

Inclusive Mathematics Classrooms: Advocating for Policies, Practices, and Resources STEM for All Multiplex Synthesis: September 2022

The “long-standing, thoroughly documented, and seemingly intractable” issue of mathematics educational inequity is familiar to generations of educators (Aguirre et al., 2017). Some of what we “know” about equitable mathematics instruction can be framed by approaches that consider pedagogy, engagement with mathematical practices, and purposes for studying mathematics. In this webinar, we discuss the different ways to support equitable instructional practice in mathematics classrooms for students that are Black, Indigenous, Latinx, multilingual, cognitively diverse, or members of other groups minoritized in the study of mathematics. In addition, we consider new questions and the work yet to be done. (from the September [blog post](#) by Salvador Huitzilopochtli)

The Expert Panel

The expert panel for the [September Theme of the Month](#) was facilitated by [Dr. Salvador Huitzilopochtli](#), currently a lecturer at San Jose State University—Department of Teacher Education. His current research is informed by ten years of experience as a middle-school mathematics teacher and teacher-leader in culturally, linguistically, and economically diverse schools in the San Francisco East Bay Area.

He was joined by four scholars with valuable insights on this issue:

- [Babette Moeller, PhD](#), a distinguished scholar and leader in educational R&D and equity, is dedicated to ensuring that K–16 students with disabilities benefit from educational innovations and reforms. She is the lead author of *Math for All* (Corwin Press), a K–5 professional development program.
- [Kathryn B. Chval, PhD](#), is the Dean of the College of Education and Professor of Mathematics Education at the University of Illinois Chicago (UIC). Her research focuses on effective preparation models for mathematics teachers, as they encounter multilingual learners, and curriculum standards. She is the lead author of *Teaching math to multilingual students: Positioning English learners for success* (Corwin Press).
- [Jonee Wilson, PhD](#), a former high school mathematics teacher for Baltimore County Public Schools, is currently an Assistant Professor of Mathematics Education at the University of Virginia. Her work focuses on examining and outlining instructional practices that empower and honor historically marginalized students specifically in the context of conceptually-oriented mathematics classrooms.
- [Beatriz Eugenia Quintos Alonso, PhD](#), is a former special education teacher in Mexico and the United States. She currently is a Clinical Associate Professor in the Department of Teaching and Learning, Policy, and Leadership, at University of Maryland. The long-term goal of her work is to interrupt historical patterns of marginalization in math classrooms by collaborating with teachers and families.

The Purpose of Math Education for All

As the panelists introduced themselves, they addressed the question: What is the purpose of math education? The answer to this very basic question inevitably shapes curriculum, pedagogy, and assessment — classroom interactions, task design, the teacher’s role, the student’s role, and the roles of others in the educational ecosystem. “If you think that the student’s role is to be an obedient note taker, you’d see very

different math lessons than if you think the teacher's role is to facilitate student conversations with mathematics." (Kathryn Chval)

In the dominant model, mathematics has in effect played a role in maintaining a system that privileges some, while marginalizing many more, and difference (whether cultural, linguistic, or neurotype) is construed as deficit (Mehan 1996). Kathryn said, "What's the purpose of mathematics? If we're honest, I would say it's to sort people, to marginalize people, to privilege others, if we're going to be honest about what's happening." The marginalized include people of color, people whose first language is not English, and neurodiverse people. Characteristic results of this sorting and marginalizing were noted in the blog: "*Currently, 66 percent of US science and engineering professionals are White or Asian men; if White and Asian women are included, the number is 88 percent.*" (McGee, 2020, p.21, original italics)

The panelists spoke of the role and task of mathematics education today against this backdrop. Kathryn said, "I would say our purpose is to challenge and disrupt systems, policies, and practices that have denied access to a discipline that we love..." Babette Moeller said, "The purpose of mathematics, for me... is to help make mathematics accessible to all students." Jonee Wilson spoke of embracing the problem-solving practices of marginalized students, and supporting them to learn as they use mathematics to critique and make sense of history and today's society as well as their own cultures and communities specifically. Beatriz Quintos raised the challenge of students whose first language is not English: "The purpose of my work is really that boys and girls that look like me, speak Spanish, are immigrant or US born, ...or any multilingual learners, do not have to work twice as hard to demonstrate their brilliance in the math classroom. Also, that they don't go into a school system that tells them that their language and culture is not as valuable as that of others."

Salvador then asked: "What can teachers do? What can schools do? What can educators do with families to promote equity in mathematics education?"

The panelists agreed that educators first must believe and expect that everybody can learn mathematics. As Babette said, "It's important for teachers to recognize that every student...brings strengths and challenges. You can build on the strengths to address areas of challenge." It is also essential to recognize that "students are multidimensional," and that mathematics education is more likely to be successful when it sees its students from many perspectives and gets a rich understanding of what they bring to their learning, and how mathematics is situated in their life outside of school.

