

Nepantla aquí, Nepantla allá: The Borderlands of Identity from Mexican-Origin Women in STEM

Journal of Hispanic Higher Education

1–16

© The Author(s) 2022

Article reuse guidelines:

sagepub.com/journals-permissions

DOI: 10.1177/15381927221130174

journals.sagepub.com/home/jhh

Norma E. Garza¹, Sarah L. Rodriguez²,
and Maria L. Espino³

Abstract

The study explored how Mexican-origin women in STEM utilized Anzaldúa's borderlands of identity and *Conocimientos* to successfully navigate between Mexican-origin cultures and STEM cultures. Students experienced life-changing events during their studies (el arrebato) and felt torn between STEM and Mexican-origin cultures (*Nepantla*). However, students also sought to reimagine their futures (*Coyolxuahqui*, the blow-up) and use their degrees to help their communities.

Resumen

El estudio exploró cómo mujeres de origen mexicano que estudiaron STEM (Ciencias, Tecnología, Ingeniería, y Matemáticas) usaron la identidad de fronteras de Anzaldúa y *Conocimientos* para navegar exitosamente entre las culturas de su origen mexicano y las de STEM. Estudiantes experimentaron eventos que cambiaron sus vidas durante sus estudios (el arrebato) y se sintieron jaladas entre las culturas de su origen mexicano (*Nepantla*) y las de STEM. Sin embargo, los estudiantes buscaron reimaginar sus culturas futuras (*Coyolxuahqui*) y usar sus grados académicos para ayudar a sus comunidades.

Keywords

Latina, higher education, STEM, Gloria Anzaldúa, Mexican, culture

¹The University of Texas at Arlington, Arlington, TX, USA

²Virginia Tech, Blacksburg, VA, USA

³Iowa State University, Ames, IA, USA

Corresponding Author:

Norma E. Garza, The University of Texas at Arlington, 701 S. Nedderman Drive, Arlington, TX 76019, USA.

Email: norma.garza2@mavs.uta.edu

Out of the two million Latina students enrolled in an undergraduate program, only about 2.8% earned a bachelor's degree in science and engineering (National Center for Science and Engineering Statistics, 2021). With the low number of bachelor's degrees awarded, Latinas are underrepresented and systematically excluded in STEM (Contreras Aguirre et al., 2020). While there are myriad explanations for the exclusionary nature of STEM, one such reason is the clash of cultures that Mexican-origin women experience.

STEM cultures tend to be individualistic, competitive in nature, and having the mentality of objectivity (Barton et al., 2018), but Mexican culture is collectivistic and women students might feel the pressure of being a "good Mexican daughter" while completing their studies (Espinoza, 2010). In this clash of cultures, Mexican-origin women will try to get ahead in their studies and career while also attempting to fulfill family responsibilities that are expected of them, like visiting family often or living close to them.

Within higher education, prior literature on Latina students in STEM has demonstrated the importance of STEM identity formation (Rodriguez et al., 2017), having a strong network of support from peers and faculty of the same race/ethnicity (Contreras Aguirre et al., 2020), and interventions that used collectivism and increased self-efficacy to improve department climate (Rincón & George-Jackson, 2016). And, while there have been continued calls and examples within educational research that utilize Chicana feminist epistemologies to better understand the experiences of Latina students within school and college settings, this scholarship remains limited (Calderón et al., 2012; Carrillo & Dean, 2020; Delgado Bernal, 1998).

STEM educational research has not had a meaningful engagement with Chicana feminism, such as Anzaldúa's (1987) writings, as a possible way to understand how culture influences the borderlands experiences and clashing of cultures that Mexican-origin women may face as they enter STEM disciplines. In the words of Anzaldúa (1987), "Like all people, we perceive the version of reality that our culture communicates. Like others having or living in more than one culture, we get multiple, often opposing messages. The coming together of two self-consistent but habitually incomparable frames of reference causes un choque, a cultural collision (p.85)." Chicana feminist perspectives, like Anzaldúa's, provide a lens to understand the unique experiences of Mexican-origin students by deconstructing concepts of gender and race as well as that of immigration, language, and religion (Calderón et al., 2012; Carrillo & Dean, 2020).

As such, our current study addressed a gap in the literature by bringing Anzaldúa's concepts of *Nepantla* (in-between state) and *Conocimientos* (ways of knowing) to the higher education STEM setting to understand and address the needs of Mexican-origin women in STEM more fully. To explore this, the following research question centers this study: how do Mexican-origin women in STEM experience borderlands of identity between Mexican-origin cultures and STEM cultures?

