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Katherine Arias Garcia

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Centering Latinx students in STEM education research through pláticas methodology

Katherine Arias Garcia 

University of California, Irvine, USA

ABSTRACT

Pláticas methodology is introduced in this article to advance the centering of Latinx researchers and Latinx students in STEM research. As an increase in Latinx educational researchers enter academia, engaging an appropriate epistemology and methodology that is culturally relevant and race-centered is key in the ongoing STEM education research which aims to diversify and create equitable outcomes for Students of Color. This article draws from a study with 24 Latinx STEM students and 48 pláticas. An overview of pláticas methodology, Chicana/Latina Feminist Epistemology, along with an examination of the principles of pláticas methodology in STEM education. This article is timely as the Latinx student population and Hispanic-Serving Institutions are growing in higher education. This article places emphasizes reframing methodology to provide a culturally relevant and holistic methodology to engage Latinx Students and advance STEM education research focusing on Latinx students.

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Introduction

Addressing Latinx¹ student underrepresentation in STEM is a national priority to meet the STEM workforce goals and to achieve equity to reflect national demographics. According to the National Science Board's Science and Engineering (S&E) Indicators 2019 report, Latinx comprised 20.4% of the U.S. population (ages 20–34), yet represented only 14.8% of bachelor's, 11.2% of master's, and 7.8% of doctoral degree recipients in Science & Engineering fields (Trapani & Hale, 2019). To ensure that STEM education continues to advance and reach parity, there is a need to focus on Latinx students in STEM and the growing universities classified as Hispanic-Serving Institutions (HSIs). HSIs are two-year and four-year campuses with a 25% Latinx student population. Also, there is a growing number of emerging-HSIs campuses with 20–25% Latinx students in 2022 (Excelencia in Education, 2022). HSIs are important because they respond to the changing demographics and serve 66% of the nationally enrolled Latinx students in higher education. Additionally, research shows that HSIs are key in Latinx student pathways to STEM (Herrera, 2020; Herrera et al. 2018; Herrera & Hurtado, 2014). As STEM research advances toward educational and racial equity in academic and social outcomes, focusing on the growing Latinx student community must continue to be at the center of STEM education research. As a Latina educational researcher who examines Latinx student success, I have dedicated my professional career to understanding Latinx student career trajectories. I am a first-generation college graduate with professional

experience working in a medical school with diverse students. I conduct educational research to engage and center Latinx student voices and experiences in higher education. The research question guiding this study is how can *pláticas* methodology be applied in education research and STEM research to engage and center Latinx students? This methodological inquiry stems from the growth in the Latinx student population, as we must reimagine STEM research methodology to challenge traditional ways of data collection to shift to a culturally-relevant and holistic methodology to explore the experiences of Latinx students pursuing STEM. A shift is needed, which recognizes Latinx students from the margins and their experiences with racism and microaggressions in the STEM learning environment.

Moreover, the field of STEM education is going through a shift in adopting an asset-based approach to understanding the experiences of Students of Color in STEM (Denton et al., 2020; Gonzalez et al., 2020). This is a shift that stems from Feminist Scholars of Color that center on race, racism, gender and marginalization of Students of Color (Anzaldúa, 1987; Delgado Bernal, 1998; Hooks, 1989). In addition, Chicana Feminist Scholars are bridging theories to advance qualitative methodologies in understanding Latinx student experiences in higher education (Flores Carmona et al., 2021). These contributions are critical and must be understood and bridged to STEM education to go beyond addressing racial disparities in STEM education and to fully understand Latinx student experiences in STEM.

As a rising Latina STEM education researcher, I was frustrated with the traditional qualitative methods offerings in my qualitative courses because the methods did not align with my motivations to pursue educational research; to support and empower Latinx students in higher education. My pursuit of a PhD was motivated by my family upbringing and as a first-generation college student and graduate. I sought a PhD to complement my 15 years of professional experience in a medical school in Student Affairs and Equity, Diversity and Inclusion. I was then introduced to Chicana/Latina Feminist Epistemology (Delgado Bernal, 1998) and *pláticas* methodology as a method to center Latinx student experiences in educational research and empower participants through healing. *Pláticas* translates into talks or conversations between the researcher and participants. In comparison to traditional interviews, *pláticas* are two-directional discussions, between the researcher and the participants. Thus, *pláticas* allow the participants to guide the conversation which counters the power dynamics that the researcher usually holds in an interview setting. Furthermore, the positionalities of the researcher, from a Latinx/a/Chicana research background that is centered on Chicana/Latina Feminist Epistemology (Morales et al., 2023). Furthermore, many Scholars of Color such as Rendón et al. (2019) and Hurtado et al. (2009), and others have begun challenging traditional notions of measures of success and centering experiences and voices of Students of Color in STEM research. Through this article, I provide an approach to center Latinx STEM students from a Latina educational researcher who hopes to take up space in academia to interrupt the centering of white scholars and traditional ways of conducting qualitative, eurocentric and educational research.

Moreover, a methodological approach has key underpinnings to theoretical and philosophical assumptions of student success in STEM. Although there is a current shift to examine contextual factors of Students of Color in retention and persistence in STEM, many national organizations like the National Science Foundation and the National Academy of Science and Medicine continue to focus on academic outcomes in many of their national agendas. STEM research needs to go beyond academic measures to address the historical inequality of high school resources for Communities of Color, which has led to the accumulation of educational debt in higher education (Ladson-Billings, 2006). The latest literature review on STEM education research trends reflects the continued reliance on quantitative studies and a focus on epistemology and culture as lagging behind topics such as policy, curriculum and evaluation (Li et al., 2020). To achieve a disruption of solely quantitative measures, new tools and methodological approaches must be used to reframe deficit views of Latinx students to asset-based and center on Latinx student experiences.