These two assumptions underlie other steps that schools could take. Kathryn suggested, "The first thing is to be intentional. Schools can be intentional. Are they having conversations around these important issues?" Students' multidimensionality is better addressed when teachers collaborate within a school, pooling insights about their children; and Babette said that this includes:

general education teachers, special education teachers, bilingual teachers, because they each bring unique perspectives, areas of expertise, and lenses on students. The more you can bring those together, the better understanding an individual teacher can develop of the students.

In addition, it is important to engage families. Babette affirmed that it is important to recognize that families have insights that can support their children's math education "because they see their student in very different circumstances and situations and bring very important information to teachers that they can build on." Beatriz added, "It's powerful "to hear parents directly tell teachers how certain biases have impacted their own learning and their children's learning, [and] together, brainstorm ways to challenge these practices."

Getting to know families is an important way (as Beatriz said) “to broaden the definition of what math looks like and what mathematics is, by connecting the home math practices and school math practices.” This knowledge is enriched by becoming aware of the children’s community and cultural milieu. Kathryn said,

Are you getting to know where your families shop, where they live, where they play? Are you building experiences in the classroom around those things? I think we have to remember that parents are the experts of their children. Are we tapping into their expertise to understand what interests these children, what they prefer to spend their time on, what their fears are?

Kathryn suggested working with families, teachers, and students as triads, “doing professional development with not only the teachers, but with the parents and then bringing them together.” Professional developers, added Beatriz, should “position teachers as our partners.” Since “teachers are the ones who know the most about classrooms, we knew we couldn’t plan at the top-down model of professional development.”

Culturally Sustaining Practices and Teacher Learning

Culturally sustaining education honors and takes account of students’ multiple settings and resources, “providing diverse opportunities for participating as a way of supporting different voices and perspectives... It’s also about being curious about the students and their ways of thinking and opening up different ways of communicating.” (Jonee)

How does that look in the classroom? First, it means that teachers need to recognize and take advantage of the different ways of knowing present among the children. This means a pedagogy that makes possible, and values, different ways of engaging with mathematical ideas. “Are teachers and parents paying attention to what interests the children? Do you build mathematics around that?” (Kathryn). Jonee described one approach that can elicit and engage students’ interests and ways of knowing:

One of the most basic things that I like to do is just ask the students what they want to talk about today...Sometimes...you’ll hear about things that they’re excited about, things that they see as problematic. For example, in a K-12 setting where the first and second graders were complaining about not having as much time on a newly constructed playground. That was a natural space for the teacher to turn that conversation into a math question: ‘Okay, let’s test out that hypothesis.’ If you think about the many ways that students could collect and display data as they work to prove their point- the math naturally evolved from the students. We might not consider that to be a “social justice” project per se, but to a six-year old, the fact that they are not getting the same opportunities to play on this playground as much as the older kids, it is definitely something that they are thinking about in terms of equity and fairness.

Second, educators need to find different ways to evaluate learning, developing “evaluations that nuance what it means to be smart. Unpacking the complexity of learning and finding “ways of attending to learning and growth that have nothing to do with the quiz, or grades... opening up spaces for different ways of showing what you know, different ways of being seen and heard as ‘math doers.’” (Jonee).

Third, a welcoming and respectful classroom culture opens the way for fuller participation. For example, Beatriz pointed out that when multilingual children don’t participate, their reluctance may not be owing to language proficiency, but to their unease about whether they belong there.

How do I create a safe space so that they can participate and they know they’re expected to participate in rich mathematical discussions? ...Privileging the use of Spanish, multiple means to

communicate math ideas, assigning competence, all that is going to open their participation and support them in the math classroom.

As Jonee said, such a culture supports students' growth, helping them to:

see themselves in the curriculum, and see mathematics as meaningful to them, and useful in their own lives today, not just one day when they're out shopping... Also being able to learn about others through the curriculum, as well, and through their exploration of math. The idea of windows and mirrors...comes up for me. That's the idea that you're seeing yourself in the math that you're doing, but you're also looking outward, learning about the world, and seeing into the lives, perspectives, and cultures of others.

Teacher Inquiry

Teachers' inquiry is a powerful tool for change, rooted in respect for, and curiosity about students' thinking and knowing. The puzzling or challenging student can often be an important way to gain insight that can enrich and inform teachers' research into their practice (Ballenger 2009). Such an inquiry stance can "position all of us as learners, all of us as researchers, and all of us as experts." (Beatriz).

Babette described teachers engaging in a year-long study of a focal student in their classroom.

Those focal students are usually students who teachers have questions about. They tend to be students who are not average students, who are on the margins in the learning space. We are asking teachers to closely observe these students in an objective way to understand what their strengths and challenges are in relationship to different mathematical activities that they're planning.

