

Mathematics in Early Childhood Learning

A Position of the National Council of Teachers of Mathematics

NCTM Position

Early childhood learning lays the foundation for a child's mathematical journey. Young children flourish when supported in rich learning environments; yet access and outcome vary significantly by social identities. To approach early childhood learning through the lens of equity requires the early childhood education system to acknowledge that the disenfranchisement and discrimination faced by young children, their families, and early childhood educators are systemic. Equitable early childhood education demands culturally and linguistically responsive teaching; developmentally expansive and inclusive practices that respect diversity and value all children's strengths; and the voices of caregivers, families, educators, and children elevated in the decision-making process. Such practices in turn require that early childhood teachers have the support of policies, organizational structures, and resources that enable them to succeed in this challenging and important work.

Early childhood is an important and vulnerable time; these years lay the foundation for a child's mathematical journey. High-quality early mathematics experiences have a long-lasting impact, serving as a catalyst for children's later success in life. These beginning exposures to mathematics send powerful messages about who and what is valued. More so, experiencing mathematics in ways where children see themselves as important provides foundations for the kinds of relationships they develop with mathematics and the emergence of their mathematical identities (Boaler 2014). In fact, children's early mathematical knowledge serves as a predictor of later mathematics success and their college and career opportunities (Shah et al. 2018; Watts et al. 2014).

Young children flourish when supported in rich learning environments; yet access and outcome vary significantly by social identities. For example, opportunity disparities, the number and frequency of suspension and expulsions, and placement in special education or lower-tracked settings disproportionately target Black boys and Latinos (Annamma, Morrison, and Jackson 2014). The current landscape of early childhood learning reflects societal stratification by race and class and contributes to the compounding impact of systemic racism against Communities of Color (Adair and Colegrove 2021; NAEYC 2019). Children who are historically and contemporarily marginalized (e.g. students of Color, those from low-income families, emergent bilinguals, and students with disabilities) are more likely to receive narrow conceptions of mathematics learning and achievement through low-cognitive-demand tasks, an overemphasis on procedural skills and fluency without understanding, and limited opportunity to engage in mathematical play and inquiry (NAEYC 2010; NCSM/TODOS 2016; NCTM 2020).

Despite decades of equity-based reforms, inequities persist (NCTM 2020). Efforts toward those reforms will not change if the educational system structure is left unquestioned and deficit beliefs and practices persist. To approach early childhood mathematics education through the lens of equity requires the acknowledgment that the disenfranchisement and discrimination faced by young children, their families, and early childhood educators are endemic and systemic. Equitable early childhood education systems demand culturally and linguistically responsive teaching; developmentally expansive and inclusive practices that respect diversity and value all children's strengths; and the voices of caregivers, families, educators, and children elevated in the decision-making process. Below are a series of recommendations. To ensure all children have access to equitable mathematics learning opportunities, early childhood mathematics education must do the following:

- **Capitalize on the wonder and joy children naturally bring to their mathematical learning and their observations of the world.** Mathematics is a living practice (Gutiérrez 2018). Children come to school with rich ways of making sense of the world mathematically. Research evidence indicates that long before entering school, children spontaneously explore and use mathematics in play and daily activities, and their mathematical knowledge can be complex and sophisticated (Parks 2015). By capitalizing on the wonder and joy children naturally bring to their learning and to their observations of the world, teachers can cultivate and extend children's mathematical sense and interest. Professional development courses and workshops for future and current teachers need to model effective pedagogies for teaching statistics and data science, in addition to focusing on developing understanding of statistical concepts, mastery of statistical content, and knowledge of the essential ideas of statistical thinking and problem solving. Providing such courses and workshops may require universities to expand (or initiate) preservice and outreach offerings in statistics. ASA and NCTM are committed to taking appropriate action within the structures of their organizations to assist in guiding the implementation of these recommendations.
- **Use curriculum and teaching practices that build and strengthen children's problem solving and reasoning.** Children's mathematics learning and development are not linear. Mathematics includes a wide range of concepts and ideas that are intricately connected and should be taught through strengthening children's problem-solving and reasoning processes. Implementations from a one-size-fits-all developmental framework are harmful, leading to the labeling and sorting of children, resulting in segregation, marginalization, and privilege that is strongly correlated with race, language, class, and ability status (Annamma, Morrison, and Jackson 2014; NEA 2015; Valencia Mazzanti and Allexshat-Snyder 2018), and to the narrowing of mathematics experiences to rote counting, number recognition, and procedures and answer-getting activities (NAEYC/NCTM 2010; NCTM 2020). Young children are intuitive problem solvers (Carpenter et al. 2017). We must not withhold problem-solving opportunities or assume that learning to count precedes problem solving.
- **Accept and appreciate that all children have rich and diverse cultural, linguistic, home, and community experiences on which to build mathematics learning.** Children have rich and diverse experiences on which to build mathematics learning (Turner et al. 2011). Their confidence, competence, and interest in mathematics flourish when educators recognize each child's unique strengths and create meaningful learning experiences connected with their informal and formal mathematical knowledge and their cultural, linguistic, home, and community experiences (Reid, Kagan, and Scott-Little 2017; Shah et al. 2018). Tapping into

the potential of children, however, needs to move beyond surface level attempts (e.g., names in problems, cultural food referents), to honor children’s heritage language, ways of problem solving, and the mathematics already a part of their lives and communities (Souto-Manning and Rabadi-Raol 2018).

- **Build partnerships and opportunities for collaboration with students, families, community leaders, and policymakers to address barriers to educational attainment.** Systemic change must build on the funds of knowledge children and families bring. For too long, “parents [have been] positioned as recipients of knowledge to support children at home to do better at school” (TODOS 2020, p. 2). Parents and caregivers are children’s first teachers. To advance equitable outcomes, early childhood education decision-makers must recognize and build on the strengths of children, families, and early care educators and elevate their voices in the decision-making process.
- **Develop systems of reflective practice across affected parties for equitable access to early care and childhood mathematics learning opportunities.** To ensure equitable access to high-quality learning, all affected parties need to actively confront inequitable policies and practices, including challenging our own beliefs. It is important to recognize that we all hold conscious and unconscious beliefs about what each child can learn and do, about what mathematics is important to learn, and about how mathematics should be taught (Reid, Kagan, and Scott-Little 2017). These beliefs translate into equitable and inequitable teaching practices and school structures. Critical conversation, self-reflection, and collaborative actions are needed among all stakeholders, including teacher preparation and support. Teacher education programs must include attention to the mathematics component of early childhood programs and continuing professional development opportunities to support high-quality mathematics education. The development of institutional policies that promote teachers’ collaborative learning and planning can provide necessary resources to overcome classroom, community, institutional, and system-wide barriers to young children’s mathematical success (Cuban 2013; NRC 2009, 2015).

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