emotional tie to this new identity. All of the conflicts that happen become the resolution as they truly learn who they are through the criticisms of others and can become a new conscious version themselves.

All of these ideas fall under spiritual activism. *Conocimiento* is the process, but once *conocimiento* is achieved then social transformation can begin. It is the collective choosing of the *conocimiento* thinking that creates a way of life, as well as a call to action to continue the growth for self and others. This growth and social change is driven by commonalities while recognizing and respecting differences [20, 21].

Conocimiento as a Framework for Engineering Education

The *conocimiento* framework is currently being utilized to describe the pathways to and through engineering of Latino/a/x students [9]. In the larger study, *conocimiento* is used as a tool to describe the clashes barriers encountered by the students in the engineering education system in order to break them down. Some of these clashes (i.e., *arrebatos*) include: (1) a lack of belonging, (2) being questioned constantly about ability, (3) receiving poor education, (4) individuals instilling a sense of doubt and failure, and (5) the dispossession of language and educational opportunities as a result of deficit ideologies. These *arrebatos* are described by participants and the driving force to experience *Nepantla*, or a liminal stage. After this, these students have described feeling otherized (i.e., *Coatlicue*) and decided to change majors, stop asking questions in class, developing relationships with other engineering students and professors, and even experiencing depression. Their stories represent overcoming *Coatlicue* in their own ways and traversing through the next stages. All of these exemplars provide a counternarrative to the research on engineering education, which has promoted the development of an engineering identity as a way to increase the participation of Latinos/as/xs but continues to create a space where a healthy identity development is not possible.

Ongoing and Future Work

The current research focuses on exploring the lived realities of these Latino/a/x participants. The study involves a longitudinal study and the description of the framework and how it related to identity development of students is currently part of the initial stages of the study. This work also seeks to identify the systemic barriers encountered by students, particularly as they become engages in engineering after they graduate. Future work will focus on analyzing the discrepancies that may exists between policy, institutional action, and the lived realities of the students, and how these impact the broadening participation of students at Hispanic Serving Institutions (HSIs) and Emerging Hispanic Serving Institutions (EHSIs). It is important to note that the participants in this study come from both HSIs and EHSIs, as well as research intensive and primarily teaching institutions, and both private and public. Despite the differences in context, several participants have experienced similar instances of discrimination and educational barriers; thus, indicating that although these institutions serve a large number of Latinos/as/xs there are still systemic issues that have not been resolved or attended. Future work will explore how engineering may perpetuate the production and reproduction of dominant narratives and impact the healthy development of an engineering identity for Latinos/as/xs, as an analysis of the Latino/a/x monolith narrative that has persisted in engineering education research [9, 22].

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References

- [1] G. Anzaldúa, *Borderlands: la frontera*. San Francisco: Aunt Lute, 1987.
- [2] L. P. Huber, "Disrupting apartheid of knowledge: Testimonio as methodology in Latina/o critical race research in education," *International Journal of Qualitative Studies in Education*, vol. 22, no. 6, pp. 639-654, 2009.
- [3] D. Delgado Bernal, R. Burciaga, and J. Flores Carmona, "Chicana/Latina testimonios: Mapping the methodological, pedagogical, and political," *Equity & excellence in education*, vol. 45, no. 3, pp. 363-372, 2012.
- [4] D. Delgado Bernal, R. Burciaga, and J. F. Carmona, *Chicana/Latina testimonios as pedagogical, methodological, and activist approaches to social justice*. New York: Routledge, 2017.
- [5] R. Burciaga and N. Cruz Navarro, "Educational testimonio: Critical pedagogy as mentorship," *New Directions for Higher Education*, vol. 2015, no. 171, pp. 33-41, 2015.
- [6] J. Beverley, *Testimonio: On the politics of truth*. Minneapolis: U of Minnesota Press, 2004.
- [7] G. E. Marcus, "Ethnography in/of the world system: The emergence of multi-sited ethnography," *Annual review of anthropology*, vol. 24, no. 1, pp. 95-117, 1995.
- [8] H. R. Bernard, *Research methods in anthropology: Qualitative and quantitative approaches*. Oxford: Rowman & Littlefield, 2017.
- [9] J. A. Mejia, I. V. Alarcón, J. Mejia, and R. A. Revelo, "Legitimized tongues: Breaking the traditions of silence in mainstream engineering education and research," *Journal of Women and Minorities in Science and Engineering*, vol. 28, no. 2, 2022.
- [10] W. Ayers, *Transforming educational pathways for Chicana/o students: A critical race feminist praxis*. New York: Teachers College Press, 2016.
- [11] D. Delgado Bernal, "Critical race theory, Latino critical theory, and critical raced-gendered epistemologies: Recognizing students of color as holders and creators of knowledge," *Qualitative inquiry*, vol. 8, no. 1, pp. 105-126, 2002.
- [12] D. Delgado Bernal, "Using a Chicana Feminist Epistemology in Educational Research," *Harvard Educational Review*, vol. 68, no. 4, pp. 555-583, 1998, doi: 10.17763/haer.68.4.5wv1034973g22q48.
- [13] D. G. Solorzano and D. Delgado Bernal, "Examining transformational resistance through a critical race and LatCrit theory framework: Chicana and Chicano students in an urban context," *Urban education*, vol. 36, no. 3, pp. 308-342, 2001.
- [14] I. Villanueva Alarcón, R. J. Downey, L. Nadelson, Y. H. Choi, J. Bouwma-Gearhart, and C. Tanoue, "Understanding Equity of Access in Engineering Education Making Spaces," *Social Sciences*, vol. 10, no. 10, p. 384, 2021.

- [15] I. Villanueva, T. Carothers, M. Di Stefano, and M. Khan, "'There Is Never a Break': The Hidden Curriculum of Professionalization for Engineering Faculty," *Education Sciences*, vol. 8, no. 157, pp. 1-21, 2018.
- [16] I. Villanueva *et al.*, "What does hidden curriculum in engineering look like and how can it be explored?," in *American Society of Engineering Education Annual Conference and Exposition*, Salt Lake City, 2018, pp. 1-16.
- [17] B. de Sousa Santos, *Epistemologies of the South: Justice against epistemicide*. New York: Routledge, 2015.
- [18] B. de Sousa Santos, *The End of the Cognitive Empire: The Coming of Age of Epistemologies of the South*. Durham, NC: Duke University Press, 2018.
- [19] C. Moraga and G. Anzaldúa, Eds. *This bridge called my back: Writings by radical women of color*. New York: SUNY Press, 2015.
- [20] M. Vallone, "The Wound as Bridge: The Path of Conocimiento in Gloria Anzaldúa's Work," *Revue Électronique D'études Sur Le Monde Anglophone*, vol. 12, no. 1, pp. 1-10, 2014. [Online]. Available: <https://journals.openedition.org/erea/4135#quotation>.
- [21] A. Hurtado, "Theory in the flesh: Toward an endarkened epistemology," *International Journal of Qualitative Studies in Education*, vol. 16, no. 2, pp. 215-225, 2003.
- [22] R. A. Revelo, J. A. Mejia, and I. Villanueva, "Who are we? Beyond monolithic perspectives of latinxs in engineering," in *American Society for Engineering Education Annual Conference and Exposition*, Columbus, OH, 2017, vol. 2017.