Literature Review

Previous research has shown several factors that contribute to the underrepresentation of women, Black, Latina/o/x, and Native American students in STEM (Camacho & Lord, 2013; Carlone & Johnson, 2007; Ong et al., 2011; Rodriguez et al., 2017). Camacho and Lord (2013) found that the problem was recruiting Latina/o/x engineering students, instead of retaining them. Similarly, a synthesis of 40 years of literature conducted by Ong et al. (2011) found that women of color in STEM faced issues of isolation, microaggressions, tokenism, etc. A likely explanation proposed by researchers is that STEM cultural norms are operating under color blindness and Whiteness, which perpetuates a sense of sameness that inherently excludes anyone who is racially or ethnically different (Collins, 2018).

As the overall number of Latina students in college increases, there is a disproportion of Latina students earning their bachelor's degrees (3%) within STEM disciplines compared to their white peers (62%) (Excelencia in Education, 2019; Rodriguez et al., in press). When focusing on marginalized backgrounds, research shows that there are systematic challenges (e.g., racism, sexism) that cause inequities in and outside of STEM environments (Charleston et al., 2014; Rincón & Lane, 2017; Rodriguez, Pilcher, & Garcia-Tellez, 2021). Emerging literature on Latina students, as a whole, addresses the need for a sense of belonging and the development of an engineering identity (Rodriguez & Blaney, 2020; Rincón & Lane, 2017; Rodriguez, Lu, & Ramirez, 2020; Villa et al., 2016). Scholars have articulated how faculty, peers, family, and religious beliefs influence STEM identity development (Rodriguez, Bukoski, Cunningham, et al., 2020; Rodriguez et al., 2017, 2019; Rodriguez, Pilcher, & Garcia-Tellez, 2021) as well as how experiencing a sense of belonging and engaging in acts of resistance can contribute to the success of Latinas in STEM (Rodriguez & Blaney, 2020; Rodriguez, Bukoski, Cunningham, et al., 2020). In particular, without a sense of belonging to their STEM environments, Latina students often become marginalized by their peers and develop feelings of self-doubt and isolation (Rodriguez & Blaney, 2020), while also struggling to keep their "good Mexican daughter" identity. Espinoza (2010) emphasizes the importance of *familismo* (prioritizing family) to Latina students, which comes in stark contrast to the individualistic nature of STEM cultures, which creates the clash between college and families. Specifically, Mexican-origin students tend to cope with college stressors by seeking family support but sometimes shy away from seeking family support when their values are in contrast with their parent's values or if their parents lack college knowledge (Rodriguez, Garbee, & Martínez-Podolsky, 2021).

While understanding this literature allows us to acknowledge and enhance the current scholarship of Latina students as they navigate STEM majors, these studies treat Latina students in STEM as a monolith and do not attend specifically to Mexican culture. Additionally, these studies do not engage with Chicana Feminism epistemologies which have the power to contextualize cultural clashes at the borderlands between Mexican-origin women's families and their college educations.

As Latina students break away from culturally defined gender roles, such as being a “good Mexican daughter” (Espinoza, 2010; Raffaelli & Ontai, 2004), developing STEM identity while navigating *Concimientos* and borderlands, Latina students in STEM can come to understand their positions in their majors.

Theoretical Framework

This study is framed by Gloria Anzaldúa’s writings, specifically about navigating two cultures and the phenomena that emerge in those instances. Anzaldúa’s (1987) *Borderlands* first discusses the experience of being torn between two cultures and living along the border of the United States and Mexico. This in-between state is referred to by Chicana Feminists as *Nepantla*, which comes from Nahuatl and means “the land in between,” by which Anzaldúa uses to help describe the conflict she feels between her Mexican and American identities. We use this framework to help understand how Mexican-origin women in STEM feel like they are in an in-between state while going through their undergraduate journey. Such that Mexican-origin students have to navigate their cultural origins and the culture of STEM, which are two very different spaces and can be in conflict with each other.

In *Borderlands* (1987), Anzaldúa starts writing about *Conocimientos* as well as its seven stages (Anzaldúa, 1987; Anzaldúa & Keating, 2013). *Conocimientos* is what Anzaldúa refers to as the process of changing consciousness. This is a transformation the individual experiences before growing into a new self. The seven stages consist of first experiencing a life-changing event (*el arrebato*), being torn between identities (*Nepantla*), to later pausing and reflecting to become more of who we are (*Coatlicue State*), the fourth stage is to letting of stagnant parts of the self (*el compromiso*). Then, you put the pieces back together and reinvent the self (putting *Coyolxuahqui*—the moon goddess in Aztec mythology—together), the sixth stage is the realization we are no longer the same and forgiving the self (the blow-up), and finally, transformation happens (shifting realities). Anzaldúa uses the stages of *Conocimientos* to explain the process of knowing and changing consciousness after a life-altering event. For example, a life-changing event could be becoming a teenage mother, which will automatically lead to the instability of being between two selves (e.g., the non-mother self and the mother one). Then, the breakdown happens, and it follows a state of self-reflection about what happened. Utilizing internal resources, the woman can let go of the pieces no longer serving her, like guilt or shame, and starts putting herself back together. In the last stages, the woman realizes her life will not be the same and accepts her new self before going back to reality with her new consciousness.