As the teachers learn from and about their focal students, they translate their learning into adaptations in their lessons, which are themselves opportunities for further inquiry. Moreover, the teachers often find that such adaptations arising from a focus on one student's learning are of benefit to the other students. And as Kathryn noted,

The more understanding teachers have of different approaches students have learned in other places so that they understand what the child is doing in their mathematical thinking, they're going to be a better teacher.

Returning to the Purposes of Math Education

After these rich exchanges, Salvador returned the conversation to the purposes of math education, in the context of "windows and mirrors as both reflection and vision and expanding vision." Beatriz reflected on a comment expressed by a mother during a conversation with parents about "funds of knowledge." The mother situated education in the context of community life (see González et al., (2005). Beatriz reflects:

It was very humbling to hear her perspective of education and math education, because it had nothing to do with getting more money, nothing to do with getting more degrees. It had a lot to do with helping her community, being a valuable resource. She had a garden where she tried to share what she had learned in there in growing vegetables and growing flowers and seeing how her garden could make a difference in the life of other community members that she was meeting. She wanted to be part of the community and change the community in a way that didn't have to do with the narratives that are dominant in the school. I think that, for me, it grounds me to have a conversation with parents and with children about what are their purposes for education, and for math education. For immigrant families, it plays a critical role.

Kathryn reminded us that our purposes for math education determine many aspects of how children experience math, and how that encounter speaks to them about themselves, their capabilities, and their place in society. Math educators need to bear this in mind and be advocates for inclusive and equitable education for all children.

I think we should be advocates. I think, as we talk to people about... If you ask them, what are the goals of math teaching, you get everything from test prep, getting them ready for the next class, life skills...it really influences the decisions that people make. As you engage in conversations with others, or you encounter resistance to teaching math in more innovative ways, it's important to understand the perspectives of the people that you're engaging in those debates with.... You really need to be pretty strategic and persistent, and approaching different people in different ways. Having those strategies thought out, I think, is really important.

Babette reminded us that now is an important opportunity to clarify our basic commitments about math education in its social meanings:

I think it's an urgent time for us to broaden our understanding of what the purpose of mathematics education is and what our goals are. It's not just about academic preparation, but also about helping children to find joy and belonging in mathematics, to help them develop.

Recommendations for Teacher Leaders

Teacher leaders can play an important role in their schools' growth in regard to inclusive math education, by:

- Supporting triadal communication (teachers, families, and students) about the purposes of math education, and the elements of school and classroom culture, curriculum, and pedagogy that reflect the resources, challenges, and intentions of the participants in the conversation.
- Initiating and facilitating effective communication between math teachers and teachers of other subjects, with the goal of sharing insight and knowledge about the students and their lives outside the math classroom.
- Advocating for, or implementing, professional development that includes intentional teacher inquiry about their own practice, informed by in-depth child studies.

Recommendations for Researchers

Many of the points raised in this Theme of the Month present rich opportunities for research that can be of value to practitioners. For example, there is considerable need for descriptive and analytic case studies of the effects of culturally supportive pedagogy on student self-efficacy and learning. Moreover, there is a need also for studies of math teachers' learning to adapt their curriculum, pedagogy, and assessments to create and sustain a math learning culture that is inclusive and productive. Finally, the approach taken by our panelists sees parents and other stakeholders as participants in their children's math learning: what new questions and developments arise when "practitioner" is construed to include these out-of-school educators?

Recommendations for Administrators and Policymakers

As with most significant changes in school culture and practice, administrators and policy makers can play an important role as they listen to the steps that teachers are seeking to take to make math education more inclusive. Such innovations will require support to make time for collaboration, build community connections, and undertake the kinds of teacher inquiry that have been suggested in this Theme. Administrators and policy makers will be most effective in their support and collaboration if they are

informed, intentional, and strategic about envisioning and moving towards an inclusive math education for the children we are educating now.

References

- Aguirre, J., Herbel-Eisenmann, B., Celedón-Pattichis, S., Civil, M., Wilkerson, T., Stephan, M., Pape, S., & Clements, D. H. (2017) [Equity within mathematics education research as a political act: Moving from choice to intentional collective professional responsibility](#). *Journal for Research in Mathematics Education*, 48(2), 124-147.
- Ballenger, C. (2009). [Puzzling moments, teachable moments: Practicing teacher research in urban classrooms](#). New York: Teachers College Press.
- González, N., L.C. Moll, and C. Amanti (eds) (2005). [Funds of knowledge: Theorizing practices in households, communities, and classrooms](#). New York: Routledge.
- McGee, E. O. (2020). [Black, brown, bruised: How racialized STEM education stifles innovation](#). Cambridge, MA: Harvard Education Press.
- Mehan, H. (1996). [The Construction of an LD Student: A Case Study in the Politics of Representation](#). In *Natural Histories of Discourse*. Michael Silverstein and Greg Urban, eds. Pp. 253–276. Chicago: University of Chicago Press.



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