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INTERSECTIONALITY AND THE EXPERIENCES OF WOMEN IN STEM IN COLOMBIA

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ABSTRACT

This paper examines the experiences of women in science, technology, engineering, and mathematics (STEM) in Colombia through an intersectional lens. Drawing on focus groups with undergraduate students, graduates, and women in leadership positions, the study analyzes how gender interacts with class, ethnicity, territory, age, nationality, and family roles to shape unequal trajectories in academic and professional settings. The findings show that exclusion in STEM cannot be explained by gender alone. Instead, it is organized through a matrix of domination in which some women enter and remain in STEM under significantly harsher conditions than others. The analysis highlights five central dynamics: the unequal weight of class-based and territorial disadvantages, the political invisibility of Afro-descendant and Indigenous women, the penalization of motherhood, the normalization of symbolic and communicative violence, and the transfer of institutional care to informal support networks. At the same time, the study identifies forms of agency and perseverance developed by participants, although these often come at the cost of emotional hardening, chronic exhaustion, and self-surveillance. Rather than celebrating resilience as a sufficient answer, the article argues for a shift toward institutional responsibility, epistemic justice, and more habitable educational and professional environments for women in STEM.

KEYWORDS: Intersectionality; Women; STEM; Higher Education; Symbolic Violence; Motherhood; Participation; Colombia.

1. INTRODUCTION

Although women in Colombia outnumber men in overall higher education enrollment, this advantage does not translate into the fields of science, technology, engineering, and mathematics (STEM). Women remain underrepresented in many STEM programs and professions, especially in engineering and technology, where masculinized institutional cultures continue to shape access, recognition, and advancement. The persistence of this gap cannot be explained as the simple outcome of individual choice. Rather, it is linked to long-standing processes of gender socialization, family expectations, and social norms that define which futures are considered legitimate for women from an early age.

In academic and workplace environments, these dynamics are reinforced through everyday practices. Technical competence, authority, and leadership are often coded as masculine, while women are expected to prove themselves repeatedly in ways not demanded of men. As a result, belonging in STEM is not distributed equally: it is granted more easily to those whose social position already aligns with dominant norms of class, race, age, language, and professional availability.

This article examines how women in Colombia experience participation in STEM when gender is understood as inseparable from other social identities. The study starts from the premise that “women” cannot be treated as a homogeneous category. A student from a rural region, a woman from a low-income household, an Indigenous or Afro-descendant woman, a migrant woman, and a mother in a demanding engineering program do not encounter the same barriers, even if all are formally included within the same institutional field. Their experiences are shaped by different forms of exclusion and different thresholds of legitimacy.

From this perspective, success and failure in STEM cannot be read solely through meritocratic narratives. They are also effects of institutional arrangements and cultural expectations that reward conformity with a masculine norm, particularly around uninterrupted productivity, physical availability, mobility, and distance from care responsibilities. Intersectionality makes it possible to examine how these systems operate simultaneously rather than sequentially. It therefore offers a more precise account of the unequal conditions under which women access, remain in, and progress through STEM trajectories.

The article is organized in a structure comparable to the reference text. First, it presents the

methodological design. Second, it synthesizes the main findings into a coherent analytical model centered on the interaction between identity, institutional culture, and participation. Third, it discusses the implications of these findings for higher education and labor contexts. Finally, it outlines the study’s conclusions and its contribution to ongoing debates on gender equity, institutional transformation, and justice in STEM.

2. METHODOLOGY

This study was developed within a qualitative-interpretive paradigm and adopts intersectionality as its main analytical perspective. Rather than aiming at statistical generalization, the research seeks to understand how women interpret their own experiences and how meaning is produced collectively through narrative interaction (Gadamer, 2001; Creswell & Poth, 2018). This approach is especially relevant for STEM contexts because many of the forms of exclusion described by participants are subtle, cumulative, and normalized. They often appear not as isolated incidents but as repeated practices that structure everyday participation (Denzin & Lincoln, 2011; Nadeem, 2019).

The empirical design combined focus groups with documentary review. Focus groups were selected because they allow for the observation of how meanings are co-constructed in interaction. Agreements, disagreements, interruptions, hesitations, and silences are analytically important in a study concerned with legitimacy, voice, motherhood, discrimination, and professional identity. In this case, focus groups also made it possible to compare trajectories across different stages of participation in STEM, from program entry to professional consolidation (Riessman, 2008).

Five focus groups were conducted with a total of nineteen participants. The sample was intentionally structured to cover distinct positions in the academic and professional cycle: three groups with undergraduate STEM students, one group with graduates, and one group with women graduates in academic or professional leadership roles. Participation criteria included training or professional experience in STEM and willingness to discuss identities and life conditions relevant to intersectional analysis, including socioeconomic background, region, age, ethnicity, maternity, and work status. Sessions were held virtually, lasted approximately 90 to 120 minutes, and involved groups of three to five participants. Each session followed a semi-structured guide organized around three major axes: stereotypes in educational

transitions, stereotypes in labor insertion and career development, and knowledge of institutional equity measures. Audio recordings and field notes were produced for each session.