Thus, a culturally relevant methodology must be used to examine the experiences of Latinx students and to further understand racism and microaggressions in STEM classrooms for STEM

educational equity. Pláticas methodology is a growing methodology, which has primarily been applied in the social sciences field and new applications in rural education and queer research studies (Gonzalez et al., 2023; Puente & Vélez, 2023). To my knowledge, this is the first article to examine the application of pláticas methodology in STEM education research to provide an understanding of the benefits of a culturally relevant methodology. In this article, I describe pláticas methodology, a culturally relevant methodological approach, that centers Latinx student voices, experiences and engages Latinx students as knowledge holders (Fierros & Delgado Bernal, 2016). This article draws from a study that employs pláticas methodology with Latinx first-generation college STEM students pursuing the field of medicine in a highly selective 4-year institution in Southern California. The article will include a discussion on epistemology, a literature review of critical feminist methodologies in STEM education, methodology and an examination of the application of the five principles of pláticas methodology with Latinx STEM students. This article aims to examine the application of pláticas methodology in STEM education research, discuss the challenges and potential of using pláticas methodology with Latinx students in STEM to advance educational equity in STEM fields.

Epistemological orientation

Ladson-Billings (2000) explains that epistemology is more than knowing, it is defined as a “system of knowing,” which is based on people’s lived experiences and views of the world. Epistemology is very powerful because it shapes the lens through that a researcher views the world and impacts how research questions are formed, and the methodology employed in research. The STEM education field epistemology still heavily relies on positivism to find a single truth, a black and white interpretation of knowledge. Positivism assumes objectivity and uses scientific methods when seeking truth, for instance, STEM research largely draws from traditional forms of scientific inquiry for seeking knowledge and conducting research. The STEM education epistemology has historical roots in excluding diverse knowledge and viewpoints and results in epistemological racism that has centered on white male scientists (Delgado Bernal, 1998). Recent STEM education scholars have begun to critique the role of the epistemology lens and the need to adopt critical epistemologies to advance STEM education research (Pearson et al., 2022). However, as addressing equity in STEM education becomes a nationwide priority, STEM education epistemologies must be critiqued and new epistemologies must be adopted, especially as new Scholars of Color enter the STEM education field.

In my work, I am using a critical-race-gendered epistemology, in contrast to the traditional epistemologies that center on white dominant narratives. Through a critical framework, such as critical race theory in education (CRT), scholars have contributed to the centering of race and racism in higher education (Solórzano, 1998; Ladson-Billings, 2005). While through Latino critical race theory (LatCrit) scholars have contributed to centering the racialized experiences of Latinx students, including intersectionalities of immigration, language and gender (Solórzano & Delgado Bernal, 2001; Villalpando, 2004). Collectively, these critical theoretical frameworks have led to the development of a critical-race-gendered epistemology. Furthermore, Carmona (2021), Gaxiola Serrano (2023) and Escobedo & Camargo Gonzalez (2022) have contributed to the development of critical-race-gendered epistemology into a Chicana/Latina feminist epistemology in education, which centers the knowledge and experiences of Chicana/Latina researchers and students in US Society. Chicana/Latina feminist epistemology acknowledges and centers Chicana and Latina scholars’ way of knowing and knowledge (Fierros & Delgado Bernal, 2016). Central to Chicana/Latina feminist epistemology is recognizing the everyday lives of the researchers and participants, which challenges traditional notions of objectivity (Delgado Bernal, 1998).

In addition, through a critical-race-gendered epistemology, students are viewed as holders and creators of knowledge (Delgado Bernal, 2002). Through this epistemology, student

knowledge impacts methods used to understand the lived experiences of students. Delgado Bernal further explains that employing a Chicana/Latina feminist epistemology in educational research becomes a means to resist epistemological racism and to recover untold histories (Delgado Bernal, 1998). Qualitative methods that center the voices of the participants are taken further in a critical-race-gendered epistemology that recognizes that students from marginalized groups have often been silenced and not validated. Examples of critical-race-gendered methodologies are story-telling, the centering of student narratives, counterstories, *testimonios*, *cuentos* and *dichos*. These methods go beyond the dominant narratives to capture stories that are traditionally missing. Pláticas methodology stems from Chicana/Latina feminist epistemologies, which I introduce and anchor in this article to challenge the traditional science objectivity and bias that centers on white norms and re-center Chicana/Latina research scholars and Latinx STEM students.

Literature review

To situate pláticas methodology within STEM education research, I present a brief literature review on qualitative methodological tools in STEM education and qualitative studies that focus on Latinx students in STEM education. Qualitative studies in STEM education use a variety of methodological tools to incorporate diverse student voices and understanding the Student of Color college experiences in STEM. For instance, the phenomenology study by McGee and Bentley (2017) uses life-stories interviews to uncover the marginalization of Black and Latinx students and their STEM aspirations. The life-story interview format included semi-structured and open-ended questions on students' experiences in their homes, school, neighborhood, and STEM classroom contexts. Burt (2020) used a similar qualitative narrative method of one narrative of an engineering Black male graduate student to examine the individual experiences of a graduate Student of Color and their career processes as they plan to enter academia as a faculty. Burt (2020) and his participant employed an elaborate storytelling technique in sharing the critical role of institutional change agents in the development of his engineering identity. Another qualitative tool that has been used is ethnography by Allen and Eisenhart (2017) with four Women of Color in STEM to examine new high school STEM initiatives and identity development. In addition, Nasir and Vakil (2017) also conducted an ethnographic study to examine STEM-focused academies in urban schools, highlighting students' identities in STEM. Furthermore, focus groups are another tool that has been used, such as, Gibbs and Griffin (2013), to examine a student's career choice. While Palmer et al. (2011) conduct in-depth interviews as a qualitative tool to examine the retention of Students of Color in STEM in predominantly white institutions. Palmer et al. (2011) also used member's checks by providing the transcript to participants and providing "thick description" of the participant's reality. Finally, case study methodology has also been applied by Museus and Liverman (2010) with the selection of three high-performing institutions. The case study tools allowed for a holistic understanding of successful institutions and campus climate issues. Collectively, the qualitative studies have moved the STEM education field in embracing race, identity and recognizing the critical role of campus context in the STEM learning environment.