In K–12 settings, researchers have used *Nepantla*, which is the in-between state, as a way of studying social change through engineering in Latina/o/x high school students (Mejia et al., 2017). Mejia et al. (2017) found that Latina/o/x engineering students were in a constant state of *Nepantla* but used it to create social change in their community. Similarly, *Conocimientos* was used as one of the theories to explain how youth learned mathematics during a summer program (Martinez, 2020). Martinez (2020) found that all children showed a positive shift in consciousness, through the seven stages of learning math. This study utilized Anzaldúa’s concepts of *Nepantla*

and Conocimientos to interrogate the clashing of cultures that Mexican-origin women in STEM encountered as they pursued their STEM educational journey. Doing so allowed us to more fully understand how students make sense of their experiences at the borderlands of identity, culture, and higher education pursuits.

Method

This study used a phenomenological multi-interview approach to investigate the experiences of 14 undergraduate Mexican-origin women majoring in STEM fields at a tier-one predominantly white university in the southwest (see Table 1). Phenomenology allowed for discovering meanings and exploration of the meaning-making of her role as a Mexican-origin woman in STEM (Moustakas, 1994; Van Manen, 2014).

To capture the essences, we used excerpts from the interviews as views into the lived experiences of participants (Van Manen, 2014). These excerpts provided rich context and detail of the meaning-making of how participants navigated their STEM journeys. Participants were 18 years of age or older, self-identified as having Mexican American or Mexican origins, and were classified as junior or senior STEM majors. Participants were recruited by contacting the colleges of science and engineering advisors, coordinators, and directors and emailing the recruitment flyer to their listservs. STEM-related student organizations, particularly those serving women and Latina/o/x students, were also contacted and asked for a few minutes of their time to introduce the study and recruitment efforts. Finally, snowball sampling was also used to connect with prospective participants.

Data Collection

Students completed a pre-interview questionnaire and a series of two interviews, all in English. The pre-interview questionnaire was collected during the initial interview and administered with paper. It provided demographic information and background data about their STEM experiences. Then, participants completed two one-on-one interviews that lasted approximately 1 hour. In accordance with the phenomenological approach, a semi-structured interview guide was created, which was aimed at elucidating a comprehensive understanding of the student's STEM experience (Moustakas, 1994).

The first interview examined interest, experiences, and a sense of belonging in the STEM disciplines and it was composed of 14 questions. The second interview had 13 questions and followed up on questions from the first interview. Conducting the interviews as semi-structured and in two parts allowed researchers to gain a greater understanding of the essence of their experiences (Lincoln & Guba, 1985; Sandelowski, 1995; Strauss & Corbin, 1990).

Data Analysis

Each interview was transcribed in English and read a couple of times to gain a comprehensive understanding of how Anzaldua's theories helped explain the journey of Mexican-origin women students through their STEM undergraduate career

Table 1. Participant Information.

Pseudonym	Major	Classification	SES	First-gen student?	Parent education level	Primary language used at home
Ana	Engineering	Senior	High	No	Mother: Bachelors Father: Masters	Spanish
Ashley Carmen	Computer Science Mathematics	Junior Junior	Low Middle	Yes Yes	Mother & Father: Middle School Mother: Associates Father: High School	Spanish and English English
Cindy	Computer Science	Senior	Middle	Yes	Mother: Junior High Father: Elementary	Spanish
Emily	Natural Sciences	Senior	Low	Yes	Mother: High School Father: Elementary	Spanish
Isabel	Natural Sciences	Junior	Middle	Yes	Mother: Some High School Father: Never Attended	Spanish
Laris	Natural Sciences	Senior	High	No	Mother: Masters Father: Bachelors	Spanish
Lydia	Engineering	Senior	Middle	No	Mother: High School Father: Bachelors	Spanish
Maite	Natural Sciences	Junior	Middle	No	Mother: Masters Father: Some College	Spanish
Maria	Natural Sciences	Senior	Middle	No	Mother: Masters Father: Some College	Spanish
Salma	Natural Sciences	Junior	Low	No	Mother: High School Father: Masters	Spanish
Samantha	Natural Sciences	Junior	Low	Yes	Mother: Middle School Father: High School	Spanish
Sofia Victoria	Engineering Engineering	Senior Senior	High High	No No	Mother and Father: Some College Mother: Masters Father: Associates	English English

