

Implications From Interviews of and About International Students and Researchers

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Following the work by Shultz et al. (2023), I present data related to surveys and interviews of math education researchers from underrepresented cultures in the wider literature. I present findings related to constructs they deem important in math education and have not seen widely represented in current research.

Keywords: International Students, Equity

Long ago in ancient India, there was a group of blind monks. One day, they learned that something had come to their village. Only able to touch the object, one thought it to be a thick snake, another a large fan. When the third touched it, he determined it to be a leathery barricade, and the fourth concluded it was a tree trunk. The last concluded it was a curved spear. This is The Parable of the Blind Monks and the Elephant, which illustrates the variety of conclusions that people can arrive at despite studying the same phenomenon. Even if math education research might be a well-defined area of study, different researchers may view the nature of math education, teaching, and learning quite differently. So wider adoption of differing, even contradictory viewpoints, can help paint a more holistic picture of any topic of interest, including math education.

In this paper, I present data from a preliminary investigation into the cultural differences that math education researchers from non-American backgrounds notice in math education spaces. When I use the term “math education spaces,” I refer to math classrooms and math education research. This paper reports on the specific research question “What attitudes toward mathematical learning do scholars identify as important and underrepresented?” To work toward an answer to this question, I started by looking at the experience of researchers who came to the US as international students. Due to survey responses, I expanded my view to include anyone who might fall outside the dominant, White culture of the United States. The scope of the participants’ experiences ranges from learning or teaching in an American math classroom to conducting research in a math education setting. In this paper, I present a wide variety of sentiments, opinions, and judgments of the current state of mathematics education research based on the lived experiences of a similarly wide variety of researchers and graduate students.

Theoretical Framework

Just as the theoretical frameworks we use are inherently influenced by their authors, sometimes quite explicitly in the case of individuals like Vygotsky and the cultural influence of Soviet Marxism (see Fu (1997) for his commitment to furthering the Marxist project) researchers also bring their own biases and influences to their work. It is not only the implicit biases and beliefs of American and European researchers that are worth examining but also of outside the Anglosphere, especially as non-Western education and math researchers and instructors continue to work in the West and international students continue to be a significant (and changing) demographic of college math classrooms. We must also ask if we allow international students to bring their frameworks to their professional work and if we allow their influence to perpetuate throughout the field.

For this paper, I draw upon Sfard & Prusak's notion of identity and draw a parallel to their belief that "the notion of identity is a perfect candidate for the role of 'the missing link' in the [researchers'] story of the complex dialectic between learning [about mathematics education] and its [American] context." They define identity as "collections of stories about persons or, more specifically, as those narratives about individuals that are reifying, endorsable, and significant." Key to this idea is the distinction between Actual and Designated Identity, where "actual" identity is characterized by how the individual understands themselves and "designated" identity is how they imagine themselves in the future. Sfard and Prusak (2005) argue that one's education is how one realizes one's Designated Identity starting from one's Actual Identity. In the context of this study, this means that one's understanding of American classrooms starting from outside the United States shapes one's designated identity as a math education researcher.

Literature Review

In their paper on the role of mathematical identity in math education research, Sfard and Prusak (2005) report on a study of Prusak (2003) comparing the learning outcomes of national Israeli students and Soviet-Israeli immigrants, both of Jewish religious backgrounds. While the outcomes of each group were comparable in terms of overall success, the methods each group of students employed were not. Sfard and Prusak argue that the identity of the students is powerful enough to explain the different study methods. The Israeli students saw mathematics as a way to further their career prospects, and the Soviet immigrant students instead saw mastery of mathematics as important to becoming "full-fledged as a human being" (p. 20). That is, they saw mathematical mastery as having inherent value.