The participant profile adds important context to the findings. Thirteen of the nineteen women were students, three were graduates, and three were women with consolidated leadership trajectories in STEM. Most participants were between 20 and 30 years old. Around three quarters had studied at private universities, while roughly one quarter came from public institutions. Their fields were concentrated primarily in electronic and mechatronics engineering, and nearly half combined study and paid work. The study also sought territorial and institutional diversity, including women from urban and rural regions and from a range of public and private higher education institutions in Colombia. Recruitment was carried out through intentional sampling using Women in

Engineering (WIE-IEEE) and related academic and professional networks.

Data were transcribed verbatim and analyzed in MAXQDA through thematic analysis within a narrative framework. The analysis preserved narrative sequences instead of fragmenting testimony excessively, since the study was concerned not only with recurring topics but also with plot, position, justification, and voice. The procedure involved familiarization with the material, code generation, development of themes, theme revision, and analytical writing anchored in both recurrent patterns and counterexamples (Braun & Clarke, 2006; Riessman, 2008). Throughout the process, intersectionality served as the guiding lens for identifying how gender interacts with class, ethnicity, territory, age, nationality, and family roles in the production of differentiated experiences of privilege and oppression (Crenshaw, 1993; Collins & Bilge, 2021).

Table 1. Participant Profile.

Dimension	Distribution	Analytical relevance
Role	13 students; 3 graduates; 3 leaders	Covers entry, transition, and consolidated trajectories in STEM.
Age	Mostly 20-30; smaller groups 31-40 and 40+	Allows comparison across early, mid, and later career stages.
Institution type	Approx. 74% private; 26% public	Contrasts institutional experiences and resource conditions.
Field of study	Primarily electronic and mechatronics engineering	Focuses on highly masculinized STEM subfields.
Time use	47% study-work; 42% study only; 11% work only	Reveals unequal pressure from labor and care demands.
Territorial scope	Urban and rural regions in Colombia	Captures central-peripheral differences in opportunity.

3. RESULTS

The analysis shows that women's experiences in STEM are organized through a set of interconnected dynamics rather than through a single line of discrimination. These dynamics can be understood as a relational structure in which access, recognition, voice, and continuity are unevenly distributed. Four major findings emerged from the data: (1) inequality is intersectional and cumulative; (2) symbolic violence is normalized in everyday interaction; (3) institutional support is fragmented and often externalized; and (4) empowerment is frequently built as a survival strategy under hostile conditions rather than as the result of equitable participation.

3.1. STEM as a field structured by intersectional inequality

A central finding of the study is that women do not enter STEM from the same starting point. Gender interacts with class, territory, ethnicity, age, nationality, and family responsibilities in ways that produce unequal possibilities for access, permanence, and recognition. Participants

repeatedly indicated that barriers in STEM do not arise from one identity alone but from the convergence of several identities at once (Crenshaw, 1989; Collins, 2000; Collins & Bilge, 2021).

Class background appeared as a decisive filter. Several participants described how higher socioeconomic status opens access to recommendations, contacts, and networks that make entry into study and employment more viable. By contrast, women from lower-income backgrounds described having to compensate for the lack of inherited social capital, even after obtaining a university degree. In this context, meritocracy works less as a neutral principle than as a discourse that obscures unequal points of departure (Bourdieu, 1996). A degree may certify competence, but it does not erase the stigma attached to class origin.

Territory also emerged as a powerful axis of inequality. Participants from rural regions described STEM not as a field naturally open to aspiration, but as something geographically and symbolically distant. Engineering is often imagined as belonging to urban centers, while women from peripheral

regions are pushed to make educational decisions based on proximity and economic survival rather than desire or vocational fit. In several accounts, career choice was determined by whatever program existed closest to home, not by free educational selection. The distance was therefore not only spatial but also epistemic (Quijano, 2000; Viveros Vigoya, 2016; Lugones, 2008).

Ethnicity made inequality even sharper. One of the strongest findings in the data was not a detailed narrative of inclusion but the recurrent absence of Afro-descendant and Indigenous women in participants' educational environments. Their invisibility was described as a structural fact. This absence should not be read as accidental. It suggests that exclusion often occurs well before university enrollment, filtering some bodies out of STEM trajectories before they can even appear in institutional spaces. For those women who do enter, racialized identity is not an additional burden layered on top of gender, but part of a simultaneous system of diminished recognition (Crenshaw, 1989; Solís Calvo, 2021; Verdugo, 2022).