(phenomenon). Then, each interview was divided into meaningful units for greater examination (Moustakas, 1994). A set of 38 codes were created based on Anzaldúa's theories, which took into consideration the ethos, including intrapersonal, interpersonal, and cultural constructs (Anzaldúa, 1987). A four-step data analysis process was engaged, using a phenomenological approach (Moustakas, 1994). During step 1, researchers reflected on and set aside their own beliefs and assumptions about the phenomenon (epoche), which helped be receptive to the meanings that participants ascribed to certain experiences. During step 2, the transcripts were read but this time more in-depth and moving away from surface appearances of the phenomenon to get to its core understanding (eidetic reduction). During step 3, the researchers examined the meaning of the units created from their experiences (e.g., Nepantla, bi-culture, machismo, el arrebato) and considered the phenomenon from a myriad of standpoints to identify underlying factors (imaginative variation). During step 4, the researchers integrated meanings and defined the essence of the phenomenon using raw transcript data to verify the results (synthesis and verification). One person of the team collected data and the research team created a codebook for systematic coding of the transcripts. Coding was done by one of the authors, for consistency, and verified by the others. The research team met to discuss interpretations of the data, and collectively identified major essences of the study. Transcripts as well as preliminary results were shared with participants.

Research Positionality and Trustworthiness

It is important for qualitative researchers to position themselves to be conscious of the biases, values, and experiences they bring to a qualitative research study (Creswell, 2013). Researchers' lived experiences and identities provide benefits that can help them understand participant experiences, but they can also limit and create biases in analysis and interpretation. In regard to this paper, the first author is a Mexican immigrant woman who has lived in a border town, similar to many of the participants. The first author also has an insider perspective of being in a STEM field in her undergraduate and graduate career. The other two authors' research focuses on equity in STEM disciplines and has conducted studies about a variety of topics related to underrepresented students in STEM. Both have an outside perspective due to the fact they have not experienced the STEM collegiate context in the same way the participants did. All three researchers are of Mexican descent and are women, which gives an insider perspective of the many gender and cultural norms and expectations of this community.

Findings

Mexican-origin women students experienced Anzaldúa's Borderlands and different stages of Conocimientos during their STEM journeys. Several of the participants experienced el arrebato and Nepantla as they experienced life-changing events in their educational pursuits and, at times, felt torn between their culture and obligations as a "good Mexican daughter" (Espinoza, 2010) and their duties as a STEM student.

Finally, many of the Mexican-origin students experienced later stages (el compromise and Coyolxualqui and shifting realities) when discussing their future goals, with many of them wanting to utilize their Conocimientos and reimagine using their STEM technical skills to help their communities.

Life at the Borderlands: ni de aqui, ni de alla. My culture is not Their Culture

Students often experienced a feeling of “ni de aqui, ni de alla” (neither here nor there) as they navigated the borderlands of two cultures: that of their STEM major and that of home, family, and community. Victoria, an engineering major, had a child when she was 17 years old (el arretrato), but still wanted to attend the university to become financially independent for her daughter. With her parents' support, her daughter remained in their Texas border community while Victoria studied several hours away, only able to travel home every other week. Victoria hid her daughter from most of her STEM peers and faculty since engineering culture tends to prioritize educational studies. She explained her worries about being stereotyped at her new graduate school as a single Mexican-origin woman:

there is such a small Latino population in [her new city], and even more at [my new graduate school institution], that I feel that people make me or embody me as the whole population of Latinos, and I don't want the first thing that they think of as “oh well, [Mexican-origin women] all have babies at 17 years old.” . . . graduate students are perceived as work horses. and if you can't give 80 hours a week in lab because you have family commitments that is never looked at positively. . . I can't give you as much as someone who is single.

Having a daughter at a young age was a major life-changing event and, she feared, might cause the STEM community to stereotype her. She also feared that the culture of engineering might clash with that of her Mexican culture which prioritized family, highlighting the borders of her two worlds.

Other students described living at the borderlands, given the contrast between the warm, connected Mexican culture and that of their STEM environment. Maite highlighted the difference in personal interactions:

In my biology class sophomore year, I cracked a joke and like literally, the two girls next to me just ignored me. Or like, I would ask questions and they would just be like, “Oh, yeah,” and turn around and just ignore me again. And apparently, from other people that I've talked to, that is actually very common. . . [in contrast] it just kind of reminds me, where am I from. I am Mexican. That's where I was raised, that's who I am, that's my whole culture, you know.

Maite felt isolated and had a hard time making connections while Mexican culture valued connecting with people, her natural sciences experiences reflected a common norm of purposefully avoiding interpersonal connection, even between women.

Students further highlighted living at the borderlands in how the values present in STEM cultures contrasted sharply to those in their individual lives. Ashley talked about making a social impact in the world with her computer science major. Ashley separates herself from the STEM culture that she has experienced of only getting a computer science degree to make money but instead, using technology to solve real-world problems in Latin American developing countries:

. . . I feel like I am a minority in the sense that I never wanted to pick the industry setting. . . I want to use computer science for something bigger than to start a start-up or the next big app. And I mean some kids here they just go code a game or something trivial and I feel a minority in that sense that I perceived computer science differently than anybody else. . . I feel like we have different ideas and values.