Shultz et al. (2023) investigated how Hispanic serving institutions enact culturally relevant pedagogy (CRP) in the sense of Ladson-Billings (1995). They found two barriers to enacting CRP: a reluctance to discuss various aspects of identity (racial, gender, ethnic) and a belief that "mathematics is culture-free" (p. 503). They linked the various attitudes and instructors' reluctance toward implementing CRP to their identity. For example, one Korean instructor guessed that shallow cultural references in word problems would be more insulting than inviting based on how he imagined references to various aspects of Korean popular culture. They found that despite both barriers, instructors generally enacted aspects of CRP in their classes. To address these barriers, they call on the field to "take more risks in conversation and invite a more diverse range of people to the undergraduate mathematics community" (p. 486). As RUME researchers are part of the undergraduate mathematics community, this call applies here as well.

In summary, Sfard and Prusak (2005) linked identity to how math students understand the experience of mathematical instruction, and Shultz et al. (2023) did a similar investigation, except with instructors instead of students. In this work, we link identity to how education researchers understand the experience of mathematical instruction.

Methods

To begin to understand the cultural influences that international students of math and math education bring to their work, I sent out a survey primarily aimed at students who started their math education in the United States as immigrants or international students and recruited conference attendees as participants. Recruitment took place in person and online.

Participants filled out an initial survey consisting of demographic questions and two main questions: 1. What are some things in math education that you feel are important but are underrepresented in Western math education research? 2. Briefly describe American cultural practices or attitudes regarding teaching and learning that initially surprised you. Participants

were also asked if they would participate in a follow-up interview, of which 8 agreed. Interviews were semi-structured and lasted for 45 to 60 minutes. Interview participants were all relatively new to math education research, either as graduate students, postdocs, or established scholars who have recently started math education research. Transcripts were edited for clarity.

After cleaning up the transcripts, I engaged in a thematic analysis (Braun and Clarke, 2006) to identify common themes between the survey and interviews. The thematic analysis consisted of two rounds of coding. The first identified answers that expanded upon what was asked in the initial survey. The second round identified common themes between the questions. Although a common finding that I will discuss later is the importance of ethnic identity, I will discuss them in general terms to protect anonymity, thus cultural origin will be discussed only when necessary. It would be overly ambitious to sketch out an entire theory of attitudes toward math education or to think that a handful of interviews can provide enough material to even do so. As such, the results are meant to illustrate the diversity of opinions even within a small dataset.

The interview participants consisted of 2 Central Americans, 1 South Asian, 1 West Asian, 1 North Asian, 2 Southeast Asians, and 1 East Asian. This demographic information is based on self-reported data but generalized to grant wider anonymity. A limitation was my inability to collect interview data from large groups such as Africans, Hindus, or Chinese. Furthermore, because there was only a single researcher involved in coding, there is no measure of inter-reliability.

Results

After organizing my findings, multiple themes appeared: the cognitive aspect of mathematical learning, the social aspect of mathematical learning, and the American mathematical practices in a global context. All these reflect some facets of math education that the participants do not see reflected in their work, either as researchers, instructors, or students.

Cognitive Nature of Math Learning

One cultural difference participants noticed regarding the cognitive aspect of mathematical learning was the emphasis on calculations and memorization. One survey response described an “arbitrary distinction between procedural and conceptual mathematics,” and another wrote about the importance of not only memory, but also rhythm in mathematical learning, and that “reciting math orally often uses rhythm.”

Two interview participants went into greater detail about the importance of mastering calculations. Both discussed how the use of calculators was discouraged in their upbringing outside the United States. When asked how such practices affected their mathematical education, one said “I felt like if I learned by doing things by hand I understand things better.” Another discussed how achieving algorithmic competency helps achieve “mastery” and importantly, move beyond memorization, “deeper understanding,” and “critical thinking.”

These respondents placed large importance on memorization and algorithmic competency in their personal theory of mathematical learning and see that Western research largely marginalizes it. It is unlikely they can use it in their professional theories. Although the interviewers rarely cited existing research on why strong procedural knowledge advances one’s conceptual knowledge, one survey response has insight into that “mathematical ideas and justifications underpin every algorithm and procedure.”