Furthermore, the latest qualitative research on Latinx STEM students centers on Latinx students through the use of phenomenological theories and asset-based frameworks. Phenomenological theories aim to understand the participant and their world, while asset-based theories challenge traditional deficit views of students and focus on the cultural assets and strengths of students. For instance, Rincón et al. (2020) used a phenomenology methodology to center the lived experiences of Latinx STEM students. Some of the unique characteristics of phenomenological analysis are the requirement of the researcher to disclose their positionality concerning the phenomenon being explored, values experiences, use verbatim excerpts and quotes from participants (Padilla-Díaz, 2015). Findings from Rincón et al. (2020) reveal a grounding of

community for Latinx students as they navigate STEM. Additionally, Rodriguez and Blaney (2020) conducted a phenomenology study, focusing on Latina STEM students' sense of belonging and the findings reveal marginalization in the STEM learning environment. The qualitative tools used were interviews and phenomenological analysis that included the researchers setting aside their own beliefs and assumptions about the phenomena. Moreover, Herrera and Kovats Sánchez (2022) conducted a qualitative study on community-based perspectives by Latinx students in STEM. This study had a large research team and researchers used the focus group to build rapport with Latinx students to discuss experiences in STEM. The findings of Herrera and Kovats Sánchez (2022) point towards the critical role of community and a new STEM identity model. Furthermore, López et al. (2019) guided by Chicana/Latina Feminist Epistemology, uses pláticas within the research team to share positionalities, experiences with STEM and familismo. Through these pláticas, the research team decided to focus on familismo and conduct a mixed-methods study, with a leading qualitative strand that included interviews with Latinx STEM students. López et al. (2019) identified familismo or the strong identification of family as a cultural practice enacted by Latinx undergraduates in Science and Engineering. Moreover, these qualitative studies offer insight into the role of identity, culture, family and communities of Latinx STEM students and employ asset-based frameworks to challenge traditional deficit narratives of Latinx students lagging in STEM. A gap in the literature is the use minimal use of Chicana/Latina Feminist Epistemology and employing pláticas as a methodological tool in data collection. Thus, the STEM education field has been gradually shifting to be more inclusive of qualitative tools, and I now present a novel qualitative methodology to continue advancing STEM education research to engage Latinx students.

Overview of pláticas methodology

Pláticas is a methodological approach that draws from Chicana/Latina feminist epistemology (Fierros & Delgado Bernal, 2016). Chicana/Latina feminist epistemology acknowledges and centers Chicana and Latina scholars' ways of knowing and knowledge (Fierros & Delgado Bernal, 2016). Chicana/Latina feminist epistemology is a framework that includes the methodology of pláticas as an extension of a particular way of knowing (Fierros & Delgado Bernal, 2016). Early researchers, Valle and Mendoza (1978) have contributed to the articulation of pláticas as an inquiry approach that includes *entrada*/entry, interview and *despedida*/goodbye and appreciation. Chicana/Latina scholars using Chicana/Latina feminist epistemology contributed to pláticas as a methodology that is grounded in *respeto*/respect for the participants as holders and creators of knowledge (Delgado Bernal, 2002), makes every day lived experiences part of the research inquiry (Fierros & Delgado Bernal, 2016), a potential space for healing (Avila, 1999) and relies on a relationship that is based on reciprocity, vulnerability, and researcher reflexivity (Avila, 1999). Fierros and Delgado Bernal (2016) have identified the following five key principles for pláticas methodology:

1. View and honor participants as co-constructors of knowledge;
2. Incorporate everyday lived experiences as part of research inquiry;
3. Are two-directional and based on reciprocity, vulnerability, and researcher reflexivity;
4. Provide a potential space for healing;
5. Draw heavily from Chicana/Latina feminist theory (2012).

Pláticas were chosen over traditional methods because pláticas respect participants as knowledge holders and draw from the everyday lives of Latinx students. Pláticas have been used by various researchers in educational research with Latinx youth and Latina mothers (González & Portillos, 2012; Guzmán, 2013). Few STEM education scholars have applied pláticas methodology

(López et al., 2019) with Latinx research teams and Latinx students. The application of pláticas in STEM education research is a disruption in traditional methodology that centers on traditional measures of academic outcomes and student success in STEM education. Continuing to center race and racism in STEM education, pláticas methodology furthers the centering of Latinx students, especially as Latinx students population and increase of Hispanic-Serving Institutions. Pláticas methodology also disrupts the traditional qualitative approach which traditionally occurs as a one-way interaction and lacks the recognition of the power dynamics between the researcher and participant. In a one-way interaction, participants are viewed as the subject and the interviewers extract information from the participant. The researchers hold the power between the researcher and the participant. These types of interactions may be harmful and further the marginalization of Latinx students in higher education. To center Latinx students and address these important qualitative issues, I choose to engage in pláticas methodology with 24 Latinx STEM students.

Methodology

For this article, I am drawing from a qualitative study that examines the trajectories of Latinx students interested in careers in medicine. The goal of this study was to examine the cultural assets of Latinx premedical students as they persist in their undergraduate years. This study is based on 24 Latinx premed students from a large research university, located in Southern California, near the San Diego and Mexico border region and in this article will be referred to as Sol University. Sol University's campus demographics for the academic year, 2018–2019 are Black 2.67%, Latinx 20.35%, Asian 53.32%, White 19.28%, American Indian/Alaska Native and Native Hawaiian <1% and Other 3.25% (Campus institutional research, 2019). The campus is an emerging Hispanic-Serving Institution (HSI) with a 20% Latinx student undergraduate population. The campus, Sol University was chosen based on four criteria: research productivity classification, large science presence on campus, high Latinx premeds presence on campus and a medical school on campus. IRB was obtained through the campus IRB office.

The participants were recruited via direct emails, through campus resource centers and student organizations. Also, through the researcher's professional experience working in a medical school, she reached out to students that met the criteria. The following are the selection criteria: students must identify as Latinx, Latino/a, Chicano/a, or Hispanic, students are in their junior or senior year or recent college graduates from Sol University and must demonstrate an interest in applying to medical school within the next 3 years. A total of 24 participants agreed to the study, 14 women and 10 men. All the participants are first-generation college students. The majority of the participants identify as Mexican-American (15), Mexican (6) and Latino (3) which includes South American and Central American ethnicities. Each participant completed two pláticas with the researcher. Data collection was conducted in the summer of 2020 and due to the COVID-19 pandemic, pláticas were conducted online with the Zoom platform.