Ashley felt that STEM fields often uphold cultural values that emphasize utilizing technical skills for trivial purposes, whereas her individual and cultural values emphasize using one's knowledge to invest in the community. All of these examples highlight how some of the students experienced *el arrebatado* about entering a new culture (STEM) that was not their own, which led them into the next stage of *Conocimientos*, *Nepantla*.

Nepantla: Will I be a “Good Mexican Daughter” or a Good STEM Student?

Participants described being torn between their identities as family-oriented Mexican-origin women and as STEM students, particularly in relationship to managing responsibilities, achieving goals, and navigating issues of Americanization and immigration. While students sought to be family-oriented, STEM cultures were often at odds with this part of their identity. Maria, a natural sciences major, described two of Anzaldúa's concepts. She described both the physical and emotional distance created by pursuing her science degree away from her family, which was difficult for her. Her father's surgery, which was a major life event within her family (*el arrebatado*), exacerbated feelings of *Nepantla*:

I'm really family inclined. So sometimes it's a little overwhelming just being away from my family. . . recently my dad had a heart surgery so that was hard to just not be there and support and stuff. It was just a lot for me to deal with it and school.

Many times, being a “good Mexican daughter” (Espinoza, 2010) means being in close proximity and taking care of family. Not only do students not have their, often-times, strongest support system close to them but they are also feeling like they are letting that same support system down by focusing on their STEM degree. Similarly, Maria, a natural sciences major, explained how accomplishing STEM goals can clash with being a good Mexican-origin daughter:

[My family is] kind of like, “No, you’re going to get married, you’re going to have children,” and I’m like, “I don’t think so. I want to accomplish my goals, these are my goals, and this is what I want to do.”

Maria described the clash, or state of *Nepantla*, between being a family-oriented Mexican-origin woman and the nature of pursuing a STEM degree as irreconcilable with that identity.

Salma explained how her family’s emphasis on preserving Mexican cultural values, like family, made her feel guilty for pursuing a STEM degree far away from them. Despite family encouragement to attend a local university, she received a scholarship for her more prestigious STEM-focused university. However, her parents feared that she might be “Americanized” by higher education, similar to her father:

[my dad’s] parents pick[ed] him up once he was done [with] college, and they brought him back home, even though he already had a job where he was at, like a really good job. . . I guess they don’t want me to become Americanized. . . they don’t want me to leave and not see them anymore. . . Even though they themselves have become Americanized a little bit. . .

As a result, she lived in a state of *Nepantla* in which her identity and identity as a STEM student and her identity as a good Mexican daughter were constantly at odds. This borderland was made more pronounced as her STEM degree was connected to ideas of Americanization, in the eyes of her parents.

The Future is Putting Coyolxuahqui Together and the Blow-Up

Many students experienced challenges during their undergraduate studies in STEM, but those challenges helped them, like Anzaldua described, put Coyolxuahqui back together. Through their STEM journeys, they learned to reinvent themselves and find a way to exist at the borderlands of STEM and Mexican culture. Emily, a natural sciences major, described it like this:

I’m starting to fly like this butterfly. They start to migrate whenever they don’t feel comfortable. . . It’s not that I don’t feel comfortable here where I am right now, but I like change. I want to migrate to a different place and start from scratch. No, not from scratch, but to start again. . . I feel there is a lot more to learn from myself as an individual. I feel like that’s going to be a continuation. So, I guess I’m ready to flip the page and start a new chapter. And in that chapter, of course like everything, it’s going to have its ups and downs, but I hope for it to have a very good ending.

Some of the most significant parts of the interviews were when the students had the realization, or blow-up, to help their own community with the technical skills and activist strategies they had learned throughout their STEM journeys. They were fully aware of the difficulties that the Mexican-American community faces and wanted to progress in their career, not only to uplift themselves but also their people. Salma, a

natural sciences major, planned on using her knowledge of nutrition to help the Latina/o/x community:

I plan to work with Hispanics in the future. . . I believe it's better when you're working with, I guess you can say, people of a certain ethnicity, they like to hear from someone that's their own ethnicity. . . we've had a couple of white doctors come in and tell us what we need to change. . . the community feels [the white doctors] don't understand the community at all; they don't understand their financial situation, they don't understand the culture.

Mexican-origin women found ways to integrate knowledge of their communities and their STEM pursuits. This represents a form of putting Coyolxuahqui back together, as they were forced to continue growing and re-envisioning who they were as STEM individuals.