Age and nationality also shaped experience. Younger women were sometimes read as technically unprepared, while older women were judged against expectations about what they "should" still be doing at their stage of life. Women with marked regional accents, particularly from the Colombian Caribbean, described how speech itself became a site of devaluation. Their tone, accent, or style of expression was used to weaken their authority and to question their capacity for leadership (Butler, 1988; Viveros Vigoya, 2016; Fricker, 2007). Taken together, these accounts show that participation in STEM is not simply gendered; it is stratified through a matrix of domination in which some women have to travel much farther than others to be seen as credible.

3.2. *Everyday violence as background noise*

A second major finding concerns the normalization of symbolic violence in STEM environments. Participants did not usually describe discrimination as exceptional. More often, they presented it as something ambient: a type of background noise integrated into academic and professional life. The very fact that such practices are repeated and minimized is what makes them effective (Segato, 2016).

This normalization appeared in several forms. One was technical invalidation through humor. Participants described situations in which their contributions were not openly refuted on technical grounds but were neutralized through mockery,

irony, or dismissive comments. Such interactions did not merely produce discomfort; they re-established male cohesion by placing women at the edge of the scene, present but not fully recognized as legitimate knowers (Bonino, 2004; Bourdieu, 1996).

Another recurrent pattern was communicative control. Several participants referred to being told to calm down, soften their tone, or remain silent. These interventions functioned as more than interpersonal incivility. They regulated the acceptable style of female participation and shifted attention away from the substance of women's arguments toward their manner of speaking. This tone policing was particularly significant for women whose regional accents already marked them as different (Ahmed, 2017; Dotson, 2011; Anzaldúa, 1987).

Silencing also appeared in explicit form. Some women reported being directly told not to answer technical questions because they were women, or choosing not to respond in order to avoid escalation with older men or authority figures. Such silence should not be interpreted as passivity. In many cases it was a calculated strategy within a hostile environment. Yet it carried a cost: avoiding open conflict often meant accepting invisibility as the price of short-term survival (Romaine, 2007; Segato, 2003).

Motherhood was one of the clearest sites where symbolic violence became institutional violence. Participants described academic and professional contexts in which care responsibilities were treated as private disruptions to a supposedly neutral system. One especially telling case involved a pregnant student whose justified absence led to a whole group being penalized because a professor refused to consider her condition. The event is important not only as an example of lack of empathy, but as evidence of the productive norm embedded in STEM cultures: the ideal subject is someone who never pauses, never cares for others, and never becomes physically unavailable (Buchmann & McDaniel, 2016; Federici, 2012; Lagarde, 1997).

3.3. *Institutional orphanhood and the outsourcing of care*

A third finding concerns the weakness, invisibility, or fragmentation of institutional strategies for equity. When participants were asked about measures adopted by universities or employers to support women's permanence and advancement, the dominant answer was not that such policies worked poorly, but that they were barely known, weakly implemented, or absent from daily life. The result was a sense of institutional orphanhood.

In educational settings, support was often confused with generic economic assistance rather than understood as a gender-responsive strategy. Participants recalled cases where some women, particularly from Indigenous communities, received housing or food subsidies. Yet such measures were described as narrow and insufficient. They addressed survival, but not belonging. There was little evidence of mentoring, psychosocial accompaniment, intercultural support, or specific responses to the layered exclusion experienced by rural, racialized, or caregiving students. The limits of this approach became evident after the pandemic, when several participants observed significant dropout among women whose needs exceeded material aid alone (Yuval-Davis, 2006).

Motherhood exposed these institutional limits even more clearly. Participant accounts suggest that universities and workplaces often treat maternity as a private issue to be solved individually. The daily routine of student mothers described in the study makes this visible: long hours of care, paid work, commuting, study, and domestic labor are sustained through personal sacrifice rather than through supportive institutional design. In leadership trajectories, this logic extends to doctoral opportunities and professional mobility. Formal equality – applying the same rule to everyone – ends up reproducing inequality when institutions refuse to account for care responsibilities (Lagarde, 1997; Buchmann & McDaniel, 2016).

In workplace settings, the same pattern appeared in relation to safety and task allocation. One participant described being assigned dangerous fieldwork in a border zone while management framed the situation as fair because she received the “same work” as male colleagues. Yet the actual response to risk was not an institutional gender-sensitive protocol, but paternalistic reassurance and the presence of a male escort or driver. Equality was thus defined as identical assignment, even when exposure to danger was not experienced identically. In this regard, organizational neutrality worked as a mechanism of blindness rather than fairness (Segato, 2016; Choo & Ferree, 2010).

Faced with these institutional voids, many participants identified informal networks – especially IEEE and Women in Engineering (WIE) – as the spaces where real support was found. These networks offered mentoring, emotional validation, practical guidance, role models, and a sense of community often unavailable in universities themselves. This was one of the most significant findings of the study: what institutions failed to

provide was being supplied through voluntary, largely feminized labor in external or parallel spaces. Support for women in STEM was therefore not absent, but outsourced (Solórzano et al., 2000).