Pláticas is an appropriate method to use because this study is on Latinx students, emphasizing the relationship building between researcher and participants, which requires reciprocity and mutuality (Fierros & Delgado Bernal, 2016). The pláticas were semi-structured and two pláticas were conducted with each per participant, (1 hour average). The pláticas were conducted to respond to the main research inquiry on persistence in premedical studies. The first plática focused on relationship building between the researcher and participant, explanation of the project and learning about the participant's family and educational background. The second plática focused on participants' experiences in premedical studies and campus resources. As the plática is meant to create a space for vulnerability, I shared my experiences and struggles as a first-generation student at Sol University. The pláticas also allowed Latinx students to share unexplored topics that are important in their college trajectory. Each plática was recorded and

transcribed verbatim. The pláticas were conducted from June 2020–September 2020, during the height of the COVID-19 pandemic. Initially, pláticas were going to be conducted in person, but due to the pandemic, switched to virtual pláticas through the use of the Zoom platform.

All pláticas were transcribed and member checks were conducted with participants. The qualitative software, NVIVO, was used for the coding and development of themes. This study uses a grounded approach for the analysis of data that is driven by a Chicana/Latina feminist epistemology. I employed the notion of “cultural intuition,” which is the Latina researcher bringing their professional and personal experience into the research process and analysis (Delgado Bernal, 1998). My cultural intuition guided my pláticas with the students and my follow-up questions. I wrote memos after each plática to make sense of emerging themes. Also, individual case reports were written for each participant to conduct a cross-case analysis. Case reports allowed comparison and contrast of students with different majors and their experiences with the COVID-19 pandemic occurring during the summer of 2020. Initial codes were created based on Rendón et al. (2019) cultural assets and I completed a second cycle of coding to refine and combine some of the first round of codes. Finally, a codebook was created and guided by the literature of Latinx students in higher education.

Findings

Pláticas methodology offers researchers a variety of strengths in STEM education research. Below is an overview of the various strengths of employing pláticas methodology in STEM research with Latinx students, from building a relationship with participants to a potential place of healing. I examine the five principles of pláticas methodology and the challenges that can arise. Lastly, I offer suggestions on expanding engagement with Latinx students in STEM.

View and honor participants as co-constructors of knowledge

Central to pláticas is to honor participants as co-constructors of knowledge and this principle allows recognition of students as knowledge holders. Pláticas methodology extends Chicana/Latina feminist epistemology in recognizing students as knowledge holders by recognizing their familial and household knowledge, bilingualism, biculturalism, and commitment to their communities (Delgado Bernal, 2002). To view Latinx students as knowledge holders requires a transformative shift for researchers in STEM education research, which have traditionally viewed Latinx students as underachieving with low academic outcomes compared to White and Asian students. An epistemological shift is needed which traditionally centers on white student narratives as norms. Below is an example of recognizing students as knowledge holders through pláticas methodology. During my plática with Janet,² a Biology major, I told her that I value her knowledge as a STEM student and that she is an expert on STEM experiences. I asked Janet,

Katherine: what have we not talked about that is important to you?

Janet: we need to talk about racism with faculty.

Janet then proceeded to share a racial microaggression in the STEM classroom with her professor. The plática that I had with Janet allowed us to not follow a strict protocol, but instead, the plática allowed for the participant to share items that were important to her and her experiences as a STEM student. By allowing the participants to share items important to them, the pláticas moved beyond surface answers to questions and went further in-depth about their experiences on their campus as STEM students. If I had not recognized Janet’s knowledge as a STEM scholar, I would have missed this topic of racism and microaggressions in the STEM environment. Although I come from a similar Latinx background to Janet, as the researcher, I do not know the

lived experiences of Janet within the STEM environment. Issues of campus context, racial campus climate, racial faculty makeup and sense of belonging within the student's science department are all issues that arose from the Latinx students guiding the pláticas. Thus, pláticas allow an in-depth analysis of Latinx student experiences, including topics such as racism and microaggressions inside the STEM classroom.

Another strength of pláticas methodology is the fluidity involved in a plática, which is a mechanism to honor Latinx students as knowledge holders. A traditional interview protocol is not needed, as the researcher does not check off a list of questions but instead engages in a conversation with participants. Instead of an interview protocol, a pláticas protocol includes areas of discussion during the plática. A plática allows for a two-way conversation that makes space for participants to discuss items that are important to them and disrupts neutrality in the research process (Delgado Bernal et al., 2018). Below is a sample from my first pláticas with Luis. Luis is a Human Biology major that recently graduated from college, he experienced translating for his father when he was younger. Luis plans to use his Spanish skills in his future practice and sees a role for himself in alleviating language barriers.

Luis: I don't know if you understand me... like, that type of breaking, that communication barrier between, people from the Hispanic population and people that come from Mexico...

Katherine: Yeah...like there could be some miscommunication

Luis: and also...

Katherine: Go ahead.

Luis: Sorry, sorry, sorry. Also like in the Mexican population, I feel like there's this stigma where people don't want to go to the doctor or they're afraid to go to the doctor. I just want to break that communication barrier and like, not make people like, I don't know how to put it. Sorry. I want to explain myself good...

During these pláticas, Luis and I went back and forth regarding his interest in speaking Spanish as a physician in the future. Other participants had mentioned using their bilingual skills and I thought that's what Luis was planning to do. However, the back and forth that occurred centered on Luis and his view of the importance of addressing both language and stigma in medicine for the Mexican community. In these interactions, there are power dynamics present, as I am the researcher, asking questions on my research project. Also, through my professional staff role, I had worked with Luis in a premed program, so Luis had some level of comfort with me. However, as the researcher, I still held power and through the back and forth, the power went back to Luis. Luis was able to insert himself and clarify the concept of 'breaking'. During our second pláticas, we discussed this interaction. Luis shared that when I asked a question, sometimes he didn't know what to say, but pláticando (conversing) was helpful for him "it makes me like reflect and see."

