COMMUNITY CULTURAL WEALTH OF A MULTILINGUAL INTERNATIONAL STUDENT IN AN INQUIRY-BASED UNDERGRADUATE MATHEMATICS COURSE

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This paper examines the community cultural wealth (CCW) mobilized by Johan, an international, multilingual undergraduate student from Malaysia, as he participated in an inquiry-based mathematics course at a U.S. university. Drawing on Yosso's (2005) CCW framework, this paper presents an empirical counterstory that makes visible the linguistic, spiritual, social, navigational, aspirational, and resistance capital Johan leveraged in response to English-dominant and verbally oriented participation norms. This study extends CCW research into undergraduate mathematics education by illustrating the labor required to persist in inquiry-based classrooms that are often assumed to be equitable.

INTRODUCTION

Undergraduate mathematics instruction is increasingly shifting toward inquiry-based approaches that emphasize whole-class and small-group discussions and the collective construction of mathematical ideas (Laursen & Rasmussen, 2019). Research suggests that such approaches are more beneficial overall for student learning than traditional lecturing (Freeman et al., 2014). However, emerging research indicates that inquiry-based approaches may not be equitable for all students. For example, Johnson et al. (2020) found that inquiry-oriented abstract algebra benefited some student groups more than others, raising concerns that participation structures and classroom norms may disadvantage certain students.

Given the centrality of student communication in inquiry-based undergraduate math classrooms, it is important to examine how multilingual students experience and navigate these learning environments. This examination is especially relevant as undergraduate mathematics classrooms become increasingly linguistically diverse while English remains the dominant language of instruction in higher education in the USA. Math education research has challenged the longstanding assumption that mathematics is neutral or color-blind, demonstrating instead that mathematics learning is deeply connected to students' identities, histories, and sociopolitical contexts (Gutiérrez, 2013). This relationship is especially consequential for multilingual students whose primary language differs from the language of instruction, as their experiences often lie at the intersection of language, immigration, and other marginalized identities (Rios, 2023).

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Asset-based frameworks such as Community Cultural Wealth (CCW; Yosso, 2005) offer analytic tools for examining how marginalized students draw on multiple forms of capital to navigate educational contexts. While CCW has been used to highlight the resources marginalized students bring to undergraduate STEM classrooms more broadly, relatively little research has examined how CCW operates specifically within inquiry-based undergraduate mathematics courses. Existing undergraduate studies often emphasize persistence and achievement outcomes in STEM (e.g., Cortes, 2017; Dika et al., 2017), with fewer analyses attending to how classroom interactional norms shape students' everyday experiences and participation.

This study addresses this gap by presenting an empirical case study of Johan, an international multilingual undergraduate student enrolled in an inquiry-based math course. By foregrounding Johan's lived experiences, this paper illustrates how CCW can be used to analyze the forms of cultural capital that multilingual students mobilize to navigate and persist in inquiry-based undergraduate mathematics classrooms.

FRAMEWORKS

Theoretical Frameworks: Critical Race Theory and Latinx Critical Race Theory

This study is grounded in Critical Race Theory (CRT), which examines how race and racism shape educational contexts and experiences (Ladson-Billings & Tate, 1995). Latinx Critical Race Theory (LatCrit) builds on CRT to consider the intersection of race and racism with other forms of subordination, such as language, immigration, and religion (Solórzano & Delgado Bernal, 2001).

Analytical Framework: Community Cultural Wealth (CCW)

Building on CRT and LatCrit, Yosso's (2005) CCW framework identifies multiple forms of capital—aspirational, familial, linguistic, navigational, social, and resistance—that marginalized students draw upon within educational systems not designed for them. *Aspirational* capital refers to the ability to sustain hopes and goals for the future despite structural barriers in education, while *familial* capital encompasses the cultural values and ways of being learned within families that shape students' orientations toward learning. *Linguistic* capital consists of the resources developed through using multiple languages or communicative practices to make meaning, and *navigational* capital describes the ability to maneuver through educational institutions not designed to support one's identities. *Social* capital involves the peer relationships and networks that provide support and access to learning, and *resistance* capital refers to the knowledge and practices used to recognize and challenge inequitable schooling structures. These forms of capital are not discrete or exhaustive; rather, they overlap and interact to illustrate the assets students bring into learning environments.