3.4. “Thick skin” and the cost of survival

The fourth major finding concerns how women narrate their own persistence. Participants frequently described empowerment using local expressions such as being brave, *echada pa'lante*, *berraca*, or determined. At first glance, these narratives signal agency and resistance. However, the analysis suggests that such empowerment is often forged under coercive conditions. It is less the outcome of an equitable environment than a strategy developed to endure a hostile one. Many participants described a need to prove that if a man could do something, they could do it too. This comparative logic reveals a reactive form of empowerment. Women are not simply encouraged to learn or lead; they are pushed to demonstrate equivalence against a masculine standard that remains the implicit norm (Butler, 1993).

This pattern is especially visible in the recurring notion of “thick skin.” Participants described older women in STEM as emotionally hardened, always having had to show strength, and younger women as gradually learning similar habits. Thick skin, however, should not be romanticized. It is an adaptation to continuous exposure to invalidation, ridicule, and scrutiny. It protects women from some forms of exclusion, but it also requires emotional self-armoring and a partial masculinization of authority. In that sense, the image of the *guerrera* or *echada pa'lante* becomes less a celebration than a scar left by institutional violence (Ahmed, 2017; Segato, 2016).

The texts also show that this hardening has a communicative dimension. Women learn not only to resist but to modulate, defend, and justify their own voice in spaces where assertiveness is easily reframed as aggression. This is especially clear in testimonies about being told to lower their tone, calm down, or become more acceptable in speech. In one case, a participant explicitly linked her coastal identity to the need to speak louder in order to be taken seriously. Her strength, then, was not simply psychological; it was also rhetorical and embodied, built in response to environments that consistently questioned her authority (Anzaldúa, 1987; Ahmed, 2017).

The costs are particularly severe when empowerment intersects with motherhood. Several narratives reveal admiration for women who manage to study, work, care for children, and perform academically with little sleep and almost no

institutional support. Yet this admiration is ambivalent. What is praised as strength can also be read as socially organized overexploitation. Women are celebrated for surviving conditions that should be transformed, not normalized. The figure of the “superwoman” appears not as a rights-bearing subject, but as an impossible ideal: the woman who is productive in academia or the workplace while simultaneously bearing primary responsibility for care, without showing fatigue or demanding institutional accommodation (Lagarde, 1997).

In leadership narratives, guilt emerged as a particularly painful dimension of this burden. Some women recalled being told that their children “did not know their mother” because of professional commitment. These comments strike at a central site of gender discipline: even when women achieve technical authority, their legitimacy remains vulnerable to moral judgment about care. The system thus imposes a double demand. Women are expected to succeed as though they had no caregiving responsibilities, while also being judged for any visible sign that work has taken precedence over family. Under such conditions, empowerment is inseparable from fatigue, solitude, and constant self-justification (Buchmann & McDaniel, 2016).

4. DISCUSSION

The findings confirm that women’s experiences in STEM in Colombia cannot be adequately interpreted through gender alone. Rather, the data show that participation, persistence, and professional recognition are produced within an intersectional structure where gender interacts with social class, ethnicity, territory, age, motherhood, and institutional position. In this sense, the study aligns with intersectional theory by showing that inequalities do not simply accumulate; they are mutually constituted within specific institutional and cultural settings (Crenshaw, 1993; Collins, 2000; Collins & Bilge, 2021). The narratives reveal that exclusion in STEM is not accidental or episodic, but embedded in a broader matrix of domination that organizes who is perceived as naturally legitimate, who must constantly prove competence, and who is silently displaced before even entering the field.

A key contribution of the study is that it shifts the discussion away from individual choice and meritocratic explanations. The participants’ accounts show that access to STEM pathways is already filtered by unequal conditions long before university entry. This is especially visible in the testimonies regarding class and territory. One participant stated, “El estrato social tiene mucho que ver, especialmente

por el tema de las influencias,” while another explained that in many rural contexts, “que una mujer llegue a la universidad y más aún que estudie ingeniería, todavía se ve como algo muy lejano a su realidad.” These accounts reinforce Bourdieu’s understanding of social capital and Viveros Vigoya’s situated reading of intersectionality: opportunities are mediated not only by academic performance but also by inherited networks, institutional legibility, and territorial location (Bourdieu, 1996; Viveros Vigoya, 2016). In that sense, the supposed neutrality of STEM training is undermined by the fact that some women arrive with cultural and relational capital already aligned with institutional expectations, while others must overcome economic restriction, geographic distance, and symbolic devaluation simultaneously.

