

The Intersection of Culture and Mathematics

A Position of the National Council of Teachers of Mathematics

NCTM Position

Mathematics is a human endeavor and a creative pursuit to understand and actively engage in our world. To create humanizing experiences and maximize learning in the mathematics classroom, educators must regularly and intentionally integrate culturally centered mathematics in each and every one of our PK–12 mathematics classrooms.

Introduction

NCTM (2018, 2020a, 2020b) supports fostering students' positive mathematical identities by broadening the purpose of learning mathematics and implementing equitable mathematics instruction so every student has access to relevant and high-quality mathematics education. Yet, the traditional instruction of school mathematics that continues to be taught in schools often results in students feeling a disconnect between themselves and the relevancy of mathematics to their daily lives. If we truly want to move towards mathematics being a vehicle for learning about and making sense of the world around us, we need to regularly and intentionally integrate more equity, justice, and culturally centered mathematics education in every one of our PK–12 mathematics lessons. As all learning is social, a part of making math accessible and equitable for all students involves creating, supporting, and sustaining a classroom culture that is responsive to students' backgrounds, experiences, cultural perspectives, traditions, and knowledge (Kalinec-Craig et al., 2019; NCTM, 2014; NCSM and TODOS, 2016).

Culture is not a singular but a plural concept that is constantly evolving. Culture refers to patterns of being and doing, which includes ways of being, communicating, diverse beliefs, practices, values, contexts, and knowledge, all of which shape how people think about and engage with mathematical practices (D'Ambrosio, 1985). Some aspects of culture are represented in our multi-dimensional identities: race, ethnicity, religion, generation, gender, sexual orientation, education, class, occupation and socio-economic status, and disability (Safi et al., 2021).

In teaching and learning mathematics, we must move beyond surface-level activities for cultural explorations (e.g., student names, cultural food, and festivities) within mathematics curriculum and experiences. While such conversations are a start, they are not enough to authentically attend to and value teachers', students', and our communities' diverse cultures and identities (Desai et al., 2022). There must be intentionality in bridging the intersection of culture and mathematics to learn about and value students' and teachers' cultures as assets to teaching and learning mathematics, become more culturally conscious, and work to develop systemic changes that have long-lasting impacts.

Declarations

- 1. Mathematics is not culture neutral.** Many people believe that mathematics is an independent abstract system that exists independently and, therefore, has no connection to culture. However, mathematics, like any other discipline, has evolved within diverse cultural contexts worldwide (Ascher, 2002; D'Ambrosio, 1985). Mathematics is a way of knowing, being, and doing (Lunney et al., 2016; Robinson et al., 2023) developed in response to a need to deal with quantities, space, and relationships and to solve problems (Joseph, 2000). While only some mathematical stories have been included in textbooks, all world cultures have developed mathematical processes. It is problematic to take a stance that only one version of the story of mathematics is the right one. Mathematical ideas often arise from need, which is connected to values and belief systems (D'Ambrosio, 2000). It is important to learn about and challenge how school mathematics reinforces the myth that only Europeans did mathematics (Gutiérrez, 2017). Instead, educators must recognize and appreciate the diverse ways of knowing, being, and doing that have led to mathematizing in all parts of the world and make space for exploring these ideas in the classroom.
- 2. Effective mathematics instruction leverages cultural knowledge and lived experiences as assets.** Mathematics learners are also learners of the culture, language, and identities they have developed and experienced in the communities as part of their everyday lives. When learning school mathematics, learners use their prior knowledge to access new knowledge: the new knowledge is added and connected to their prior knowledge repertoire, including languages (López Leiva et al., 2013; Lunney Borden, 2013) or funds of knowledge (Moll & González, 2004), and identity (Esteban-Guitart & Moll, 2014). Providing mathematical experiences that connect to students' cultures and lived experiences will promote the development of positive student mathematics identities and confidence in students' abilities to make meaningful contributions, giving them agency as capable learners and doers of mathematics (Desai et al., 2021; Desai & Safi, 2023; López Leiva, 2020).
- 3. Effective mathematics teachers are culturally conscious.** Culturally conscious teachers take the time to understand how negative stereotypes impact their students and actively work to erase those negative stereotypes' effects on marginalized students' educational outcomes (Seda & Brown, 2021). Culturally conscious teachers play a crucial role in recognizing and addressing the detrimental impact of negative stereotypes on their students. They also understand that taking a color-evasive approach to their students hampers their ability to empower them to overcome the negative stereotypes frequently associated with their identities. These teachers recognize that traditional school structures have perpetuated inequities based on race, ethnicity, and socioeconomic status. Consequently, they actively advocate for policies that empower all students to become critical mathematical thinkers and effective problem solvers, without restricting such opportunities to conventional high achievers. Key strands of culturally responsive mathematics teaching (Zavala & Aguirre, 2023) include a) Connections to Knowledge and Identities — building on students' experiences, mathematical understandings, and cultural funds of knowledge; b) Maintaining Rigor and Support — maintaining high cognitive demand while simultaneously providing access points for all students, and c) Attending to Power and Participation — enhancing equitable participation by disrupting status, distributing intellectual authority, and supporting student agency and opportunities to take action. Culturally conscious teachers need socio-political knowledge to understand policies, resist misrepresentation, and feel empowered to dismantle harmful practices that target our most vulnerable and marginalized student populations.

4. Effective schools develop systemic approaches that embrace culturally relevant mathematics instruction. Culturally relevant mathematics instruction demands shared conversation and decision-making among educators, school leaders, and the communities in which they work. As part of such a systematic approach to mathematics instruction, classroom teachers and school/district leaders should collaborate with students and families in planning and providing mathematics experiences that are culturally relevant by design (Ladson-Billings, 1995). Undertaking this work necessitates trust, introspection, and open dialogue, allowing all members to share expertise, participate in the decision-making, and examine and gain a deeper understanding of how culture impacts learning. In the classroom, teachers should adopt a more expansive worldview and create opportunities for open discussions about diverse cultural practices and unspoken norms (Hammond, 2014).

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