

Equity aligned practices in Montessori math

Mixed ages and materials extend access to learning



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Dr. Montessori approached children with an open mind, stubbornly refusing to cloud her observation of any child with the negative judgments made by mainstream culture. On the contrary, she paid close attention to children from a variety of socio-economic and ethnic backgrounds as well as children with different abilities. Because of this, she has had a global influence.

Montessori pedagogy includes an inherently equity/inclusion-focused approach to math instruction which puts Montessori public schools in a strong position to provide leadership in American education. Montessori practices that bring equity to math instruction, increasingly supported by research as both equitably delivered and educationally sound, include mixed-age groupings, uniquely created mathematical materials with a built in control of error, the three hour work cycle, and a storytelling tradition.

Montessori distinguishes itself as an alternative program with a consistent pattern of mixed age groupings. Mixed age groupings implicitly allow for and endorse the practice of mixed *ability* groupings. In her book *Building Equitable Classrooms*, Dr. Rachel Lotan

promotes these groupings as a feature of equitable classrooms because they promote “equal status interactions.” All students have equal access to qualified and experienced mathematics teachers, quality curriculum and equally challenging tasks.

Mixed-age groupings change how students view and interact with each other. Historically, American schools have practiced “tracking,” or placing students into groups based on notions of their abilities in mathematics. These math groups have at the extremes used labels such as “low-achieving” and “high-achieving” or “gifted math students” and “remedial math students.” The idea is that such groups enable the teacher to cater their lessons towards

that offer something the child is lacking. In mathematics, this might look like an elementary child being drawn to a peer because that child understands something that their reasoning mind wants to know. Conversely, it could also look like a child being attracted to a peer because they are excited about a concept and want to share it. Having the freedom to converse with each other, children can gain an understanding of (and be fascinated by) the logic of a peer. Through these interactions they come up with a different strategy to demonstrate the concept and, as a by-product, expand their pool of strategies and deepen their own understanding. This is a wonderful process that happens when children can work and re-

The materials appeal to a diverse group of children

specific ability levels. But tracking in the U.S. has been associated with segregation and discrimination of children from nondominant ethnic groups or low socio-economic status. However, it continues to find its way back into classrooms in the United States, particularly in the area of math instruction, albeit with different nomenclature.

Montessori noted children’s social behavior in her scientific observations over many years and in a variety of cultures. What these children revealed to her was surprising and consistent: They knew what they needed, and they learned from each other. In present-day Montessori classrooms, children are at times attracted to peers and materials

ceive lessons with each-other because of their curiosity and attraction, rather than from a perceived notion of their ability.

Like Montessori, Carol Dweck, the proponent of a “growth mindset,” states that it is the teacher’s job to unlock those students who are not learning. Contrary to the “fixed mindset” mentality, the idea here is that there is no such thing as a “math person” but rather, all children are equally capable of learning math given the opportunity and access. Dr Danny Martin, a leader in math education and professor at the University of Chicago articulates the axiom that

continues >

Black Children Are Brilliant. (Video here: youtu.be/cdFMN4Rr_JI)

We guide by helping children become aware of the different kinds of capabilities, strengths and talents among their group. It is equally valuable to help them realize the rich repertoire of experiences each student brings from their cultural and ethnic backgrounds, as well as the multiple intellectual abilities which rich mathematical tasks require. Equal status is fostered when students are working in small groups on such tasks. The guide walks among them observing, giving feedback and changing expectations. This can be done by highlighting and making use of the contributions of individual students, especially those with lower social status among their peers because they have not been recognized as the mathematically “smart” ones.

The Montessori materials also support equity with their built-in control of error and their appeal to multiple modes and senses. These multi-dimensional materials are visually and tactically attractive to children, they feed their desire to move, and they provide opportunities for a sensory-motor exploration of mathematical concepts. The materials appeal to a diverse group of children. Children from cultures that stress visual, auditory, tactile or kinesthetic ways of perceiving the world or children whose language or dialect is different from that of the adults in their classroom, still have access and opportunity to mathematics via these materials.

The uninterrupted three-hour work cycle provides the time for children to extend their exploration. During these explorations, children learn, by experiencing, such concepts as squared and cubed numbers, commutative and distributive law of multiplication, or the measurement of a liter of water through such exploration. The process of trial and error, taking risks during individual and small group exploration

and making mistakes brings about learning.

A study done comparing Chinese and American teachers' understanding of fundamental elementary mathematics highlights the importance of such freedom. In the study, while the majority of Chinese teachers were enthusiastic about exploration of concepts on their own, even when unsure of an answer, most U.S. teachers held back in exploration and avoided wrong answers. A guide can draw their attention to the exploration children do and point out that such risk taking happens in the same way when they make verbal attempts at answering math questions in front of their peers. Errors are to be celebrated as pathways to learning.

Finally, then Montessori story-telling practice supports equity and inclusion in mathematics instruction. Besides the Story of Numbers, many elementary lessons either begin with a story or application of a concept to real life situations, or include a story about some aspect of the lesson. For example, negative numbers can be applied to penalties on a football field or to an overdrawn bank account. Telling stories to children that connect to the context of their culture presents an opportunity to build equity and inclusion. Encouraging them or their parents to tell such stories helps the reasoning elementary child to understand that mathematics is fundamentally related to the needs of human beings and it fosters the learning of mathematics. Research suggests that when problems are rooted in the contexts of learners, students can demonstrate much deeper mathematical understanding and their performance is also higher on traditional mathematical measures.

Dr. Montessori started with the child and came up with a method continuously cultivated by what the children showed her. Montessori public school educators and leaders are called to do the same. As Dr. Montessori stated,

“Knowing what we must do is neither fundamental nor difficult, but to comprehend which presumptions and vain prejudices we must rid ourselves of in order to educate our children is most difficult.” Montessori public school leaders must continue to observe the child and to be bold in stating principles and practices that move towards building equity.

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