Discussion

Mexican-origin women students in STEM often experienced life-changing events (el *arrebato*) that caused them to begin feeling torn between their identities as STEM students and home cultures. These identities often clashed because of the exclusionary nature of STEM fields (e.g., McGee, 2020) as well as a misalignment in values between Mexican-origin culture and the various STEM disciplines. The ideas, priorities, and values of STEM culture at the university were different from that of Mexican-origin women that this created a stark borderland for students between their homes and communities and their STEM pursuits, causing greater feelings of disjoint between their worlds, forcing students to reconsider what it means to be a STEM engaged person and how they will progress through the stages of *Conocimientos*.

Students found that they felt torn between two places in which they did not entirely fit into either and were in a constant state of Anzaldúa's (1987) *Nepantla* throughout their STEM journeys. This study builds on prior studies (e.g. Rodriguez & Blaney, 2020) by connecting ideas of the good daughter dilemma (e.g., Espinoza, 2010) with the nature of Mexican-origin women at the borderlands between Mexican culture and STEM pursuits. The exclusionary culture of STEM is in stark contrast to the close-knit Mexican-origin communities that students are used to, even if it is a chosen family of STEM students (e.g., Rodriguez, Estes, Sissel, et al., 2019; Rodriguez, Pilcher, & Garcia-Tellez, 2021).

Scholars have called for STEM students to be able to bring their whole selves to their studies (e.g., Rodriguez & Lehman, 2018); however, at present, we do not give students space for humanity and family. Families are sending their daughters over-literal and figurative borderlands and the threat of Americanization at these borderlands is real as students are often asked to assimilate to STEM cultures. Within this study, students often moved through most of the stages of *Conocimientos* and progressed toward transformation. However, one might wonder at what cost this transformation has happened and how Mexican-origin women students will be capable of

resisting STEM norms (e.g., Rodriguez, Bukoski, Cunningham, et al., 2020) and able to reconcile connections between their cultural identities and STEM environments.

Limitations and Implications for Future Research

Several key limitations existed for this study and created implications for future research. First, future studies might disaggregate Mexican (international, foreign-born) and Mexican American experiences. These educational experiences may differ, particularly as it relates to issues of Americanization and around giving back or providing for Mexican-origin communities within the United States or the Latina/o/x diaspora, particularly as it relates to geographic location and historical context (i.e., Texas versus California). Furthermore, future studies might consider utilizing an intersectional framework explicitly which might add nuance to some of the intricacies related to interlocking oppressions. Lastly, scholars might seek to disaggregate STEM, particularly those fields which may lend themselves to community-based work or contrasting with fields that are not typically viewed in that way, such as computing, but have options for how those fields could be seen as community-based technical fields.

Implications for Practice

This study illuminates several key implications for practice, particularly around creating community in STEM and beyond, redefining what it means to be a “good” STEM student, and incorporating assets-based approaches. Creating a sense of community for Mexican-origin women in STEM means structuring justice-oriented spaces that promote healing as well as allowing for place-based STEM opportunities that honor the university community or place that students call home. Doing so would move toward eliminating the borders that cause student distress. Next, administrators, faculty, and scholars might move toward redefining what a model STEM student looks like, encouraging students to have more alignment with living a full life (e.g., including family, acknowledging and supporting student parents) and blending one’s experiences and technical skills. Finally, educational stakeholders might be encouraged to approach STEM environments and work with Mexican-origin women students in an assets-based approach where they honor the community cultural wealth and funds of identity (e.g., Rincon & Rodriguez, 2021) that students are bringing to STEM.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This work was supported by NSF grant number 1647181 at The University of Texas at Arlington with Principal Investigator Panos S. Shiakolas. Any

opinions, findings, and conclusions or recommendations expressed in this work are those of the authors and do not necessarily reflect the views of the NSF.

