

Beyond a Single Name: PVEST and Intersectionality in Multilingual Women's Identity Formation in a U.S. Mathematics Ph.D. Program

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The experiences of multilingual women in U.S. mathematics Ph.D. programs are shaped by intersections of language, race, gender, and nationality. This narrative inquiry examines the identity formation of three women from Korea, Colombia, and Mexico, employing a combined framework of intersectionality and Phenomenological Variant of Ecological Systems Theory (PVEST). Findings identify three distinct pathways: the carryover of prior gendered invalidation, leading to impostor syndrome despite high commitment; context-dependent coping across bilingual ecologies; and the consolidation of an advocacy identity in a more protective environment. Theoretically, the study extends PVEST to Asian and Latin populations and clarifies a dual-function coping mechanism where strategies can be both adaptive and costly. Findings call for strengthening protective factors and identity-inclusive instructional designs in mathematics education is necessary to support this growing student population.

Keywords: Multilingual, PVEST, Intersectionality, Narrative Inquiry

Multilingual students constitute a significant portion of post-secondary mathematics classrooms (Data USA, n.d.). Recent research has begun to examine their experiences, although much of this valuable work has focused on multilingual students under a single name (e.g., Hwang et al., 2022; Rios, 2022, 2024). While this research has provided important insights, there remains an opportunity to explore how these multilingual students enter classrooms with diverse backgrounds and multiple social identities—including but not limited to race, gender, and nationality—that intersect in complicated ways (Hwang, 2023; Leyva & Joseph, 2023; Rios, 2022, 2024). These identities do not operate independently. They interact with one another and with students' multilingual status to create distinct lived experiences (Hwang, 2023). Although analyses examining single identity categories are informative, they may not fully capture the specific challenges that emerge from these intersections (Hwang, 2023; Leyva & Joseph, 2023; Rios, 2024). That is, there remains potential to further understand how students interpret experiences, navigate challenges, and develop their identities in mathematics education.

This study builds on existing work by examining the lived experiences of three multilingual women in a mathematics Ph.D. program: Helena, Jihyun, and Maria (pseudonyms). To analyze these stories, I adopt narrative inquiry, which focuses on how individuals make sense of their lived experiences (Clandinin & Connelly, 2000; Connelly & Clandinin, 1990; Polkinghorne, 1995). Within this approach, I employ a theoretical framework combining intersectionality (Crenshaw, 1991) and Phenomenological Variant of Ecological Systems Theory (PVEST; Spencer et al., 1997; Spencer, 2006). In this study, intersectionality is used as a lens to analyze how students' multiple social identities create unique structural contexts (Crenshaw, 1991; Gholson & Martin, 2019; Graham, 2022; Leyva, 2016; Leyva et al., 2022). PVEST then provides a framework to analyze how each student interprets and reacts to their experiences within that context, leading to the formation of their emergent identities (Spencer et al., 1997; Spencer, 2006; Velez & Spencer, 2018). Following the PVEST framework, I view identity as dynamic and contextually situated, emerging through the navigation of challenges arising from one's intersectional positions (Spencer, 2006; Velez & Spencer, 2018).

This study addresses the following research questions:

1. How do intersecting identities (language, race, gender, nationality) shape each student's lived experiences and stressors?
2. How does the five-stage PVEST model explain the processes through which each student copes with stress to form an emergent identity?
3. What do the narratives of these three students reveal about their life-stage specific outcomes?

Theoretical Framework

Intersectionality

I use intersectionality to analyze the structural context that shapes each student's experience. Emerging from Black feminist scholarship, intersectionality explains how interlocking systems of power—such as racism, sexism, and nationalism—create unique contexts of oppression and privilege (Crenshaw, 1991; Leyva, 2016). This lens is critical for this study because it moves beyond analyzing single identity categories in isolation and instead focuses on how their convergence shapes a person's lived reality.