Incorporate everyday lived experiences as part of the research inquiry

Another unique aspect of pláticas methodology is the inclusion of students' everyday lived experiences as part of the research inquiry. In traditional research methods, research questions are central to the items being investigated. In pláticas methodology, through the fluidity and back and forth of the conversation, there is space to go beyond responses to research questions. As an emerging researcher, this was difficult to balance, as I wanted to focus on my research questions, but I also wanted to engage meaningfully with the Latinx students. To achieve meaningful pláticas with the Latinx students, I conducted two rounds of pláticas, each one hour long. The extra time allowed for back and forth and inclusion of everyday lived experiences of Latinx students.

To incorporate the everyday lived experiences of Latinx STEM students, I made space and time to discuss "going off topic" moments. While conducting the pláticas, the students and I realized

we were “going off topic.” We both made time and listened to each other. The items students shared while “going off topic” were important to the students. Journaling after the pláticas helped me reflect on the “going off topic” moments. I then began to notice, when students said they were “going off topic,” they were providing a longer narrative and providing more context to their responses. My interpretation of these “going off topic” moments was that the topic of persistence in STEM and the lived experiences of Latinx students are complex. The complex lived experiences and responses were not brief and required contextualizing within the lived experiences. The pláticas through the back and forth and focusing on the lived experiences allowed for the layers and complexity to be revealed. For instance, on the topic of persistence in STEM, the following layers were discussed, familial, financial and campus context. Thus, pláticas methodology allows for inclusion of family and culture in higher education research (Alemán Jr, Delgado Bernal & Cortez, 2015).

Also, the pláticas were conducted during the height of the COVID-19 pandemic with a virtual Zoom platform. The Zoom platform allowed for “face to face” engagement with the students and a focus on the pláticas, since there were limited distractions online. The online setting allowed students and researchers flexibility by decreasing travel and time commitments to engage in research. The virtual pláticas allowed for an examination of each of the five principles and the ability for in-depth pláticas on the everyday lives of students online. A limitation of the online platform is that most of the pláticas took place in student’s home and students did not have their own private office or space. The latest research from Oliffe et al. (2021) on online Zoom interviews points to the benefits of conducting online interviews from the home for comfort. However, not all Latinx students had a designated private space at home, with some participating from in their home closets, cars and garages. In addition, the following items were discussed, that were not part of my original research topics; the transitions to a virtual learning environment, moving back home, lack of employment, anti-police brutality nationwide protests and the impact of the COVID-19 pandemic on the lives of Latinx students. All these items were important to the students, especially the nationwide anti-police protests and the COVID-19 pandemic. I could not ignore these national events and we had discussions on the latest current events. I started many of my pláticas by recognizing the key moments and acknowledging that a lot is happening in the world right now. Below is an excerpt of my pláticas with Diana, a Latina, Mexican-American, majoring in Human Biology and Global Health. Diana shared what she was witnessing in her neighborhood with COVID-19.

Diana: When Covid came out, a lot of testing was in these higher income areas. And so I know just based on what I see and the things that I read, like they have a lot more resources. So I want to go where the help is needed. And so definitely want to stay in LA county. I’ve had a lot of family from East LA, South Central and so I’m always taking the metro over to LA.

Through pláticas fluidity and focus on the lived experiences of Diana, pláticas allowed the inclusion of Diana’s lived experiences with her family in her local neighborhood. Diana kept returning to discuss her hometown and her hometown clinics. The pláticas led to the findings of the impact of COVID-19 and Diana’s understanding of the current pandemic and the social determinants of health, such as access in low-income communities (Garcia, 2022). Diana continued to share that she hopes to contribute to her community to address health inequities in the Latinx communities.

Provide a potential space for healing

Pláticas is a potential place of healing for student participants. The STEM learning environment is known as a competitive space, which places heavy emphasis on academic metrics, such as exam scores and grade point averages (Hurtado et al., 2009; Seymour & Hewitt, 1997). The STEM competitive space can come to odds with Latinx student’s culture and identity which emphasizes

collaboration, culture and family (Villalpando, 2003). Pláticas allow for validation and affirm students' experiences, challenges and dreams and create a potential space for students to pause, reflect and heal on their STEM trajectory.

The pláticas that I conducted with a subgroup of STEM students interested in pursuing medicine, all experienced constant reminders of needing to meet a threshold of grade point average and exam scores. Students received reminders about their grades through their classmates, faculty and graduate and professional school admissions officers. For instance, as I was wrapping up the pláticas session with undergraduate Sergio, he begins to open up about the impact of grades and pressure in STEM on himself and his friends.

Katherine: I just want to open up some time to ask you if this is there anything else that you would like to share about being a pre-med at Sol University

Sergio: Yeah, I think another stressful thing is, I recently saw an article about why underrepresented students should consider going to medical school and that's because of the wake sadly the death of George Floyd and the fact that we really need to change the systemic racism that has been occurring throughout our generation. But while the intent is good, to promote medical school pursuits and education for underrepresented students, I also think the article needs to explain how difficult [it is] being a pre-med students and how instead we should really fix the medical school admissions. I've noticed I had a bunch of friends who also are underrepresented who were pre-med student at first but then after taking a chemistry class they stopped. They stopped because they're like I can't take it anymore this class is too hard and I have to take more classes mostly science classes and I feel like I'm wasting my time or I feel like there was no hope for me to even become a doctor. I realized that the part of the problem is not just the difficulty of the requirement for medical school admissions but also the system in itself. Like why is it that there is so low percentage of underrepresented students in medical school? I do think that this is very important and that there are many passionate students out there who realize that medical school isn't for them but in reality it could have been, but they decided not to pursue it because of this imposter syndrome that sadly affects us all.

Katherine: Thank you for sharing all of that. I agree with you 100% that there's definitely some structural issues that are happening and you bring up a really great point again about looking at the admissions perspective and I know you mentioned this earlier about the mission and who does the medical school want...