The findings also deepen the discussion on political invisibility. The absence of Afro-descendant and Indigenous women was not presented merely as a demographic detail, but as evidence of prior exclusion. Statements such as “Desde que empecé la carrera, no he tenido compañeras afrodescendientes” and “Si ya es difícil por ser mujer, para ellas debe ser mucho más difícil” point to a structural filtering process that precedes university participation. This supports Crenshaw’s argument on the invisibility generated when institutions treat “women” as a homogeneous category and ignore how race, class, and geography differentiate access to rights and recognition (Crenshaw, 1993). The data suggest that institutional diversity discourses often remain superficial because they fail to address the cumulative mechanisms that expel racialized women before they can even appear in official inclusion narratives. In this regard, the absence itself becomes empirical evidence: what is not present in the classroom is part of what must be analyzed.

Another relevant contribution of the discussion lies in showing that inequality is also epistemic. The participants do not describe exclusion only as lack of access, but as a continuous struggle over legitimacy, voice, and authority. This is especially clear in the recurrent experiences of ridicule, silencing, and tone control. One participant recalled, “Entonces comenzaban como con burlitas entre ellos y terminaban invalidando completamente cualquier cosa que yo estuviera diciendo.” Another explained, “Me pasó varias veces que era como ‘Ay, pero cálmate’.” These experiences are consistent with the literature on symbolic violence, epistemic injustice, and tone policing (Bourdieu, 1996; Fricker, 2007; Ahmed, 2017; Dotson, 2011). What is being regulated is not simply behavior, but the very conditions under

which women can be heard as technically credible subjects. The women's speech is reframed as emotional excess, regional inadequacy, or personal overreaction, thereby shifting attention away from the content of their arguments. This means that exclusion in STEM also operates through communicative discipline: women are allowed to speak only under conditions that preserve masculine authority.

This dynamic becomes even more visible when regional and linguistic identity intersect with gender. The dismissal of coastal accents, for example, is not a neutral reaction to speech style but a coded form of social and territorial hierarchy. The testimony "Le critican su acento porque tiene un tono más costeño" suggests that accent can become a marker of reduced technical legitimacy. In this way, certain women are not only gendered in STEM spaces; they are also regionally marked and ranked. Their speech is heard through a filter of classed and territorial prejudice that places them farther from the figure of the "ideal" engineer. Here, Fricker's notion of testimonial injustice is particularly useful: the speaker's credibility is diminished not because of the content of what she says, but because of who she is perceived to be (Fricker, 2007). The result is that women must overperform rationality, precision, and restraint simply to be granted the status of competent participants.

The study further shows that age is another axis through which STEM cultures regulate belonging. The statement "Por la edad, ya no se debería intentar estudiar o superarse" reveals that women's educational and professional trajectories are judged against social chronologies that define when aspiration is legitimate. Younger women may be dismissed as inexperienced; older women may be treated as out of time. The testimonies about women in their sixties and seventies who had to become "muy duras, muy fuertes" point to the historical endurance required of earlier generations to remain in masculinized environments. Rather than celebrating resilience as a naturally admirable trait, the data suggest that "strength" often names a defensive adaptation to prolonged hostility. This complicates celebratory narratives of perseverance by showing that staying in STEM has frequently required emotional hardening, self-surveillance, and the suppression of vulnerability (Butler, 1988, 1990; Ahmed, 2017).

One of the strongest dimensions of the findings concerns the naturalization of violence. The data suggest that many discriminatory practices become normalized precisely because they are recurrent,

banal, and institutionally unchallenged. The study conceptualizes this as a kind of "background noise," where harmful acts cease to appear extraordinary and instead become part of the ordinary culture of engineering education and work. This is visible in testimonies such as "Aunque sí incomoda, no fue una afectación tan grande como para armar un problema." Such statements do not indicate that the violence is minor; rather, they show how women learn to minimize harm in order to remain functional in hostile environments. Segato's argument is useful here: patriarchal violence is effective not only when it is spectacular, but when it becomes routine and socially intelligible (Segato, 2003, 2016). In the participants' narratives, silence, accommodation, and emotional minimization appear less as free choices than as survival strategies within systems where complaint itself is punished.

This normalization is especially acute around motherhood. The findings show that motherhood is not treated as a social responsibility requiring institutional support, but as a private disruption to productivity. This becomes evident in the testimony about the pregnant student whose group was penalized because "El profesor no aceptó excusas," and in the description of the student-mother whose daily routine began at four in the morning and ended after midnight. These narratives support feminist analyses of care and reproductive labor by showing that academic institutions continue to operate around an unmarked masculine subject: one imagined as fully available, disembodied, and free from care obligations (Lagarde, 1997; Federici, 2012; Buchmann & McDaniel, 2016). Under this model, motherhood appears as deviation, burden, or inefficiency. The findings therefore challenge neutral institutional language, revealing that rules framed as equal often produce unequal effects because they ignore differentiated conditions of embodiment and care.