For the multilingual women in this study, their positioning in U.S. higher education often frames them through a deficit lens as 'non-native English speakers.' I intentionally use the term 'multilingual' to recognize the linguistic resources these students possess, but it is the societal label of 'non-native' that often forms part of their structural reality that privileges English. This label intersects with their identities as women and as Latina or Asian, creating a unique structural context where linguistic ability can be conflated with intellectual competence (Leyva & Joseph, 2023). Intersectionality provides a tool for examining how these overlapping systems shape students' experiences.

Table 1. The Five Stages of the PVEST Model (Spencer, 2006).

Stage	Explanation
Net Vulnerability	The balance or imbalance of risks (e.g., social stereotypes, discrimination) and protective factors (e.g., educated family, role models)
Net Stress Engagement	The balance or imbalance between stressors (i.e., actual experiences of challenge) and available supports
Reactive Coping Methods	Problem-solving strategies an individual uses to manage the stress they are experiencing. These can be adaptive or maladaptive.
Emergent Identities	The stabilization of repeatedly used coping strategies into a predictable, yet fluid, pattern of response that forms an aspect of one's identity—how individuals perceive themselves within their context.
Life-Stage Specific Coping Outcomes	Resulting behaviors and outcomes of an emergent identity, which can be productive (e.g., academic achievement, well-being) or unproductive (e.g., psychological distress, dropout)

Phenomenological Variant of Ecological Systems Theory (PVEST)

To analyze how students navigate their experiences shaped by intersectionality, I use PVEST (Spencer et al., 1997; Spencer, 2006; Velez & Spencer, 2018). PVEST models how individuals form identities through a cyclical process that begins with *Net Vulnerability*, and is followed by *Net Stress Engagement*, *Reactive Coping Methods*, *Emergent Identities*, and *Life-Stage Specific Coping Outcomes*. Table 1 summarizes each stage.

These stages are not linear but cyclical. One's subjective interpretation of a challenge shapes their reactive coping method. When the person feels a particular coping method is producing desirable results, that coping method stabilizes into an emergent identity. This identity then leads to life-stage specific coping outcomes that create a feedback loop, altering the students' initial net-vulnerability for the next cycle of stress engagement (Spencer, 2006). In this study, the model allows me to trace how each student's net vulnerability translates into their emergent identity.

Method

In this study, I employ a qualitative research design using narrative inquiry, a methodology that focuses on understanding one's lived experiences through what they tell (Clandinin & Connelly, 2000; Connelly & Clandinin, 1990; Polkinghorne, 1995). This approach was chosen because it allows for an in-depth exploration of how participants make sense of their lives and construct their identities over time. The focus on subjective, lived experience aligns with the phenomenological perspective of PVEST, which argues that an individual's perception of events is central to their development. In this study, narrative inquiry provides the method to access and understand these phenomenological processes.

Researcher Positionality

As the researcher, I share several social identities with the participants. I am a Korean woman who received her K-16 education in Korea and is now a multilingual international student in a U.S. mathematics education Ph.D. program. My own experiences with linguistic challenges and feelings of incompetence have shaped my interest in this topic. This shared positionality helped build rapport and trust with the participants, which allowed for more open sharing of their stories. At the same time, I was mindful of my tendency to attribute my own challenges to personal deficits. Throughout the research process, I engaged in reflexivity to avoid imposing this deficit perspective on the participants' experiences and instead sought to understand the broader context of their stories.

Participants and Data Collection

The participants for this paper—Maria, Helena, and Jihyun—were first-year Ph.D. students in mathematics at a large Midwestern university in the U.S. All are multilingual international students whose K-12 education was primarily not in English. Maria is from Mexico, Helena is from Colombia, and Jihyun is from Korea. All names are pseudonyms.

I collected data in three stages to capture each participant's experiences: Participants first wrote an autobiography, "Me and Math: My relationship with mathematics up to now," about their relationship with mathematics based on the idea from Di Martino & Zan (2010). After that, I conducted one 60–90 minute semi-structured interview with each participant to explore events from their autobiography in more detail and to ask further questions. Lastly, a series of follow-up interviews was conducted via email or shared documents, allowing participants time to reflect on their responses.