Also, through pláticas, I was able to validate students beyond their GPA. I reminded students that I did not see them as a number and that a certain course grade did not define them and their career trajectory in the sciences and medicine. As an educator, I believe in a humanistic approach that humanizes Latinx students and does not measure a student's worth by their academic scores. During the pláticas, the Latinx STEM students had a physical release with tears and relief to be seen as a STEM scholar, not as a struggling STEM student. Rendón's (2002) work on validation theory for Latinx students, highlights the important role validation plays in supporting Latinx students that are first-generation college students and in college environments that do not support them.

Additionally, pláticas were a space for the STEM students to pause and reflect on their experiences in the STEM learning environment. The STEM students had a full load of STEM coursework, lab, employment, research and involvement in various student organizations. Their full load did not allow them to pause and reflect on their interactions with peers and faculty in the STEM learning environment. This pausing and reflection allowed the students to process many experiences for the first time. The Latinx STEM students were processing for the first time their experiences of social isolation, microaggressions, micro-insults and their negative interactions with peers and faculty, who questioned their intelligence. Unpacking these microaggressions is key to the healing of Latinx STEM students. Many of the students were never given space and time to name the institutional and structural issues occurring on their campus. For example, naming the structural issues of lack of Latinx faculty in the sciences and the role of high-stake testing in STEM and admissions to medical school. Naming and addressing these issues were key for student healing because of the strong notions of meritocracy within science and higher education.

Diana: I just want to say thank you for having this space, it's like a venting time, I know I talk to a few of my friends who met with you as well and I just thank you for having this [space] allowing me to be heard and listen to. Because I never really spoken about these topics to someone other than friends that were complaining about process or the struggle, so thank you for that.

Katherine: Thank you, [I] am glad it was helpful to ... I think there[s] a lot, student carry being student at Sol University, being first-generation, being a Latina, so I'm glad you were able to share and get something off your chest. I also just want to let you know, I'm here also as a resource for you. I work at the medical school, if you ever want to check-in again during your final year or as you're getting ready to apply to medical school, we do have a new program that we just launched last year, the program will be opening up the applications in the fall.

Diana did apply to the outreach program in the medical school and today is in her final year of undergraduate studies and will be applying to medical school the following year. Thus, through trust and creating a safe space during the pláticas, a mutual space of healing is created for Latinx students that have been marginalized in STEM. This is a place where students can process their feelings and experiences, share their various identities, share their grades, without judgment and challenges and feel validated by the STEM learning environment which has tried to invalidate Latinx STEM student's culture, voice, and familial experiences.

Draw heavily from Chicana/Latina feminist theory

Pláticas methodology is rooted in Chicana/Latina feminist epistemology (Delgado Bernal, 1998), and a strength is that the researcher brings their whole self into the research process. For instance, the notion of "cultural intuition," which is the researcher bringing their professional, personal, familial and collective experience into the research process and analysis (Delgado Bernal, 1998). Within engineering education research, there has been a call for the inclusion of positionality statements in journals for transparency and recognizing the researcher's privilege, especially with STEM equity research (Hampton et al., 2021; Secules et al., 2021). The use of 'cultural intuition' goes beyond reporting a positionality statement but acknowledges that Chicana/Latina researchers have unique research perspectives and these experiences are strengths to the research process (Delgado Bernal, 1998). Thus, a researcher bringing their whole self is regarded as an asset to the research process.

My identity as a Latina, first-generation college graduate, from a low-income family background, has shaped my educational experiences and beliefs. I bring with me 10 years of professional experience working with Latinx premed students from high school age to medical students. Through this time, I have gained insight into the obstacles and successes that STEM students face in higher education as they persist to graduate and advance toward medical school. In research papers, I report my positionality along with the concept of cultural intuition because my identity and experiences impact my research process from, design and research questions to analysis. Below is an example of bringing my whole self into the research process. This is my positionality statement that I shared at the beginning of all the pláticas.

Katherine: So just a little bit about myself. I graduated from Sol University too, so I'm Sol University alumni. I graduated with a degree in Psychology and Ethnic Studies and then I got my Master's in Education and now I'm in the PhD program at Sol University, so really focusing on higher education. All the work that I've always done has revolved around, helping students from underrepresented backgrounds get access to higher education, from outreach programs. I also work at the medical school ... working with diverse students. I've worked with students from different levels from high school, to undergrad, to now medical school, my research focuses on making sure Students of Color continue on to their goals.

Also, many of the students that were part of this study, I had known for a couple of years through my professional staff position. However, these students still enjoyed learning from me, many of them didn't know about my educational background. For new participants, they were

surprised to find out about my educational background as a former student at Sol University. Other items that I shared with students are my home background, my first-generation college status and difficulties navigating higher education. Bringing my whole self to the research process, allowed trust building with Latinx students. Through pláticas and Chicana/Latina feminist epistemology, sharing of self is a groundbreaking process to engage with Latinx students in STEM.

Pláticas are two-directional and based on reciprocity, vulnerability, and researcher reflexivity

Reciprocity in STEM research

Reciprocity is striving towards an equal relationship between the researcher and participant, a give and take relationship. Scholars of Color such as Figueroa and Sanchez (2008) and Acevedo-Gil (2019) have begun to share the key role of reciprocity for Scholars of Color conducting research with communities of Color, such as the concept of "buena voluntad." This is a concept that believes if researchers care about the well-being of the community being studied, then the researcher should enact "buena voluntad," to have a positive influence before, during, and after conducting research (Acevedo-Gil, 2019). Thus, the role of reciprocity is pivotal in a research setting and relationship. Reciprocity is needed for trust to exist and the development of a relationship between researchers and participants.

A question I asked myself while conducting this study, how can I give back to the participants? Traditional journal articles take up to one year to be published. Many of the student participants were part of a student organization, Chicano/as for Community Medicine (CCM) and I decided to partner with them on a collaborative project. I engaged with one of my participants and three additional Latinx students in a new project, The Latinx Premed Guide. We worked on this project for a year and have jointly presented in various community and conference settings to share the Latinx Premed Guide, a tool for first-generation Latinx premeds navigating an R1 STEM research-intensive campus.

Although challenging, reciprocity has many opportunities to turn one-way research into empowering interactions with student participants. Reciprocity needs to go beyond members-check and we must begin to re-imagine traditional ways of interacting with participants and giving back to participants in research. The techniques to re-imagine reciprocity within STEM research is shown in Table 1.