ORCID iDs

Norma E. Garza  <https://orcid.org/0000-0003-2443-3209>

Sarah L. Rodriguez  <https://orcid.org/0000-0002-3409-7096>

References

- Anzaldúa, G. (1987). *Borderlands/La frontera: The new mestiza*. Aunt Lute Book Company.
- Anzaldúa, G., & Keating, A. (Eds.). (2013). *This bridge we call home: Radical visions for transformation*. Routledge.
- Barton, A. C., Menezes, S., Mayas, R., Ambrogio, O., & Ballard, M. (2018). *What are the cultural norms of STEM and why do they matter?* Center for Advancement of Informal Science Education. <https://resources.informalscience.org/what-are-cultural-norms-stem-and-why-do-they-matter>
- Calderón, D., Delgado Bernal, D., Perez Huber, L., Malagon, M. C., & Velez, V. N. (2012). A Chicana feminist epistemology revisited: Cultivating ideas a generation later. *Harvard Educational Review*, 82, 513–539.
- Carlone, H. B., & Johnson, A. (2007). Understanding the science experiences of women of color: Science identity as an analytic lens. *Journal of Research in Science Teaching*, 44(8), 1187–1218.
- Camacho, M. M., & Lord, S. M. (2013). *The borderlands of education: Latinas in engineering*. Lexington.
- Carrillo, V. G., & Dean, S. R. (2020). Understanding the impact of Chicana feminism on college success: A literature review. *Journal of Hispanic Higher Education*, 19(1), 99–110.
- Charleston, L. J., George, P. L., Jackson, J. F., Berhanu, J., & Amechi, M. H. (2014). Navigating underrepresented STEM spaces: Experiences of Black women in U.S. computing science higher education programs who actualize success. *Journal of Diversity in Higher Education*, 7, 166–176. <https://doi.org/10.1037/a0036632>
- Collins, K. H. (2018). Confronting color-blind STEM talent development: Toward a contextual model for Black student STEM identity. *Journal of Advanced Academics*, 29(2), 143–168.
- Contreras Aguirre, H. C., Gonzalez, E., & Banda, R. M. (2020). Latina college students' experiences in STEM at Hispanic-Serving Institutions: Framed within Latino critical race theory. *International Journal of Qualitative Studies in Education*, 33(8), 810–823.
- Creswell, J. (2013). *Qualitative enquiry and research design: Choosing among five approaches* (3rd ed.). Sage.
- Delgado Bernal, D. (1998). Using Chicana feminist epistemology in educational research. *Harvard Educational Review*, 68, 555–582.
- Espinoza, R. (2010). The good daughter dilemma: Latinas managing family and school demands. *Journal of Hispanic Higher Education*, 9, 317–330.
- Excelencia in Education. (2019). *Latinos in higher education: Compilation of fast facts*. Author.
- Garcia, A., Rincón, B., & Hinojosa, J. (2021). “There was something missing”: How Latinas construct compartmentalized identities in STEM. In E. M. Gonzalez, F. Fernandez, & M. Wilson (Eds.), *An asset-based approach to advancing Latina students in STEM: Increasing resilience, participation, and success* (pp. 181–192). Routledge.
- Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. sage.

- Martinez, R. (2020). *Mathematics reborn: Empowerment with youth participatory action research EntreMundos in reconstructing our relationship with mathematics* [Doctoral dissertation, Iowa State University].
- McGee, E. O. (2020). Interrogating structural racism in STEM higher education. *Educational Researcher*, 49(9), 633–644.
- Mejia, J. A., Wilson-Lopez, A., Robledo, A. L., & Revelo, R. A. (2017, June). *Nepantleros and Nepantleras: How Latinx adolescents participate in social change in engineering* [Conference session]. 2017 ASEE Annual Conference & Exposition.
- Moustakas, C. (1994). *Phenomenological research methods*. Sage Publications.
- National Center for Science and Engineering Statistics. (2021). *Women, minorities, and persons with disabilities in science and engineering: 2021* (Special Report NSF 21-321). National Science Foundation. <https://ncses.nsf.gov/wmpd>
- Ong, M., Wright, C., Espinosa, L. L., & Orfield, G. (2011). Inside the double bind: A synthesis of empirical research on undergraduate and graduate women of color in science, technology, engineering, and mathematics. *Harvard Educational Review*, 81(2), 172–208. <https://doi.org/10.17763/haer.81.2.t022245n7x4752v2>
- Raffaelli, M., & Ontai, L. L. (2004). *Gender socialization in Latino/a Families: Results from two retrospective studies*. Faculty Publications, Department of Psychology. <https://digitalcommons.unl.edu/psychfacpub/61>
- Rincón, B. E., & George-Jackson, C. E. (2016). Examining department climate for women in engineering: The role of STEM interventions. *Journal of College Student Development*, 57(6), 742–747.
- Rincón, B. E., & Lane, T. B. (2017). Latin@s in science, technology, engineering, and mathematics (STEM) at the intersections. *Equity & Excellence in Education*, 50(2), 182–195. <https://doi.org/10.1080/10665684.2017.1301838>
- Rincon, B. E., & Rodriguez, S. L. (2021). Latinx students charting their own STEM pathways: How community cultural wealth informs their STEM identities. *Journal of Hispanic Higher Education*, 20(2), 149–163. <https://doi.org/10.1177/1538192720968276>
- Rodriguez, S. L., & Blaney, J. M. (2020). “We’re the unicorns in STEM”: Understanding how academic and social experiences influence sense of belonging for Latina undergraduate students. *Journal of Diversity in Higher Education*, 14(3), 441–455.
- Rodriguez, S. L., Bukoski, B., Cunningham, K., & Jones, A. (2020). Critiquing oppression and desiring social justice: How undergraduate Latinas in STEM engage in acts of resistance. *NASPA Journal of Women and Gender in Higher Education*, 13(3), 251–267.
- Rodriguez, S. L., Cunningham, K., & Jordan, A. (2017). STEM identity development for Latinas: The role of self- and outside recognition. *Journal of Hispanic Higher Education*, 18(3), 254–272.
- Rodriguez, S. L., Estes, R., Sissel, M., & Doran, E. (2019). Becoming La Ingeniera: Examining the engineering identity development of undergraduate Latinas. *Journal of Latinos in Education*, 21(2), 181–200.
- Rodriguez, S. L., Garbee, K., & Martinez-Podolsky, E. (2021). Coping with college obstacles: The complicated role of familia for first-generation Mexican American college students. *Journal of Hispanic Higher Education*, 20(1), 75–90.
- Rodriguez, S. L., & Lehman, K. (2018). Developing the next generation of diverse computer scientists: the need for enhanced, intersectional computer science identity theory. *Computer Science Education*, 27(3–4), 229–247.

