

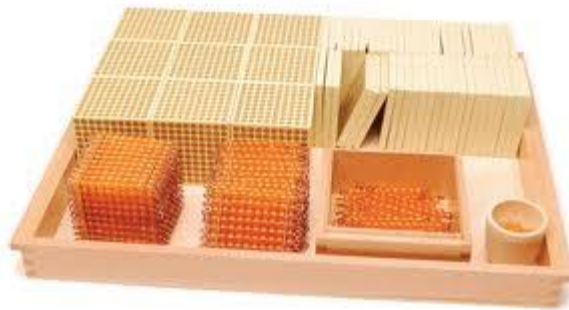
How to Help your Child Succeed in Montessori Math in the Classroom and at Home

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There is truly nothing out there that I have come across so far in my years as a teacher that teaches math concepts in such a wide variety of visual and tactile ways, and thus can speak to such a wide range of learning styles, as Montessori math materials can. The following pages will briefly outline some of the concepts taught by the materials that CMP students will utilize most frequently in their Math Albanesi, Accelerated Math, and other classroom math exercises. My hope is that by demonstrating how some of these concepts are played out, I will be able to help you support your child and the other learners when you volunteer in his or her classroom. In addition, this will generalize some of these concepts and give parents ideas for materials you have around the house, so that you can practice math skills with your child in a Montessori-like format.

Here are some of the most common materials that the students will be using in the classroom:

The Golden Beads



The Golden Beads illustrate the base ten system of numbers in a very clear visual way (a ten equals ten ones, or “units,” a hundred equals ten tens, etc.). The child can see that ten hundred squares, when stacked on top of one another, look exactly like a thousand cube. Therefore, when performing “regrouping” steps in addition, subtraction, multiplication, and division operations (otherwise known as “exchanging” or “borrowing”), he or she has a concrete understanding of why it's acceptable to borrow one number from the thousands column, for example, and add ten more to the hundreds column before subtracting. On an even more basic level, though, the child is getting the concrete concept of what 764 looks like, and why it's *seven hundred sixty four* rather than *seventy-six four* or *seven sixty-four*.

How to duplicate the Golden Beads at home: Make “golden beans” at home by using one bean for each “unit” (one), a popsicle stick with ten dots drawn on it for each ten, a paper square with ten rows of ten dots on it for each hundred (or glue ten popsicle sticks together, with ten dots on each stick), and a paper cube with ten rows of ten dots on each side with each thousand. Practice making equal exchanges with your child (e.g., “You want to trade me three units for one ten? Is that fair?”).

The Wooden Numeral Cards



The wooden numeral cards help the child move from the concrete *three thousand cubes, two hundred squares, one ten bar, eight unit beads* to the abstract **3,218** or **three thousands, two hundreds, one ten, and eight units**. The use of color is prevalent throughout Montessori math materials as a subconscious strategy for helping children memorize place value. The left brain sees 3,218, while the right brain sees green, red, blue, and green. By integrating left- and right-brained approaches, we are not only creating balance and helping children use their whole brains to memorize place value, but we are finding a way to access right-brained learners who typically struggle with the predominantly left-brained field of mathematics.

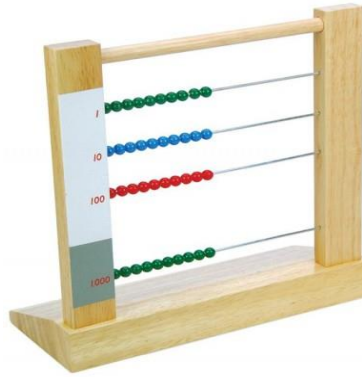
Using color for place value at home: If your child struggles and sees 764 as *seventy-six four* rather than *seven hundred sixty-four*, try replicating the color scheme we use at school when you practice math at home. Trace over thousands and units with green, hundreds with red, and tens with blue. You can even cut out strips of paper and replicate all the color-coded numbers from 1-1000 as pictured above, and have your child practice covering up the two zeros on 700 with the 60, and covering the one zero in 60 with the number 4.

The Stamp Game



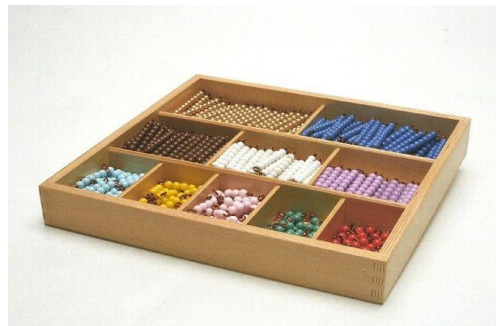
The Stamp Game works exactly like the Golden Beads, but is slightly more abstract (a ten is represented by a blue 10 stamp, rather than ten units, etc.). The students “build” the numbers with the stamps, and can then add, subtract, borrow, regroup, etc. The problem represented with the stamps above would be $3,231 + 1,323$.

