

# MONTESSORI MATTERS

MONTESSORI ACADEMY OF LONDON

EXPECT MORE FROM EDUCATION

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## Math Matters - changing the conversation

### A message from Margaret Whitley

A big part of dedicating my career to Montessori has been a commitment to be thoughtful about conversations surrounding such an emotional topic: education. Notably, and since the 1960s, when the space race was a central concern, societies around the world were asking questions about how to ensure we were educating and nurturing children to solve the scientific challenges of the day. Math became a critical discussion point that continues today. Similarly, math as a practical tool for financial literacy, balancing a bank account or managing money is another ongoing discussion.

For me, I would love for the conversation to change to something bigger. I believe that math has the potential to support healthy learning of all types, to nurture strong work habits, to hone analytical skills, and to develop a general comfort with independent problem-solving that includes embracing mistakes and healthy risk-taking.

I was discouraged this past April, when our local public schools were featured in the *London Free Press*. A number of teachers were doing their Professional Development to explore how to better teach the concept of numeracy. For me

this seems narrow and diminishes the value of mathematical thinking that can reach more deeply than a right or wrong answer or memorization.

When popular discussion targets math, I find it often misses the merits of the processes and the neural benefits of breaking down numeric problems in a systematic and structured way: the power of mathematical thinking! These critical thinking skills are what's needed in these complex times.

*I want the conversation and our students to have the nimbleness to be open to the possibility and frameworks for problem-solving that mathematical thinking affords.*

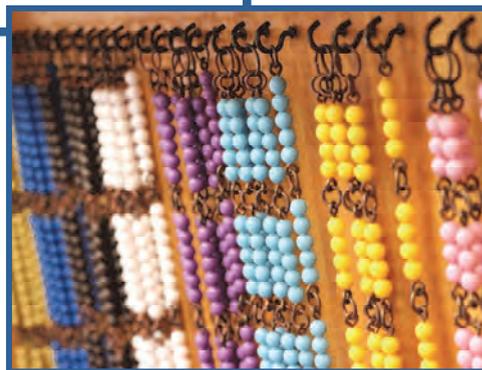
An example of proportional reasoning that was noted in the *London Free Press*:

**Q.** There are two puppies. One grows from 5 kg to 8 kg, the other grows from 3 kg to 6 kg. Which dog grew more?

**A.** The second grew more because he doubled his previous weight. <sup>1</sup>

When I read this problem I immediately asked if there was, in fact, only one correct answer. How was the term "grow" defined? If it is defined based on simply the addition of weight, did they not grow the same amount? Is it defined by percentage increase? If it is based on a percentage increase, the second one grew more. But, if it simply is amount of kilos gained they are equal.

In continuing to reflect and be thoughtful about alternative education and, specifically, a broader view on math, I want the conversation and our students to have the nimbleness to be open to the possibility and frameworks for problem-solving that mathematical thinking affords.



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## A hands-on approach to math counts

*Aerospace engineer and MA alumna thinks Montessori makes math easier to handle.*

Math is a subject that Montessori Alumna Jaclyn Robertson understands — and she understands it well. Whether it's in her professional life as an aerospace engineer or on her private time as she works to receive her private pilot's licence, math comes into play.

While she always excelled in the "subject," she credits the Montessori approach for helping students get a solid handle on math concepts.

"The lessons, especially in the early stages, were all about understanding the concepts instead of memorizing the rules," she explains. "This made it much easier and more fun to learn math, but also gives students a much stronger foundation."

She adds that the Montessori approach helps avoid the "I hate math" bias that some students develop — especially those who struggle with it. "Math was never treated as something that was too hard for some kids to learn... I feel that this means kids are less likely to get

frustrated and more likely to want to keep going."

Speaking of the desire to keep going, Jaclyn remembers a time when she was encouraged to spend time exploring a proven math formula that she wanted to disprove. "I was skeptical that (a triangle) was half of a rectangle, so I spent an entire afternoon drawing obscure triangles and calculating their areas to try to disprove the formula. Of course, the formula was right, but it gave me a better understanding of how it worked. That is something I can't see being allowed at most other schools."

That idea of letting children explore, question, try — and fail — is fundamental in Montessori. And it makes a difference. That, and the fun factor. When asked what her teachers brought to math

lessons, she says, "I think the biggest thing is that they made it fun... I remember best the (lessons) that were hands-on; we baked a giant cookie to learn about fractions or used a giant



piece of paper and cylinder to learn about Pi and how to calculate the circumference of a circle..."

The hands-on approach made math enjoyable, and, as Jaclyn says, "In general kids are more willing to learn what they find to be fun."

And that, as we all know, is not rocket science. •

## A closer look at math at MA

*Western researcher will partner with MA to learn about how we tackle teaching math*

For many years we have had student teachers, Western faculty members and parents who are involved in science and education who were intrigued by how we present math in Montessori. The more one comes to learn about our approach to mathematics the more it seems so logical to many. Sometimes, even when discussing a particular math concept, an adult will exclaim, "I finally get it" or "I would have done so much better if math had been taught to me this way."

After discussions over the last couple of years with Western about the specifics of the math program (although Montessori's comprehensive approach means subjects aren't taught in isolation) Dr. Immaculate Namukasa of Western's Faculty of Education will partner with us to conduct a research project with some of our own faculty to gain a better understanding about how we teach math in Montessori *and* how the faculty themselves were taught to teach math.