Drawing on the CCW framework, this analysis is guided by the following research question: *What forms of cultural capital are mobilized by an international, multilingual undergraduate student in an inquiry-based mathematics course?*

METHODS

The data came from a larger research project that investigated the language demands and language resources shaping multilingual students' participation in inquiry-based undergraduate mathematics courses. The study was situated in an undergraduate inquiry-oriented linear algebra (IOLA) at a research university in the southwestern USA. The course was taught by an expert inquiry-based instructor who identified as a White monolingual English speaker. Inquiry-based instruction emphasized small group discussions and whole-class discussion as central modes of participation.

The data for the larger project consisted of classroom observations of the inquiry-based course as well as semi-structured interviews with multilingual students from the course. All interviews were fully transcribed. The interviews were not designed with CCW as its primary analytical framework; rather, they focused on identifying lexico-grammatical, situational, and normative language demands emerging in inquiry-oriented instruction, as well as the resources students and instructors mobilized in response.

This paper focuses on a 2-hour semi-structured interview with one international, multilingual student, Johan (pseudonym). Johan was from Malaysia and identified as a Muslim man. At the time of the study, Johan was a third-year undergraduate student majoring in Software Engineering and was beginning his third year in the USA. In a screening survey, he self-reported his English language proficiency as less than native proficiency. A secondary analysis of Johan's interview data was conducted using the CCW framework to examine how Johan's experiences could be understood in terms of the cultural capital he drew upon while navigating the language demands induced by the inquiry-based course.

The interview transcript data was analyzed using a 2-cycle approach that combined deductive and inductive coding (Miles et al., 2014). In the first cycle, the data was examined using a set of a priori codes drawn from the CCW framework, with attention to how different forms of cultural capital appeared in Johan's account of his classroom experiences. This phase of the analysis revealed that Johan mobilized the following forms of capital from the original CCW categories: Aspirational, linguistic, navigational, social, and resistance capital. While there was no evidence of familial capital, this absence does not suggest that Johan lacked that form of capital; rather, the study's original design did not intentionally seek to capture resources beyond language. Given this limitation, the emergence of all other forms of capital is significant.

In the second cycle, the transcript was revisited to allow for new categories to emerge from the data, particularly those that were not fully captured by the initial CCW categories. This round of analysis revealed a new form of capital: spiritual capital—the knowledge, values, and practices rooted in a spiritual or religious identity. Although not explicitly included in the original CCW framework, spiritual capital surfaced in meaningful ways for Johan, as will be illustrated in the Results section.

Consistent with CRT, LatCrit, and CCW, a counterstory methodology (Solórzano & Yosso, 2002) is used to center Johan's voice and experiences. Counterstories challenge dominant narratives by positioning students' experiences as legitimate sources of knowledge and by exposing the racialized and linguistic assumptions embedded in schooling practices. This analysis exposes systemic barriers induced by the inquiry-based course in a U.S. context, and it focuses on the forms of capital that Johan brought to the math classroom despite or in response to those barriers.

RESULTS: JOHAN'S COMMUNITY CULTURAL WEALTH

Spiritual Capital

Johan's Muslim identity functioned as a central form of spiritual capital, shaping how he interpreted classroom norms, positioned himself in relation to authority, and evaluated appropriate participation in academic spaces. He explicitly connected his religious identity to Islamic intellectual traditions in mathematics: "Because I'm a Muslim and al-Khwarizmi is a Muslim… in our country, it's like the smart people of Islam." More significantly for classroom engagement, Johan described how Islamic values informed his expectations for respectful teacher–student relationships in the IOLA class:

> In Islam, we prioritize our relationship with the teacher very very high… you are not supposed to raise your voice, or interrupt when they are speaking… So, in Malaysia (a majority-Muslim country), if you do that, you're dead! But I saw like few students did that in the (IOLA) class.

However, he saw students violating these expectations in the IOLA classroom. He reported initially describing these students as being rude to the instructor, and feeling very emotionally disturbed about it.