Relatedly, one participant discussed how some of her work’s results described different attitudes among students regarding the usefulness of lectures. Of note was an international student who deeply enjoyed lectures. In summary, some researchers come to the United States

placing importance on what is typically deemed “rote” or “passive” methods of learning mathematics, and the research they are exposed to does not align with such attitudes.

Social Aspect of Mathematical Learning

There were more findings based on reactions to American classrooms, typically in higher education, as many of the participants first came to the United States as graduate students. However, some reactions were rooted in coming to the United States as children.

Attitudes Toward and of Teachers: Americans' broad cultural attitudes toward teachers and the teaching profession stood out to many participants. In describing the teacher education program from overseas, one participant said the “teacher education program is really small and [back home], being a teacher is really competitive. It is still crazy competitive. In the United States, we can't really imagine it.” A similar difference was backed by another participant from a completely different culture, who said that American teachers “do not get treated like professionals and often don't see themselves as professionals practicing a profession.” Other participants discussed how this broad societal attitude toward teaching manifested in students. One participant wrote about the surprise of “how little authority teachers hold in teaching and learning in America” and the independence of students, even though “the student-teacher ratio was a lot higher in my culture.” This comparative lack of authority was reinforced by another survey response which described seeing students “talking back to the teacher” as a culture shock. These culture shocks impacted participants' learning as well as their work as instructors. One self-described Middle Eastern researcher who first came to the United States after college described the culture as “very different” and the adjustments they needed to make when teaching American students. “We were the ones that were always guilty if we didn't know anything. And here it was, it was like the exact opposite.” The participant discussed more on how in her upbringing, the onus fell on the student to motivate their own learning, and how they had to adapt to the shift of such responsibility onto the instructor.

Classroom Dynamics: When participants discussed topics related to the wider classroom dynamics, they made their ethnic, religious, or cultural background the most explicit.

Learning as a Community: One theme that appeared in one Southeast and one South Asian culture is the idea of Learning as a Community. I offer a broad, initial definition as a culture where students, particularly higher-performing ones, have an obligation to ensure their classmates understand the material. One participant described it as follows:

“A sort of idea where it can't just be me who's learning something. Like if I'm in a classroom as a student, I can't be the only person learning because I'll feel bad. Because I want other people to also pass. The idea that somebody has to fail does not cohere with my mind. It doesn't make sense in my head like somebody has to fail. Cause it's sort of like, it takes a village to pass. And so for me, I'm definitely the type to try to study and learn and work with people, regardless of the fact that I can handle it by myself. Sometimes I take the position of a teacher.”

Moreover, this idea of Learning as a Community stood out to the participant as a noticeable absence from the American classrooms he was in, and he differentiated it from ideas such as “active learning” or “inquiry-based learning.” Another participant from a similar cultural background considers a similar phenomenon part of his initial motivation to pursue math education research. He described how, due to his relatively higher performance in his math courses even in high school, his classmates sought help from him, forming a “helper” identity and sparking an interest in math education. The first participant attributes this to how

“individualism” is characterized in their culture, where it is not the individual person that is prioritized, but the individual family unit, and how it is practiced. He said, “Constantly when I was going up... we would get told, ask your big sister, ask your big brother or like make sure they help your little brother, make sure to help your cousin.”

The emphasis on relying on others and making oneself reliable to others seemed to extend to a classroom setting and impacted the participant’s theory of classroom dynamics. This awareness of how one’s knowledge can help their classmates was present in another interview in a completely different religious context.

“In Islam, there's a lot of emphasis on learning about how the world works, how the universe works...the other thing is like when I'm learning something, I feel like this is something important I'm doing. It has an impact. I can help other people. If I learn something I can help other people to learn.”