The discussion of motherhood becomes even more powerful when linked to guilt and moral judgment. One participant recalled a comment that remained painful almost two decades later: "Un profesor hizo un comentario que me dolió muchísimo y que aún me duele," followed by the phrase "Pobres los niños que no conocen madre." This testimony is especially significant because it shows how symbolic violence operates through maternal morality. The attack is not aimed at technical skill but at feminine legitimacy itself. The message is clear: professional presence is read as maternal failure. Even when children are well cared for, the public visibility of women's work can be

turned into a moral accusation. This supports the argument that the deepest penalties against women in STEM are often not technical but ethical-symbolic: women are made to feel that professional ambition steals from their children, their femininity, or their moral worth (Lagarde, 1997; Buchmann & McDaniel, 2016). The consequence is a form of chronic guilt that accompanies success rather than disappearing with it.

The findings also complicate current institutional approaches to inclusion. The participants' narratives suggest that universities and workplaces often mistake access measures or generic welfare support for gender equity. Financial aid, housing subsidies, or the formal rhetoric of equal treatment are not irrelevant, but they are insufficient when the everyday fabric of academic and professional life remains unchanged. This is visible in the accounts of Indigenous women who received material support, yet remained exposed to broader forms of isolation and attrition, and in the post-pandemic dropout described as "*muchas desertaron*." The study therefore suggests that institutional action remains largely procedural rather than transformative. It may open the door, but it does not make the corridor habitable. A truly intersectional response would require mentoring, psychosocial accompaniment, gender-sensitive evaluation practices, explicit anti-harassment routes, and a structural recognition of care burdens and territorial inequalities (Yuval-Davis, 2006; Choo & Ferree, 2010).

The same logic appears in the labor transition. Professional women describe being sent to dangerous areas under the discourse of formal equality, even though the risks they face are not identical to those of their male peers. The testimony "*Nunca me sentí discriminada, me daban el mismo trabajo que a los demás*" is revealing precisely because it shows how low the threshold for non-discrimination has become: being allowed to work is interpreted as equality, even when the conditions of that work depend on paternalistic protection and gender-blind risk structures. The statement about being reassured with "*tranquila, ahí está el conductor*" illustrates a contradiction. The institution does not redesign the environment to make it safe; instead, it informally protects women within a system still built for male norms of mobility and exposure. Here, Choo and Ferree's multilevel approach helps interpret the data: exclusion is not only interpersonal, but institutional and representational, reproduced through rules, assignments, and implicit models of who the legitimate professional is (Choo & Ferree, 2010).

A particularly significant contribution of this study is the recognition of support networks as parallel institutions of survival. The data show that organizations such as IEEE WIE are not experienced as complementary spaces but as crucial refuges where women find recognition, mentoring, and continuity. The testimony "*Tal vez en la universidad no encontré ciertas oportunidades, pero en la red sí las he vivido*" is especially telling. It reveals a fracture between formal institutions that certify women and informal women-led networks that actually sustain them. Likewise, the account "*Estuvimos conversando mucho. Me contó sus dificultades...*" shows how these spaces enable the circulation of situated knowledge and the collectivization of what would otherwise remain individualized suffering (Solórzano *et al.*, 2000). However, the discussion must remain critical: when volunteer networks become the main source of support, institutions are effectively outsourcing care and equity work to women themselves. This means that the emotional and organizational labor required to make STEM habitable is displaced from universities and companies onto the unpaid or under-recognized efforts of women's solidarity networks.

The theme of empowerment must also be interpreted critically. The participants repeatedly invoked identities such as *berracas*, *echadas pa'lante*, *guerreras*, and *valientes*. At first glance, these expressions seem to signal agency and self-affirmation. Indeed, many narratives show a deliberate refusal to accept imposed limits. One participant explained, "*Si me dicen que no puedo, ahí es cuando más quiero demostrar que sí puedo*." Another described solving physically demanding tasks through ingenuity rather than brute force: "*me las ingeniaba con diferenciales y cuerdas para poder hacerlo. Porque de eso se trata, de resolver*." These testimonies demonstrate agency, creativity, and tactical intelligence. Yet the findings also caution against romanticizing these identities. Empowerment here often emerges not from institutional justice, but from sustained exposure to exclusion. It is less the expression of a liberated subject than the adaptive form of a subject compelled to survive in a hostile order (Butler, 1993; Ahmed, 2017).

This is where the notion of "thick skin" becomes analytically central. The study shows that remaining in STEM often requires women to cultivate emotional armor. The testimony "*Te das cuenta de que han tenido que volverse muy duras*" captures that process with precision: hardness is not innate but acquired. It is a response to repeated invalidation,

ridicule, and moral judgment. The cost of that adaptation is high. Thick skin protects against daily injury, but it may also produce isolation, exhaustion, and the impossibility of openly naming harm. In this sense, resilience is ambivalent. It enables endurance, but it can also become the language through which institutions avoid transformation. If women are celebrated for being strong enough to withstand the environment, then the environment itself remains unquestioned. The discussion therefore supports a shift from resilience-centered narratives to habitability-centered ones. The central question should not be how women can become tougher, but how STEM institutions can become less violent (Ahmed, 2017; Segato, 2016).