The Bead Frame



The Bead Frame works similarly to the stamp game, in that the student can “build” numbers by sliding the appropriate number of units, tens, hundreds, and thousands over to the right. As with the Golden Beads and the Stamp Game, numbers can then be added, subtracted, and multiplied, by sliding over more beads and borrowing/exchanging as necessary. One of the major concepts that this material reinforces is the importance of starting math operations in the units column (note that the unit beads are at the top). If a child is always trying to add, subtract, or multiply numbers in the thousand columns first, the bead frame might be a good material for him/her to work with for a while.

The Colored Bead Bars



The colored bead bars provide a fantastic approach to memorizing things like quantity, proportion, greater than/less than, multiplication facts, and squaring numbers. While the left brain sees $2 + 4 = 6$, the right brain sees green bar + yellow bar = purple bar. While the left brain is memorizing 3×7 is 21, the right brain is seeing that 3×7 taking 7 of these pink bars out of the box, or taking 3 of the white bars out. Subconsciously, the students are also learning that 3×7 takes up the same amount of area as 7×3 , thus reinforcing geometry concepts like area and equivalency. They can see how 5 five bars make up a perfect blue square, and thus understand *concretely* the concept of what *five squared* really means. The child is not just *memorizing* $3 \times 7 = 21$ or $5 \times 5 = 25$; he/she *concretely knows it to be true*.

Duplicating the colored bead bar concept at home: Use markers to make dots of different colors on popsicle sticks (see colors in photo above). You may want to cut the popsicle sticks down to size. Make several of each number so that the child can practice his/her multiplication tables. Give your child as much time as needed to count every single dot at first, if need be. The memorization will come naturally in time.

The Plastic Fraction Insets



The plastic fraction insets help students visually understand concepts like equivalency, reducing fractions, adding and subtracting fractions, etc. They can put two halves, three thirds, four fourths, etc. together and see that they make a whole. They can lay six eighths out on top of three fourths and see that they are equivalent. They can add $\frac{2}{8}$ to $\frac{4}{8}$ by piecing them together, and *then* reduce them. The plastic fraction insets take all the frustration out of fractions, and make them accessible in a visual and hands-on way.

Practicing fractions at home: Make fractions fun by cutting up food like pizza, apples, etc. Reinforce concepts like the statement that *fractions are equal parts of a whole* by showing how you cut an apple into equal pieces. You can even go one step further and show how one number can be a fraction of another number by dividing M&Ms or peanuts or pieces of popcorn into little cups or bowls (for example: 4 is one third of 12). Regardless of what household tools you use, it is essential that you help your child understand fractions in a concrete way before he/she will be able to grasp them abstractly. When your child moves on to multiplying and dividing fractions, adding fractions of different denominators, etc., he/she will be able to do these things more quickly and confidently because the foundational knowledge base needed to tackle these more advanced operations without insecurity has been accomplished.

One Last Note

One of the Maria Montessori quotes I live by is, “Never help a child with a task at which he feels he can succeed.” As difficult and counterintuitive as it may seem, *try to refrain from intervening when you see students struggling and/or making mistakes. Learning from their mistakes will help them not only sharpen their math skills, but is in fact a crucial coping skill that it is essential to master.* Montessori materials will help the child learn to self-correct, and more often than not, if we stand back and give the child the opportunity to make discoveries about where he/she went wrong and how to fix it, we will be giving that child a gift that will last a lifetime.

I hope that this packet has been informative for you. At the very least, what I hope you will take out of it is that Montessori stresses the importance of working with *all* mathematical functions, whether they be addition and subtraction, manipulating fractions, telling time, working with money, etc., in a concrete way before ever moving on to abstraction. As a Montessori graduate myself, I can tell you that working with the Montessori math materials day in and day out, allowing the materials to help me correct my own mistakes instead of being corrected by an adult, has helped me to become a confident and independent math thinker. When I encounter a math problem, I will *always* try to solve it myself before asking anyone for help. I can say absolutely that I have Montessori to thank for this. If you get a chance, take a few minutes to have me explain to you how the Trinomial Cube, a material I worked with in kindergarten, prepared me on a subconscious level for high school algebra and geometry. I promise you, it will blow your mind!