Over time, Johan came to interpret these interactions as cultural differences rather than intentional disrespect, noting, "So I'm like, 'Oh, maybe the culture is different, maybe for them it's not rude and for me it's rude.'" These interactional practices aligned with forms of dialogic communication commonly associated with inquiry-based instruction; however, in the absence of explicitly articulated classroom communication norms, Johan reported that it took nearly a quarter of the course for him to recognize and make sense of these differences in student engagement.

The IOLA class—as enacted—operated within a predominantly secular framework that did not explicitly account for religiously informed norms of participation. While U.S. public education may appropriately avoid privileging any religion, inattention to students' religious identities can inadvertently marginalize students whose values meaningfully shape how they learn and participate. In Johan's case, his faith-informed restraint and reduced vocal participation risked being misrecognized as disengagement or lack of competence. Johan's spiritual capital thus functioned as a resource for moral interpretation, meaning-making, and endurance, allowing him to remain committed to learning mathematics while maintaining his identity as a Muslim student.

Linguistic Capital

The Johan brought a rich multilingual repertoire to the classroom, including Malay, English, Arabic, and Japanese, each used for distinct purposes across educational, cultural, and religious contexts. He described a flexible bilingual instructional environment in Malaysia: "In Malaysia, we teach in English. Then if there's confusion, then only we speak in Malaysian." This linguistic flexibility allowed English to function as the language of formal instruction, while Malay supported clarification and efficiency. Johan demonstrated strong metalinguistic awareness when he noted: "Something that is expressed in English in 15 words can be expressed in two words in my language."

In contrast, the IOLA emphasized English-only participation, limiting Johan's ability to draw on his full linguistic repertoire. When asked to rate the difficulty of participating in the course, Johan stated: "If I rate one to ten with one being easy and ten being difficult, I will put it around eight." Johan's explanations indicate that this difficulty was closely tied to language and communication demands:

> Because first I need to communicate with other people which I don't like, unless it is in my language, because I'm all fluent and something, you know, just like you say, when you want to talk, you want to express this thing, but you can only express it in your language and the meaning won't get delivered if you say it in English.

In addition, Johan described suppressing Arabic in public spaces due to fear of discrimination: "I just choose not to [speak Arabic] here… to avoid discrimination… people associate Arabic with Islamophobia." Thus, Johan's linguistic capital functioned within a hierarchized language environment in which English was privileged and Arabic carried social risk. His multilingualism remained an asset, but only through sustained, invisible labor required to navigate linguistic hegemony and ensure both meaning and safety.

Social Capital

Johan's social capital emerged most clearly through his working relationship with Nam (pseudonym), another multilingual student whose preferred modes of communication and learning aligned closely with Johan's own. Rather than relying on frequent verbal exchange, Johan and Nam collaborated primarily through writing, symbolic representation, and comparison of solutions.

Johan contrasted this relationship with interactions dominated by verbal participation: "Nam, I think, just like me, symbol… Kaden (pseudonym) becomes dominant because verbal. And Nam and me, it's like we get overshadowed… It's like when somebody is talking, our ideas become hidden." With Nam, Johan described a writing-centered form of collaboration: "With Nam, it's easy for me… I show answer. Then he's like, 'Oh, show answer.' Then we compare. Why this? Why this? Because this is logic."

His social network with Nam allowed Johan to participate without the real-time linguistic demands of English-dominant talk. However, as noted in the quote above,

Johan also noted that writing-based contributions were often rendered invisible in verbally dominated group settings. Thus, Johan's social capital was situated and relational, enabling engagement while simultaneously exposing how inquiry-based norms privileged vocal participation over alternative communicative forms.

Navigational Capital

Johan demonstrated navigational capital through a constellation of strategies referenced across other CCW categories, including managing religious visibility, aligning with peers who valued writing, and drawing on metalinguistic awareness. In addition, Johan described specific actions taken to navigate classroom discourse and access instruction.

