Math in the Montessori Classroom

How does a mathematical mind develop? Math is more than mere rote memory of numbers. As difficult as we were led to believe mathematics is for the child, it is a concept easily understood by the child when presented concretely and systematically. In the Montessori classroom preparation for mathematics begins even before a child recognizes numbers. The child prepares himself indirectly through the practical life and sensorimotor activities. The study of mathematics also opens him up to the world.

Practical Life is abundant with math, as is everyday life. The child cutting an apple is performing real life fractions. The child folding is experiencing fractions as well as learning about triangles and rectangles. One of the first developmental activities a child will do is to sort. This is natural because of a sensitive period of order. Sorting and categorizing are important mathematical basics. Setting the table is all about 1 to 1 correspondence. More importantly, practical life trains the spirit of the child for the inner sense of order necessary to do math. The child washing the table or scrubbing a chair is learning sequencing skills: the steps he needs to follow and in what order. He is also learning placement: first the towel on the floor, then the brush, soap, sponge and towel. With flower arranging, he is learning to estimate the amount of water needed in the small vase for the flower. Activities in practical life such as using tweezers and eyedroppers develop and refine the fine motor skills needed for mathematics work such as the snake game. The practical life through repetition teaches the normalized child how to economize his movement and this becomes key in math. We provide an environment conducive to experiments which leads to learning.

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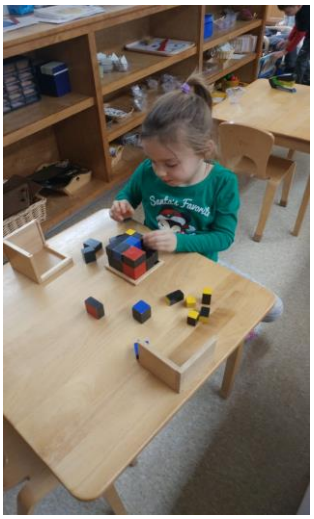
The sensorimotor curriculum is vital in developing the awareness and observation skills needed for mathematics. In the sensorimotor area there is emphasis in gradation. The gradation allows the child to experience using the senses the slightest differences in so many different ways: longer, longest, darker, darkest, biggest…smallest. This builds a strong foundation for observation an innate understanding that in math there are many #'s between 1-9,000 and the difference between one is small "one". The Pink Tower is an introduction to the decimal system and also to cubing. The binomial and trinomial cube are concrete algebraic formulas. The geometric solids allow us to hold a cube and an ellipsoid on the palms of our hands rather than imagining them as pictures in our heads.

Formula for the cube $(a+b)^3$

A cube composed of twenty-seven wooden blocks which fit together to

form the cube of (a + b + c). Each face that is "a^2" is red, "b^2" is blue, and "c^2" is yellow and all other faces are black.

a = hundreds
b = tens
c = units



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The Montessori mathematic materials allow the child to experience concretely therefore, allowing an easier transition into abstract concepts. The Montessori math materials are tangible expressions of abstract ideas. The child moves from the sensorimotor materials by way of the red rods which allows him to experience short and long concretely, now he re-experiences this again in a new light with the red and blue rods. 10 is more or longer than 5, 1 is very little compared to 8…etc. The math materials are sensorial. The child sees 1000 beads make 1 cube and feels the heaviness and lightness of each. The child also feels that 10 is more than 7 when he holds all the spindles in his hands. The concept of zero becomes crystal clear when there is nothing in the compartment of 0. Montessori knew the child could understand 1000-9000 the way he could understand 1-9, and the 9 layout only reinforce this concept. The hundred board does more than teach 1-100, it can teach skip counting families of 10, 20, etc. and act as an introduction to multiplication. Multiplication and division don't become separate entities (though they are certainly different) a child will understand that to multiply is to add many times and divide is to subtract many times. This understanding becomes internalized without the child becoming aware of it. The bank game (created by children) allow the child to experience what exactly is 5,361 and the concept of carrying over is easy when the children exchange beads for bars and bars for squares and squares for cubes. Once the child experiences the bigness of numbers he can think more abstractly and his movements become more

Tips for Math at Home

- Count everyday
- Set the table for one on One correspondence
- Use movement while Counting, steps, jumping.
- estimate

economized and an example of this is the stamp game, which is a very small and sophisticated version of addition without the concrete golden beads.

Cards and Counters:

The child matches quantity to the numeric symbols.

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"This system in which a child is constantly moving objects with his hands and actively exercising his senses, also takes into account a child's special aptitude for mathematics. When they leave the material, the children very easily reach the point where they wish to write out the operation. They can thus carryout an abstract mental operation and acquire a kind of natural and spontaneous inclination for mental calculations."

Quote by Maria Montessori

Mathematics prepares the child to study Cosmic Education. The concept of eternity is easier to understand when one understands the infinity of numbers. Math allows the child to experience wonder in the universe when he realizes how small a grain of sand is compared to all the sand to put together in beaches and deserts. He learns to wonder at the uniqueness of the geometrical patterns of snowflakes. He begins to observe the symmetry of natural wonders such as leaves and butterflies. There is one particular specimen of butterfly and then there is the entire species of butterflies, made of thousands, perhaps millions of butterflies. He learns that the love for one butterfly translates into the love for infinite number of butterflies. Just as 1 cube of 1000 beads are really made up of many single beads. So too, we are all individuals making up the whole planet earth. Mathematics is more than numbers, as the child's knowledge and awareness for the world grows so will his understanding of mathematics grow until he no longer considers it mathematics. Math is the symbolic expression of the relationship of everything living. It is the universal language of man and the abstract science of love. It is the invisible thread in the web of life.