- Rodriguez, S. L., Lu, C., & Ramirez, D. (2020). Navigating operating systems: A framework for understanding identity development for undergraduate Latina students in computing. In E.M. Gonzalez, F. Fernandez, & M. Wilson (Eds.), *An asset-based approach to advancing Latina students in STEM: Increasing resilience, participation, and success*. Research in STEM Education Series (pp. 25–39). Routledge.
- Rodriguez, S. L., Pilcher, A., & Garcia-Tellez, N. (2021). The influence of Familismo on Latina STEM identity development. *Journal of Latinos in Education*, 20(2), 177–189.
- Rodriguez, S. L., Ramirez, D., Lehman, K., & Sax, L. (in press). Utilizing Community Cultural Wealth to Explore of the Experiences of Latina Undergraduate Students in Computing. *Journal of Women and Minorities in Science and Engineering*.
- Sandelowski, M. (1995). Sample size in qualitative research. *Research in Nursing & Health*, 18(2), 179–183.
- Strauss, A., & Corbin, J. (1990). *Basics of qualitative research*. Sage Publications.
- Van Manen, M. (2014). *Phenomenology of practice: Meaning-giving methods in phenomenological research and writing*. Walnut Creek.
- Villa, E. Q., Wandermurem, L., Hampton, E. M., & Esquinca, A. (2016). Engineering education through the Latina lens. *Journal of Education and Learning*, 5(4), 113–125.

Author Biographies

Norma E. Garza is currently a doctoral candidate in the Experimental Psychology program in the College of Science at The University of Texas at Arlington. In her dissertation project, she is developing an ethnic political efficacy scale to further understand the low rates of voter participation and voter turnout in the Latino/a/x community. Her broader research projects and interests include attitudes toward immigrants and immigration, acculturative stress, bi-cultural identity, right-wing authoritarianism, nationalism, patriotism, underrepresented students in higher education, and Latinas in STEM fields. After graduation, Norma would like to continue working in a higher education institution, ideally as a professor, but she is open to other positions as well. She aspires to be a source of mentorship for students and support for her community while conducting research related to her interests.

Sarah L. Rodriguez is an Associate Professor of Engineering Education and an affiliate faculty member with the Higher Education Program at Virginia Tech. Her engineering education research agenda centers upon engineering and computing identity development of historically marginalized populations at higher education institutions. Currently, Dr. Rodriguez is involved with several large-scale interdisciplinary research projects focused on institutional environments and STEM identity development are sponsored by the National Science Foundation (NSF) and the Kapor Center. In recent years, she was selected as an Early Career Awardee and Faculty Fellow with the American Association of Hispanics in Higher Education (AAHHE) and a NASPA Emerging Faculty Leader. She also received the Barbara Townsend Early Career Scholar Award by the Council for the Study of Community Colleges (CSCC) and gave the distinguished ASHE-CAHEP Barbara Townsend Lecture. To learn more about her current projects, visit <http://sarahlrodriguez.com/>.

Maria L. Espino (She/her/ella) is currently a doctoral candidate in the Higher Administration Program in the School of Education at Iowa State University. Her dissertation is exploring how Latin* first-generation, low-income early college high school graduates are transitioning to a Bachelor's granting institutions. She obtained her Master's degree in Educational Policy and

Leadership at Marquette University in her hometown of Milwaukee, WI. She completed her Bachelor's degrees at the University of Wisconsin-Madison with a double major in Community and Nonprofit Leadership and Gender and Women studies. As a researcher, Maria's larger research scope explores and centers on the (in)equities in higher education, particularly focusing on the experiences of marginalized students. As a scholar and a student advocate, Maria believes in centering, humanizing, empowering, and supporting the communities in which we serve through practical and policy reform. As a STEM educational researcher, Maria brings expertise related to thinking about STEM identity across community college transfer pathways as well as meeting the needs of college students with financial need.