He explained that reading and writing were easier for him than processing spoken English in real time: "Reading is easier than listening… speaking, I need to remember on the spot to find the key point." To better access written communication from the instructor, Johan physically repositioned himself in the classroom: "I always make sure my surface is facing towards the whiteboard… I rotate the chair so that I can see and hear better." He also attended to when participation was expected in order to engage appropriately: "I noticed Professor… will ask at the end, 'Do you have any questions?' So just wait until she say that." These strategies illustrate navigational capital as active, ongoing adaptation, rather than passive compliance.

Aspirational Capital

Johan's aspirational capital was evident not only in his persistence despite marginalization, but also in his instrumental engagement with English-dominant expectations as a means of achieving his academic and professional goals. Although Johan consistently expressed discomfort with English-dominant, verbally oriented participation norms, he also recognized English as unavoidable in his U.S. university context and demonstrated a readiness to engage with it when necessary.

When asked what language he believed he should speak in class, Johan stated plainly: "English." He further acknowledged that English dominance in the classroom was not ideal for him, but nonetheless something he chose to accept as part of pursuing his education: "I would say, yeah. Not ideal, but it cannot be avoided. I have to read in English, it's how I see." This acceptance reflects aspirational capital not as preference, but as strategic orientation toward long-term goals. Johan's willingness to engage in English extended beyond passive acceptance; he described moments where he actively pushed himself to speak, even when doing so felt uncomfortable or ineffective: "And even if I force myself to talk, sometimes… we're not on the same page."

Importantly, as alluded to in the description of Johan's linguistic capital, his willingness to speak more English did not signal that English was sufficient for conveying his ideas. Despite this loss of meaning and precision, Johan did not disengage from learning mathematics and doing well in the course. Instead, he continued to monitor his understanding and hold himself accountable for learning, even

when he chose not to speak: “Even if I don’t talk, I still try to understand… I ask myself, ‘Can I answer this question?’” When he could not answer questions posed during class, Johan described redirecting his efforts outside of class rather than withdrawing: “If I cannot answer that question, I will go home and study the topic.” This persistence often required substantial additional labor: “Usually that night, around two or three in the morning, I will start to restudy the topic.”

Taken together, these excerpts show that Johan’s aspirational capital was not rooted in ease, confidence, or alignment with inquiry-based norms. Rather, it was expressed through deliberate, sometimes reluctant adaptation—a willingness to use English and to speak more when necessary—while continuing to value comprehension, precision, and integrity over verbal performance. Johan chose not to abandon his linguistic, cultural, or spiritual values; instead, he navigated English-dominant expectations instrumentally as part of his broader aspiration to succeed in a STEM field in the U.S.

Resistance Capital

Across the forms of capital above, Johan articulated critiques of multiple forms of oppression in the IOLA class, including linguistic dominance (English-only norms), religious marginalization (Islamophobia), and social inequity (overemphasis on vocal participation).

Johan enacted resistance through epistemic refusal—declining to equate mathematical superiority with dominant classroom norms, English participation, or verbal dominance. His resistance was quiet, principled, and grounded in alternative epistemic values shaped by his prior schooling, multilingual experience, and spiritual identity.

DISCUSSION

Johan’s experiences reveal how inquiry norms may privilege culturally specific ways of speaking, interacting with mathematical authority (e.g., the instructor), and displaying mathematical competence. These norms frequently misaligned with Johan’s forms of capital and orientations, requiring extensive navigational and emotional labor to remain engaged. Johan’s Muslim identity intersected with linguistic and cultural marginalization in ways that shaped both participation and self-protection in the IOLA class. His decision to avoid speaking Arabic due to fear of Islamophobia illustrates how religious identity is not merely personal but structurally racialized within U.S. educational contexts.

This counterstory of Johan makes visible the labor required to persist in inquiry-based undergraduate mathematics classrooms that are English-dominant, religiously blind, and verbally oriented. Johan’s experiences demonstrate that persistence should not be interpreted as evidence of equity, but rather as an indicator of the cultural wealth students mobilize in response to ongoing marginalization. By extending CCW into undergraduate mathematics education, this study contributes to a more nuanced understanding of participation, equity, and learning in inquiry-based contexts. These findings suggest that greater attention to the perspectives and experiences of

international and multilingual students, the explicit articulation of classroom participation norms, and the creation of opportunities for students to draw on their full linguistic repertoires warrant consideration.

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