Data Analysis Procedures

The data analysis was conducted in two main phases: narrative construction and theoretical cross-case analysis, respectively, narrative analysis and analysis of narrative according to Polkinghorne (1995). I first analyzed the collected data to construct a first-person narrative for each participant. This process involved coding for specific experiences, identifying themes, and organizing them into a plot. Each constructed narrative was then sent to the participant for member checking to ensure the representation was fair and accurate. In the second phase, the finalized narratives of Helena, Maria, and Jihyun were treated as the data for a cross-case analysis. I applied the theoretical frameworks of Intersectionality and PVEST to this data. First, I used intersectionality to analyze how each participant's intersecting social identities shaped their experiences. Then, I used the PVEST 5-stage model to analyze the process of identity formation for each student, tracing how their different backgrounds led to different vulnerabilities, stressors, coping methods, emergent identities, and life-stage specific coping outcomes.

Findings

This section presents the analysis of each participant's narrative. The order of cases presented here demonstrates three key mechanisms through which contexts influence emergent identity: how past environments become internalized and continue to shape coping methods, how individuals navigate multiple environmental demands, and how environment transitions can catalyze emergent identities.

Jihyun: “I decided to study science harder and show that I could do better than these boys”

Jihyun's story shows how gendered invalidation from earlier schooling can continue to shape her academic experience. As a Korean woman in a U.S. mathematics Ph.D. program, her current academic experience is shaped by a worry about being perceived as incompetent, which is rooted in sexist treatment from her past educational experience in Korea.

Her net vulnerability combines significant risks from past trauma with current pressures from the model minority myth demanding mathematical excellence for Asians. The following is one of the quotes from the narrative that shows her experience of sexism.

.. [a] teacher in that class said something like, “A girl makes the water cloudy [translated from Korean saying],” which is similar to “A rotten apple (=a girl = me) spoils the whole barrel” in English. I decided to study science harder and show that I could do better than these boys.

Jihyun described that such experiences contributed to her perfectionism. In addition to those risks, she felt pressured to meet the standard based on the model minority myth: “Sometimes I feel I am representing Koreans... If I do something wrong... I am afraid they would think every Korean is neither good at mathematics nor nice.” At the same time, she wanted to contest the common bias that “Asians are not good at English.” These pressures are internalized and shape her net stress engagement and reactive coping methods.

After moving to the U.S., she faced a different environment where lectures were rapid in English and on-the-spot participation and responses were normative. Combined with the vulnerability that she had, in response, she monitored and censored herself (e.g., “I need to think at least three times before I verbally say something” or “I try to erase my Korean accent”). At the same time, she found some strategies, such as relying on written materials rather than verbal conversations.

These repetitive coping methods have been stabilized as a commitment-centered identity (i.e., “Mathematics is my life. Mathematics is who I am.”) while retaining imposter syndrome.

As life-stage outcomes, she retained high achievement as a trade-off for greater cognitive load and self-doubt. However, there was an important advance: she discussed her imposter syndrome and concerns about English with her advisor, and the advisor agreed to provide some support, which would increase protections and hopefully reconfigure net vulnerability in the next cycle.

Helena: “Don’t get me wrong. I am glad that I speak English, but Spanish is my language.”

Helena’s story illustrates context-dependent coping across multilingual ecologies: how she adapts by strategically using Spanish as the language of her inner world and community, while treating English mainly as a professional tool. She is a Colombian Ph.D. student in mathematics in the U.S. Helena’s net vulnerability is relatively low due to strong protective factors, including a supportive cohort, Spanish-speaking Latina roommates, and a Catholic community, which buffers the linguistic risks she faces as a multilingual student. Her net stress engagement is situational: stress spikes when comprehension depends on real-time oral English, such as fast speech, unfamiliar accents, multi-party talk, which makes it more challenging; but in mathematics, it is buffered by written channels, such as notation, boardwork, and slides.