Vulnerability

Pláticas methodology is very unique, in that the pláticas allow for the researcher to share parts of themselves with the participants and vice versa. The one-on-one time between myself, the researcher and the participant, went beyond the research questions but included sharing parts of my educational trajectory. I shared my struggles navigating higher education, from feelings of isolation to family support and my academic challenges as well. I decided to share this information with students because we had similar experiences and I wanted the students to know that I was familiar with situations of navigating as a first-generation college student. The mutual sharing and vulnerability that occurs lead to the development of trust.

At the end of a plática, the participant and the researcher have established a relationship. The relationship goes beyond the research space of the plática and enters a new space of friendship, support and solidarity. The relationship then takes on new ways of gathering such as through email communication, mentorship and collaboration on community and research projects. This relationship building challenges normative practices of distant and formal interactions between participants and researchers in STEM education research. Normative practices such as surveys, focus groups and interviews leave students after one or two interactions. Instead, through mutual sharing and vulnerability,

Table 1. Re-imaging reciprocity within STEM research.

Types of reciprocity	Description
Relationship development	Making time outside of the research space for follow-up meetings. Relationship building through time, trust and vulnerability.
Network	Sharing resources from STEM faculty and organizations. Exposure to hidden curriculum, research, internships and academic opportunities.
Funding	Stipends and gift cards for completion of pláticas. Sharing scholarship opportunities. Hiring students for paid internships and research opportunities.
Mentorship	Sharing resources, opportunities and mentoring of STEM students in research and career guidance.
Research collaboration	Shift to see students as research collaborators. Engage students in the research processes and projects, such as the inclusion of students in the analysis, authorship and conference presentations.

pláticas can become a starting point to form authentic and meaningful relationships between the researcher and the participant. Being vulnerable may include sharing of emotions, such as sadness and anger. Researchers need to keep in mind their readiness to discuss these topics and not cause harm. However, through sharing of stories, there is also the process of healing and empowerment (Calderón et al., 2012).

Below, I discuss the additional training that is needed to engage in relationship building and vulnerability.

The use of pláticas methodology requires extensive preparation, training, and the application of Chicana/Latina feminist epistemology and “buena voluntad” of researchers. Pláticas rely on a relationship that is based on reciprocity, vulnerability, and researcher reflexivity (Avila, 1999). To embrace the pláticas methodology, researchers need to reflect on their positionality and their approach to the research process. This includes an examination of the implicit bias of the researcher. Below I review challenges that may arise when employing pláticas and opportunities for researchers to engage authentically with Latinx students in STEM research.

Pláticas requires the researcher to have experience and training in creating a safe space for Latinx student participants. Experience working with diverse students is highly recommended, from teaching to mentoring diverse students. Experience working with vulnerable student populations is important, especially as sensitive topics such as racism may be discussed. Training in methodology is important, as it may be challenging for researchers that have been trained in traditional interview format. For instance, training in advanced qualitative methods is important to explore the role of the researcher in qualitative methodology. Also, training in decolonizing methodology for researchers to unpack their bias in Western research and learn tools to center Students of Color voices.

Also, to create a safe space, researchers need to be comfortable with their positionality and biases in STEM research. Researchers must process and unpack their positionality and how their positionality impacts their research views and engagement with Latinx students. The inclusion of a positionality statement in a manuscript is a start. However, a positionality statement is not enough, and ongoing researcher reflexivity is needed throughout the research process.

Researcher reflexivity

Researcher reflexivity is being conscious of how research affects and is affected by the research process (Watt, 2007). Researcher reflexivity involves self-examining the researcher's role in research and relationship to participants. In qualitative studies, a disconnection between the researcher and participant is recommended, to not taint participants' and researchers' responses and findings. In pláticas, ongoing reflexivity is needed for the researcher throughout the research process

to explore potential biases, assumptions and dispositions that the researcher brings to the research process. Below is a list of questions to cultivate a researcher's reflexivity:

1. What are your preconceived notions of Latinx STEM students?
2. Are you up to date on the recent Latinx student research in higher education?
3. Are you using asset-based frameworks? Asset-based terms?
4. Is your research team diverse and bilingual?
5. Are there any student responses that surprise you? Why?
6. How is your positionality and cultural intuition impacting your research process?

To maintain researcher reflexivity throughout the research process, the following qualitative tools can be used; journaling and memos. Journaling after pláticas is a practice that will allow researchers to reflect on their emotions, biases and allow for critical reflection during the pláticas. Journaling allows for notetaking and tracking of internal thoughts. Another method is the use of in-process memos. In-process memos provide insight into events or comments that resonates with the researchers during the ongoing research process (Maxwell, 1996). Also, tracking in-process memos are useful for the researcher to develop new interpretations and understanding (Maxwell, 1996). Both of these qualitative tools require the researcher to make time to stop in the research process and to record their thoughts.

Discussion

Disruptions and shifts to advance STEM education research through pláticas methodology

Now that I have provided an in-depth examination of the use of pláticas methodology in STEM education. I will now present the use of pláticas methodology as the potential to disrupt dominant narratives in STEM research and shift deficit views of Latinx students. Pláticas methodology disrupts dominant narratives of Latinx students having academic difficulties in STEM courses and leaving STEM majors. Instead, through pláticas methodology principles, a process of humanization of Latinx students in STEM education research can occur. Through principle two and five, centering of Chicana/Latina Feminist Epistemology (Fierros & Delgado Bernal, 2016), which recognizes the everyday lived experiences of Latinx students, reveals the critical role of familial impact on the persistence of Latinx students in STEM. For instance, during the pláticas with the students, there were many moments that I call "going off tangent moments." During these moments, students apologized for not sticking to the general topic of persistence but shared that they needed to tell me about their grandfather's experiences with medicine, their experiences translating in the hospital when they were young or information about their childhood and family experiences in their home community. During these "going off tangent moments," the students were proving more contextual background about their families and the impact their lived experiences and their families' lived experiences impact their choice to pursue a STEM major. Additionally, a question that I asked the students participants was "when did your interest in STEM begin?" which led to an understanding that Latinx students have been curious and interested in biology, chemistry, physics and math since their very early years in elementary and middle school. Curiosity for Latinx STEM students has also been shown as key by the work of Rendon et al. (2019). Thus, the inclusion of family and their early childhood interest in STEM is part of the humanization process of understanding a student's personal journey to STEM (Todres et al., 2009), which counters the dehumanization of solely focusing on STEM academic outcomes. Thus, through these two principles in pláticas methodology, there can be a disruption of dominant narratives to humanize Latinx students as scholars with a high interest in STEM for many years and very committed to majoring in STEM.