Overall, the discussion suggests that the main problem is not women's under-adaptation to STEM, but STEM's persistent organization around masculine norms of authority, productivity, communication, and availability. The findings expose the limits of inclusion models that merely invite women into existing structures without transforming those structures. Access without recognition, participation without protection, and visibility without authority do not constitute equity. Rather, they reproduce the condition of women as tolerated exceptions. In this sense, the study argues for a broader rethinking of STEM ecosystems in Colombia: one that links social justice, epistemic justice, and institutional redesign. This includes recognizing care as a structural issue, confronting testimonial injustice, addressing territorial and racial exclusion upstream, and moving beyond symbolic inclusion toward concrete conditions of belonging (Fricker, 2007; Viveros Vigoya, 2016; Choo & Ferree, 2010).

Finally, the findings underscore an ethical and political imperative. It is no longer sufficient to celebrate individual stories of perseverance while leaving intact the institutional arrangements that make such perseverance necessary. The testimonies reveal extraordinary strength, but they also reveal avoidable suffering. A more just approach to women's participation in STEM requires shifting the center of analysis from women's capacity to endure toward institutions' responsibility to transform. Only under that shift can equity move beyond rhetoric and become a material condition of academic and professional life (Ahmed, 2017; Segato, 2016).

5. CONCLUSIONS

This study shows that the experiences of women in STEM in Colombia are shaped by a matrix of domination rather than by gender inequality alone.

Class background, ethnicity, territorial origin, age, nationality, and family roles interact with gender to produce differentiated experiences of access, credibility, participation, and permanence. For this reason, the category "women in STEM" is analytically insufficient unless it is approached intersectionally.

The findings reveal that underrepresentation is only one part of the problem. Equally important are the forms of symbolic and institutional violence that structure everyday life in STEM environments: technical invalidation through humor, communicative control, explicit silencing, the penalization of motherhood, the minimization of harm, and the treatment of care as a private burden. These practices contribute to a professional culture in which women are expected to adapt to dominant norms rather than institutions being required to transform.

The study also demonstrates that institutional support is often weak, fragmented, or displaced onto informal networks. Universities and workplaces frequently fail to provide the mentoring, flexibility, safety measures, or accompaniment needed to sustain women's trajectories under unequal conditions. In this vacuum, organizations such as IEEE and WIE become crucial spaces of refuge, recognition, and continuity. Their importance is undeniable, but their role should not be used to excuse institutional inaction.

At the level of subjectivity, the research identifies a recurring survival logic summarized by the notion of "thick skin." Women develop strength, discipline, and self-assertion, but these qualities are often formed through defensive hardening, chronic fatigue, and solitary coping. What is celebrated as empowerment is too often the ability to endure environments that should have been transformed.

The central implication of the study is therefore ethical as much as analytical. Equity in STEM cannot continue to rest on women's resilience alone. It requires moving from a rhetoric of individual perseverance to a politics of habitability: one that redesigns educational and professional ecosystems so that difference is not merely tolerated, but institutionally supported. In that direction, the study's final reflection points to the value of creating a Colombian Observatory for Women in STEM as a mechanism to document trajectories, monitor institutional practices, strengthen policy design, and support long-term transformation grounded in epistemic and social justice.