Next fall we plan to share some of our best practices with Immaculate to help more educators understand the tremendous

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# Math reflects Montessori at all levels

Math is a hot topic in the media, whether it's international research being done just down the street at Western University that looks at "how our brains tackle math" or provincially as school boards grapple with why so many students in the conventional education system struggle to learn math – and why so many teachers struggle to teach it.

It can be challenging to explain the Montessori Method of introducing math concepts because the strength of the students' understanding begins with materials unique to the philosophy. Montessori addresses the needs of different learning styles: auditory, visual and tactile. As the students move towards abstraction, they are less dependent on the materials.

The Montessori Method is child-centred, not teacher-centred. The adults guide students toward independent learning. The greatest benefit comes from *not* knowing the answer, and having the child realize that there are different resources that can help them find it.

"The natural progression of the math material and repeated use of them builds a great deal of self confidence in the child," explains Deborah Carver, a Casa teacher who has been with MA for 29 years.

## No "subjects"

Deborah notes how organic math education is, "The math curriculum is accessible to the child from the moment they join our Casa class. One of the key differences is that math is not taught as individual 'units' of learning that the students focus on for a few weeks and then move on."

Kerry Anderson, one of MA's Junior High teachers, agrees, "Because math is introduced at such a young age, the students don't even realize how much they know. It's natural. They live it." Kerry's daughters are in the Casa and Lower Elementary programs, so she sees it from the parent perspective as well. "(Math) is just part of what they do – a natural part of



Junior High students Malissa (left) and Geneva count money raised during a charitable giving event. They were responsible for preparing a cash donation to present to the charity.

the day. It's not treated as an isolated subject, and therefore they don't fear it. There's an enjoyment in problem-solving."

Kerry adds, "Typical of Montessori, math at the Junior High level blends with other subjects." ... and can focus

## Western research at MA

benefits of Montessori in general and, more specifically, our approach to math, a subject that seems to be the "Achilles heel" in conventional education today.

The study, Immaculate explains, "investigates the relationship between the mathematics teachers engage in and the mathematics with which they engage their own students." The researchers, she adds, have looked at this in government-funded schools in Ontario, and now wish to see how this is different – or the same – in Montessori schools.

The hope is that in explaining more to non-Montessorians about our approach to teaching, we can do an even better job of helping our parents understand the tremendous gift they are giving their children... and how it is a complete shift in thinking from conventional education.

It is also part of the Academy's vision to shape our world for the better. We and Dr. Montessori both believe that can be achieved by giving more children exposure to Montessori. Perhaps the day will come when many of our own teachers or the new crop of Montessori teachers are being sought by the publically funded systems in Ontario like many other jurisdictions around the world.

However, whether it is the research project next year or Montessori in the public system, we need to be sure that the integrity of the approach is maintained – and not used piecemeal. Only this will ensure the outcomes and benefits of a Montessori education are preserved. •

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*Margaret's Message—continued from page 1.*

So much of the Montessori math curriculum and material is about helping math to have a real context, to focus on the thinking processes associated with math, to encourage self-correction around mistakes in math. This is how the problems of today will be solved. And ultimately, many of our students in their post-secondary education pursue the sciences and math because of the love of the thinking behind it and the confidence they feel with the subject matter.

Additionally, so much is done in Montessori, particularly in the Toddler/Casa levels that prepares the students for math and problem solving to come. Starting at Toddler, students have opportunities to develop concentration and follow the detailed steps of processes through the practical life activities.

These opportunities for refinement of the senses which assist with discrimination through the sensorial materials in Casa further prepares the mathematical mind before they even start comprehending numerical quantities. The mathematical mind in Montessori is supported from all the developmental needs of the child in a comprehensive and cumulative way that aligns with their development.

Maria Montessori authored a book called *Psicoaritmetica*,

which explores the idea that math is more than just the learning of facts but that arithmetic has the potential to develop the whole child, specifically the mind.

According to author Michael Duffy: "In other words, the purpose of her educational program and the mathematics curriculum in particular was developmental...Specifically, the whole curriculum was designed to develop the child's mathematical mind...Montessori called the materials she developed for learning arithmetic a 'gym for mental gymnastics' to assist children in learning to think and reason logically and clearly."<sup>2</sup>

So, while the public debate goes on about teaching mathematics and how to improve the quality of teaching math, I look at the work our teachers do daily in the classroom. Maria Montessori had this figured out years ago.

Whether it is 2015, immersed in technology, or 50 years ago when the space race was just starting, a mathematical curricular approach that embraces thinking and problem-solving in a real way will continue to serve our students for years to come, and be a comprehensive solution to present mathematics to children of all ages. It has served our students for 47 years!! •

1. Dubinski. Kate, "Teaching the Teachers," *London Free Press*, April 20, 2015, p. A3

2. Duffy, Michael, *Math Works*, 2011, p.7

*Math reflects Montessori at all levels* Continued from page 3

on practical life skills – such as learning about interest rates and mortgages.

**At the child's own pace**

The mixed-age classroom also benefits students at all levels; students who excel in certain areas can support younger classmates or those who might need help with certain math concepts. "Every child is doing the best that they

can," explains Deborah, "At the Casa level, a four-year-old can be working on solidifying their understanding of numbers one through 20, or they could be adding numbers into the thousands!" They move at their own pace.

Deborah adds, "the environment is non-competitive. The teachers are trained to recognize when a concept is understood by the child and therefore

they are ready to move on. Likewise, the teacher is very much aware of the child who is struggling and will offer additional support, a variety of materials that present the concept and repeated opportunities to master it."

This opportunity to master skills is typical of Montessori and yet another example of why the Montessori approach is so effective. •



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