Also, through pláticas methodology, the dominant narrative of 'leaving the sciences' is challenged through an understanding of the everyday lives of Latinx students dealing with a racial campus and microaggressions. Through principle four of pláticas as a place of healing and principle two, the inclusion of everyday lived experiences, pláticas allow for Latinx students to connect, pause and critically reflect on their experiences of the campus climate, including micro-aggressions with peers and faculty in STEM. As STEM students in a research-intensive university, with full loads of classroom, lab, employment and family responsibilities, many of the students navigate alone and have not had a chance to process moments of racism and micro-aggressions in the STEM learning environment. Also, Yosso (2013) reveals that Latinx students develop navigational strategies around issues of racism and microaggressions encountered in the university. Thus, many students are used to navigating a racist campus culture. However, the pláticas allowed the students to counter the isolation and humanize their experiences by connecting with the researcher in the pláticas, both being vulnerable and processing that the faculty and university structures exclude them from office hours, engagement in research opportunities and advancement to graduate schools because of the heavy reliance on academic metrics. Thus, the dominant narrative of Latinx students not engaging in undergraduate research mentorship or applying to graduate school was disrupted by understanding that Latinx students are excluded by university structures and from engagement with research opportunities through micro-aggression, unwelcoming office hours, and negative campus climates, placing the onus of engagement on the institution.

Finally, pláticas methodology allows for student voice to be at the center, which highlights students' agency, advocacy and social justice interests in STEM. Principle one, honoring participants as co-constructors of knowledge and principle three, two-directional natures of pláticas, allows for Latinx student participants to lead the pláticas and discuss items that are important to them, such as social justice interests as STEM students. Honoring students and allowing them to lead the pláticas session, recognizes student's agency and counters the dehumanization process by viewing Latinx STEM students as passive individuals in the university. Understanding that students are knowledge holders (Fierros & Delgado Bernal, 2016) in STEM, means recognizing that students are experts in living their life as STEM students and not viewing them as struggling students in STEM. Recognizes that Latinx students have collective knowledge from their families and their own experiences, such as navigating STEM courses and social science courses. Few examples in STEM education literature acknowledge Latinx students as knowledge holders, such as McGee's (2016) understanding of Black and Latinx students' knowledge of their race being devalued and navigating STEM with that information and Herrera et al. (2022) Women of Color in STEM, their knowledge on their gendered experiences and navigating as transfers and Latinx students navigating the COVID-19 pandemic with their familial knowledge (Garcia, 2022). Thus, through the pláticas methodology, researchers can begin to recognize Latinx students' agency and recognize them as knowledge holders.

Furthermore, pláticas methodology is an opportunity to shift to theoretical frameworks that are holistic, humanizing and recognize the intersectional identities of Latinx STEM students (Calderón et al., 2012). For instance, Rendón et al. (2019), Latinx Student STEM Success Model, provides a holistic model that includes Latinx STEM student assets/ventajas and knowledge/conocimiento to counter deficit framing of Latinx STEM students. Additionally, to examine marginalization and oppression in STEM, an intersectionality theoretical framework by Kimberlé Crenshaw (1990) can be applied to examine the interlocking structures of oppression and social identities of Latinx students in STEM. Scholars have applied an intersectionality framework to examine Women of Color experiences in STEM (Espinoza, 2011; Herrera et al., 2022). While scholars have advanced the use of intersectionality with Latinx students in STEM (Contreras Aguirre et al., 2020; Rodriguez and Blaney, 2020; Rincón & Lane, 2017). Also, to move towards humanizing Latinx students in STEM, the following humanizing framework by Todres et al. (2009) can be applied to shift towards understanding humanizing in STEM. Finally, to further examine the structures of a campus in serving Latinx students, especially in Hispanic-Serving Institutions (HSIs), Gonzalez

et al. (2020) highlight the importance to turn towards the Latinx student voice and Garcia's (2023) HSI transformative framework to unpack "servingness" to understand how institutions can center Latinx students and Latinx students voice in HSIs. Thus, STEM researchers must begin to understand the important contributions of scholars that use culturally relevant, race-gendered epistemologies and culturally relevant methodologies to advance STEM research frameworks to shift the deficit perspectives of Latinx students in STEM.

Conclusion

Hooks (1990) encourages us to surrender to our marginality as it offers a radical perspective to see and create and imagine alternative new worlds. My hope is that with this article, Latinx researchers take space to acknowledge their knowledge and Latinx students' knowledge in STEM. From the margins, as a Latina emerging researcher, I present this article on centering Latinx students through pláticas methodology. I hope to introduce Chicana/Latina Feminist Epistemology and pláticas methodology as an extension of recognizing Latinx researchers and Latinx STEM students.

Pláticas in STEM research is a promising methodology for Latinx researchers to engage, support and conduct research with and for Latinx STEM students. The following are key takeaways from the application of pláticas methodology in STEM education, the potential to humanize Latinx STEM students and recognize the everyday lives and knowledge of Latinx students. To choose a transformative methodology, researchers must prepare and do the work in unpacking their positionality and engaging in meaningful and reciprocal relationships with their participants. I hope that the readers of this article continue to move forward STEM research by choosing appropriate racial-gendered and culturally relevant methods.

Notes

1. I use the term Latinx to represent people that identify with Latin America and for gender inclusivity and to go beyond binary terms.
2. All names are pseudonyms to protect the privacy of students.

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ORCID

Katherine Arias Garcia  <http://orcid.org/0000-0003-0093-6100>

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