REFERENCES

- Ahmed, S. (2017). *Living a feminist life*. Duke University Press.
- Ángel Rodríguez, A. D., González Mora, A., & Gómez Vargas, M. (2023). The woman in the STEM field from an intersectional perspective: ECCI University. En 3ra Multiconferencia Internacional LACCEI sobre Emprendimiento, Innovación y Desarrollo Regional (LEIRD 2023) (pp. 1-12). LACCEI. <https://doi.org/10.18687/LEIRD2023.1.1.633>
- Anzaldúa, G. (1987). *Borderlands/La Frontera: The new mestiza*. Aunt Lute Books.
- Bonino, L. (2004). *Micromachismos: La violencia invisible en la pareja*. Cátedra.
- Bourdieu, P. (1996). La dominación masculina. *Revista de Estudios de Género, La Ventana*, (3), 1-95.
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77-101. <https://doi.org/10.1191/1478088706qp063oa>
- Buchmann, C., & McDaniel, A. (2016). Motherhood and the wages of women in professional occupations. *RSF: The Russell Sage Foundation Journal of the Social Sciences*, 2(4), 128-150.
- Butler, J. (1988). Performative acts and gender constitution: An essay in phenomenology and feminist theory. *Theatre Journal*, 40(4), 519-531.
- Butler, J. (1990). *Gender trouble: Feminism and the subversion of identity*. Routledge.
- Butler, J. (1993). *Bodies that matter: On the discursive limits of "sex"*. Routledge.
- CEPAL. (2020). *La sociedad del cuidado: Horizonte para una recuperación sostenible con igualdad de género*. CEPAL.
- Choo, H. Y., & Ferree, M. M. (2010). Practicing intersectionality in sociological research: A critical analysis of inclusions, interactions, and institutions in the study of inequalities. *Sociological Theory*, 28(2), 129-149. <https://doi.org/10.1111/j.1467-9558.2010.01370.x>
- Collins, P. H. (2000). *Black feminist thought: Knowledge, consciousness, and the politics of empowerment* (2nd ed.). Routledge.
- Collins, P. H., & Bilge, S. (2021). *Intersectionality*. Polity Press.
- Nota:** en la sección de referencias recuperada aparece 2020/2019 en un archivo y 2021 en otro; dejo 2021 porque así está citado en el texto.
- Correll, S. J., Benard, S., & Paik, I. (2007). Getting a job: Is there a motherhood penalty? *American Journal of Sociology*, 112(5), 1297-1338. <https://doi.org/10.1086/511799>
- Creswell, J. W., & Poth, C. N. (2018). *Qualitative inquiry and research design: Choosing among five approaches* (4th ed.). SAGE.
- Crenshaw, K. (1993). Demarginalizing the intersection of race and sex. *University of Chicago Legal Forum*, 1989(1), 139-167.
- Denzin, N. K., & Lincoln, Y. S. (2011). *The SAGE handbook of qualitative research* (4th ed.). SAGE.
- Dotson, K. (2011). Tracking epistemic violence, tracking practices of silencing. *Hypatia*, 26(2), 236-257.
- Federici, S. (2012). *Revolution at point zero: Housework, reproduction, and feminist struggle*. PM Press.
- Fricker, M. (2007). *Epistemic injustice: Power and the ethics of knowing*. Oxford University Press.
- Gadamer, H.-G. (2001). *Truth and method* (J. Weinsheimer & D. G. Marshall, Trans., 2nd rev. ed.). Continuum.
- Guba, E. G., & Lincoln, Y. S. (1989). *Fourth generation evaluation*. SAGE.
- Instituto Internacional de la UNESCO para la Educación Superior en América Latina y el Caribe (IESALC). (2021). *La ventaja femenina en la educación superior: ¿Una paradoja mundial?* UNESCO IESALC.
- Lagarde, M. (1997). *Los cautiverios de las mujeres*.
- Nadeem, M. (2019). El debate sobre la minimización de la subjetividad en los estudios de género: Un análisis crítico. *Revista Internacional y Multidisciplinaria de Ciencias Sociales*, 8(2), 164-187. <https://doi.org/10.17583/rimcis.2019.4134>
- Quijano, A. (2000). Coloniality of power, eurocentrism, and Latin America. *Nepantla: Views from South*, 1(3), 533-580.
- Riessman, C. K. (2008). *Narrative methods for the human sciences*. SAGE.
- Romaine, S. (2007). *Language in society: An introduction to sociolinguistics* (3rd ed.). Oxford University Press.
- Segato, R. (2003). *Las estructuras elementales de la violencia: Ensayos sobre género entre la antropología, el psicoanálisis y los derechos humanos*. Universidad Nacional de Quilmes.
- Segato, R. (2016). *La guerra contra las mujeres*. Traficantes de Sueños.
- Solís Calvo, A. M. (2021). *Mujeres docentes, formación profesional y condición laboral: Análisis interseccional en la Universidad Pedagógica Nacional* [Tesis doctoral, Universidad de Alicante; Universidad de

- Ciencias y Artes de Chiapas].
- Solórzano, D. G., Ceja, M., & Yosso, T. J. (2000). Critical race theory, racial microaggressions, and campus racial climate: The experiences of African American college students. *The Journal of Negro Education*, 69(1/2), 60-73.
- Spivak, G. C. (1988). Can the subaltern speak? En C. Nelson & L. Grossberg (Eds.), *Marxism and the interpretation of culture* (pp. 271-313). University of Illinois Press.
- Verdugo, C. S. (2022). La brecha de género en los estudios universitarios del sector STEM en el espacio español de educación [Tesis, Universidad de Salamanca].
- Viveros Vigoya, M. (2016). La interseccionalidad: Una aproximación situada a la dominación. *Debate Feminista*, 52, 1-17. <https://doi.org/10.1016/j.df.2016.09.005>
- Viveros Vigoya, M. (2023). *El género en disputa: Intersecciones, desigualdades y políticas* (2.^a ed. ampliada). Siglo XXI Editores.
- Yuval-Davis, N. (2006). Intersectionality and feminist politics. *European Journal of Women's Studies*, 13(3), 193-209. <https://doi.org/10.1177/1350506806065752>