The participants, with their varied backgrounds, described a variety of perspectives on the nature of mathematical authority and how it is exercised in and beyond the classroom varied among participants, but a common theme was the larger responsibility of students to themselves and each other.

Closeness and Caring Relations: Another difference was how participants characterized “caring” in American instruction. Some participants elevated the caring of their own culture over the aspects of American culture they experienced. One preferred to characterize it as a distinct construct using the Spanish equivalent of “Cariño.” In her Hispanic culture, she characterized “Cariño” as “this value placed on being friendly and loving and caring, like this caring warm quality.” She described how it was a prominent feature of teachers from her experience teaching at an overwhelmingly Hispanic secondary school, as this extended to how the teachers treated their students “Like calling them my child... Like there's a lot more like mothering or fathering I think that goes into that role that you wouldn't see” in other cultures. Other participants partially validated this by discussing how they understood “caring” instructors from their cultural backgrounds.

One participant with an Asian background compared his experience in the United States with two Asian professors. Although both taught “traditionally” either in mindset or instructional practices, he saw different levels of caring between the two. One was “incredible in terms of he was a caring guy” and although “he would do the lecture, make stuff really hard, he really wanted you to work hard for his class and he was super.” He attributed this partially to this professor’s flexibility, such as working with him for longer than expected, and even at night. Compared to another professor “he wasn't as caring. There was an instance that I asked them a question after class. And he said to me ‘You should just practice more. You don't understand.’ And he just left.” Another participant discussed availability in terms of the expectations for teachers in her home country. Although students were expected to be in school for more than 12 hours a day, so were teachers. She characterized the instructors who adhered to the same schedule as their students as “really passionate.” While neither the teacher nor the student was in class every moment of the day, teachers were expected to be available similar to “office hours.” This same participant also described having minimal connection with her American professors and felt a lack of caring on the side of their professors.

Situating American Culture in a Global Context

Finally, the participants’ perspectives help put different aspects of American society into greater context. One of these is Americans’ beliefs about people’s capacity for mathematical

learning, especially in children. One participant described how the math content in the United States seemed a year behind what she was used to in her original country and how returning home left her unequipped for her school. Another described her experience as an instructor. In her home country, high school students in math regularly graduate with integral calculus, which required an adjustment to teaching what she considered high school material at a college.

Another finding is that the current diversity and equity research paradigm does not align with how non-European American researchers understand diversity. Participants do not encounter much work regarding Middle Eastern and North African, Asian, religious minority, or even White ethnic cultures. Some discussed their motivation to seek out Critical Race studies related to their cultural background in other departments, and the wider discourse on diversity seemed alienating, and overwhelmingly shaped by White researchers with “little room for opinion from those who are non-white, non-American.”

The participants’ opinions on diversity differed from the more dominant racial discourse. Aside from an implicit desire to see their culture represented in the wider discourse, some were also interested in more granular factors such as linguistic, ideological, religious, and ethnic diversity. One rooted their interests based on their culture where multiple indigenous languages existed in a classroom where everyone was taught their country’s national language. For example, studies about linguistically diverse classrooms in America might also benefit by drawing from frameworks drafted by those with upbringings from multilingual societies. More broadly, there might be a place for frameworks that illustrate American attitudes as foundational rather than as a reaction, as the former is the perspective of these researchers. Others placed specific importance on their ethnic background on their Actual Identity, as there were instances of individuals from Southeast and East Asia identifying not as Asian, but as their specific ethnicity. This was alongside an interest in cultural differences among White Americans. Thus, the investigation of the link between identity and attitudes should not be relegated to just non-American, non-White researchers, or even restricted to a single White identity, as there is potential interest in the relationship between White ethnic identities and math education. In general, the field can benefit from a closer inspection of these ethnic identity.