Helena employs two distinct reactive coping methods depending on the context. Within her cultural community, she finds emotional regulation and strength, stating, “having Latinas around me and speaking Spanish with them is important to me.” In academic settings, she uses a different but equally adaptive strategy to manage cognitive load and stress: choosing to be quieter. Her statement, “I tend to be quieter in English than in Spanish,” reflects a strategic choice to conserve energy and avoid the high stakes of real-time verbal processing in a second language. The stabilization of these context-dependent coping methods results in an emergent identity that is confident and leading in Spanish-speaking contexts but more reserved in English-speaking academic ones.

Her life-stage specific coping outcomes are currently productive, marked by successful adaptation to her first year. However, a potential challenge arises from the interplay between her adaptive coping (being quieter in English) and future professional demands. Her anxiety about teaching—“I am scared that I am not explaining myself well”—reveals a potential unproductive outcome. The issue is not that her coping strategy is deficient, but that a strategy that is highly adaptive for learning may not be sufficient for the demands of teaching, highlighting a tension she must navigate in the next cycle.

Maria: “I know the answer, but why I don’t have the courage to raise my hand and say it?”

Maria’s narrative illustrates how a supportive new environment can facilitate the transformation of an identity shaped by past intellectual suppression, as evidenced by her experiences in Mexico and the U.S. As a Mexican woman in a U.S. Ph.D. program, she works to overcome earlier invalidation coming from her gender and redefine her place in mathematics.

Maria carried a risk of gendered invalidation in her undergraduate studies in Mexico. In Mexico, as the only woman in the cohort, her contributions were often ignored (e.g., “Maria got a good grade because the professor just gave it to her,” or “Maria did well on the exam because her exam was easier than ours”). The silence of peers, as she noted, “none of the other classmates said anything,” reinforced the isolation. In response, she developed a reactive coping method that was twofold: she used silence as a protective strategy while internally reframing her struggle into a purpose. She came to see her persistence in mathematics as necessary “for a woman to be represented in this profession,” believing she had been “breaking the stereotype and making it possible for another woman” in her hometown. This sense of purpose became an emergent identity that she carried into her next academic environment.

When she moved to the U.S., the new environment with a cohort of six other women served as a protective factor. While this supportive community reduced her net vulnerability, she still faced academic stressors. Despite her fluency in English, the rapid pace and accents of U.S. classroom communication were challenging. In response, she developed coping methods such as relying on mathematical symbols and written work rather than verbal participation. Despite some challenges, the supportive social context provided the safety needed for the emergent identity she had begun to build in Mexico, as an advocate for women in mathematics, to be validated and reinforced. This validation led to productive life-stage-specific coping outcomes. She successfully passed her qualifying exams and now feels a sense of belonging. This success could serve as a new protective factor, reducing her net vulnerability for the next cycle.

Across these three cases, this paper presented how past environments, present supports, and transitional contexts interact with students' identities in distinct ways. Together, these narratives demonstrate the mechanisms of PVEST in practice—how vulnerabilities are internalized, how coping strategies stabilize, and how emergent identities take shape.

Discussion

This study analyzed the narratives of three multilingual women in a mathematics Ph.D. program to understand how their social identities intersectionally shape their emergent identities in the U.S., a different context from their home countries. Across cases, real-time English discourse demands, such as pace, accent/intonation, and multi-party talk, were common, yet their meaning and impact differed: Jihyun carries forward legacies of gendered invalidation under a model-minority myth, increasing her worries about evaluation; Helena navigates a split present—socially well supported while academic English remains demanding; Maria's move into a more protective environment enables the consolidation of a purpose to represent women in mathematics.

PVEST clarifies how these vulnerabilities become integrated into identity through a cycle of stress, engagement, developing coping methods, and stabilization of those coping methods. Through their coping methods, Jihyun developed an identity committed to mathematics with imposter syndrome, Helena developed an identity responsive to bilingual contexts, and Maria developed an identity as an advocate for women in mathematics. The density and fit of protections influenced these trajectories towards identities and more or less productive life-stage specific outcomes. For instance, Maria's supportive cohort reinforced her advocacy, while targeted supports for Helena and Jihyun showed the potential to reconfigure their net vulnerability for current or future challenges. Across these cases, protective factors were powerful enough to change the direction of each student's academic and personal journey.