There were also different attitudes regarding the inclusion of women in academic spaces. One woman described avoiding the sexism of her home country as part of her preference for working in the United States. Another described her understanding of her place in academia as rooted in her culture. “[There’s] a very conservative mindset, but then there are Muslim scholars who are women. When we date back to the beginning of Islam. One of the wives of the Prophet was a scholar and she just devoted her life to education.” Further investigation concluded that she was likely referring to Aisha, who became of renewed interest among Arab scholars in the 20th century (Elsadda, 2001).

Discussion and Conclusion

I end this paper with a brief discussion on counterstories. Solórzano and Yosso (2002) describe one kind which counters majoritarian stories, and another in the sense of Ikemoto (1997) which is not “created as a direct response to majoritarian stories” (p. 32). This final quote regarding the beginning of Islam could be an instance of the former. It could be a counter-story within the context of Islam, not the Christian one that dominates North American culture. Alternatively, it could be a counterstory within an Islamic context.

My findings may well be instances or parts of counter-stories that can exist outside the context of the majoritarian paradigm. Regarding authority relations, there are similarities to authority relationships as described by Amit and Fried (2005) as a development of Weber’s

(1947) framework, as well as near-peer mentoring (Stringer, 2024). It would be inaccurate to describe these frameworks as wholly inappropriate for characterizing the dynamics that have been described. However, non-Western perspectives can likely enrich current authority frameworks by providing another foundation. For example, unlike the frameworks from Amit and Fried (2005) or Hackenberg (2010), it does not need to be surprising that students would see each other as an authority by supposing such dynamics from first principles, as might be the case for Confucian frameworks.

Similarly, my findings illustrate two distinct notions of “caring,” one as a construct related to immediate, present behavior and another related to availability. These notions have been expanded on mostly outside of the Western European tradition. Lomei (2023) offers a more concrete definition of “Cariño” as “the manifestation of caring grounded in Latino cultural values” (p. 20). Her work is designed as “a departure from a universalistic conception of care and makes an intentional departure from Eurocentric views of what care might entail” (p. 21). and it remained until her work produced a workable framework to recognize *cariño* in predominantly Hispanic classrooms, and its absence can be felt in other studies. For example, Hufferd-Ackles et. al’s (2004) study about the classroom culture of a predominantly Hispanic classroom arguably captures “*cariño*” from the teacher in a salient way, yet they could not recognize it. A Korean researcher, Ye Ryung Chun, worked to capture the second notion of caring. In her dissertation (2007), she acknowledges the concept of “*chuk eun ji shim*” which is instead related to the idea of “how to care in situations where we almost do not want to care” (p. 106). In her estimation, this dimension of obligation is absent from Noddings’ work. Both these researchers shed light on conceptualizations of caring outside an American perspective and corroborate claims from the participants that such ideas are outside the current mainstream of math education research.

Conclusion

The diversity of opinions I found demonstrates the large diversity of perspectives among non-European American researchers. One does not necessarily need to conclude that the differences researchers notice between their culture and the dominant math education and research culture indicate definitive neglect of such concepts. To do so outright would downplay the contributions of scholars who have contributed in these ways. That said, the data demonstrates an opportunity to leverage the unique perspectives of international researchers working in America, as many of their personal theories of mathematics education were shaped outside a strong Western influence. They can help Western researchers have a more holistic perspective of math education as these researchers demonstrate the capacity to embody multiple cultural paradigms in a single researcher. More generally, future frameworks should not be responses to the dominant culture of the United States, but ones developed outside of it.

The variety and cultural salience of the responses raise questions for the field going forward such as: How can we understand and situate existing frameworks in relation to the cultural identity of their original authors? Explicit awareness of an author’s cultural identity does not inhibit the adoption of their frameworks. For example, Lev Vygotsky worked within the Marxist tradition (Fu, 1997) but his theories were eventually adopted by those in a capitalist society. So should work from scholars like Lomei or Chun be restricted to only Latino or Korean contexts? Our field has always applied learning theories to cultural environments distinct from cultures where said theories were initially developed, so I propose not.

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