This study's findings make four theoretical contributions to the literature on the identity development of multilingual students. First, this study provides an empirical demonstration of PVEST's applicability to Asian and Latin students in mathematics education, extending the framework beyond its primary application. While PVEST offers a lens for understanding identity formation in context (Spencer et al., 1997; Spencer, 2006), its use in mathematics education has predominantly focused on the experiences of the Black community (e.g., Graham, 2022; Gholson & Martin, 2019). This study contributes to the understanding of the framework's usefulness for other marginalized populations, illustrating how the interaction of risks, supports, and coping mechanisms also shapes the identity processes of multilingual Asian and Latin women.

Second, this research provides an empirical demonstration of intersectionality and PVEST. In this study, intersectionality explains what constitutes each student's unique net vulnerability (Velez & Spencer, 2018). It reveals that the experience of multilingual students is not

monolithic, but rather a specific structural position created by the intersection of language, gender, race, and national origin. PVEST, in turn, explains how students navigate these structural realities (Velez & Spencer, 2018). It traces the process through which their specific vulnerabilities are linked to reactive coping methods—such as Jihyun’s perfectionism, Helena’s strategic silence in English, and Maria’s reframing of challenges—which then stabilize into their Emergent Identities (Spencer et al., 1997; Spencer, 2006).

Third, this research empirically clarifies the complex mechanisms underlying core PVEST concepts. While PVEST is a non-deterministic framework that anticipates diverse and nuanced outcomes (Spencer, 2006), Jihyun’s case provides an example of this principle by demonstrating a clear dual-function mechanism. Her perfectionism is adaptive, producing the desired productive outcome of high academic achievement. At the same time, the same strategy can be mentally draining, causing negative effects like self-censorship and imposter syndrome. By explaining this complex process in detail, this research extends beyond theory to provide an empirical account of how a single coping method can simultaneously lead to both positive and negative outcomes.

Finally, this study contributes to the understanding of the role of ecological transitions in identity development. Maria’s case shows that a supportive new environment does not just create a new identity. Instead, it can serve as a space to validate and reintegrate a resilient identity that was already developed in response to a previous hostile environment. This finding highlights the interplay between individual agency—Maria’s prior efforts to reframe her struggle into a mission—and structural support. It suggests that environments serve as catalysts that can unlock and reinforce the potential of an identity already in progress.

The findings from this study call for attending to students’ complicated cognitive and affective efforts and challenges that are not visible behind high achievement. Additionally, it is essential to acknowledge students’ plural ecologies, recognizing that they may have developed different identities across various contexts. This implies that mathematics educators must devise strategies to help students integrate their positive identities into the mathematics classroom. To achieve this goal, it is important to enhance protective factors, such as having mentors and peers from similar backgrounds, and provide opportunities for developing and utilizing various coping methods, including instructional designs that adjust pacing, promote multi-channel communication, and structure equitable participation (Hwang et al., 2022; Rios, 2022, 2024).

Conclusions

This study analyzed the identity formation of three multilingual women in graduate mathematics by integrating intersectionality and PVEST. The findings traced three distinct pathways: the carry-over of past hostility (Jihyun), the navigation of a split ecology across social and academic contexts (Helena), and the consolidation of identity through a protective transition (Maria). Theoretically, the study extends PVEST’s application to Asian and Latin women in mathematics education, specifies the dual-function nature of coping mechanisms, and highlights the role of ecological transitions in reinforcing identities.

As this narrative inquiry captures a snapshot of their lived experiences at the time of data collection, their identities are likely to have continued evolving in subsequent PVEST cycles. This temporal limitation, along with the researcher’s own positionality as a Korean multilingual woman, shaped the scope and interpretation of the findings. Recognizing these aspects, future research should test the mechanisms identified here across multiple sites and over longer time scales.

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