

Arithmetic in the Primary Montessori Years: An Overview Focusing on the Lower Primary Years

by Michael Dorer

Michael Dorer, returning as our 6+ speaker at MANZ Conference 2019, has sent me this article which he has just written. I am publishing it in two parts; the second part will be published in July 2019 *e-zine Informed*. This article is appearing in the Winter 2019 edition of *Montessori Leadership* and they have granted permission to MANZ to use it. Therefore, I would like to acknowledge the International Montessori Council and their publication, *Montessori Leadership*.

In the current climate of quality assurance, accountability, ratings and even marketing, the phrase 'best practice' is being heard more often than ever. So, what does this actually mean? How can we do our best and why do we want to?

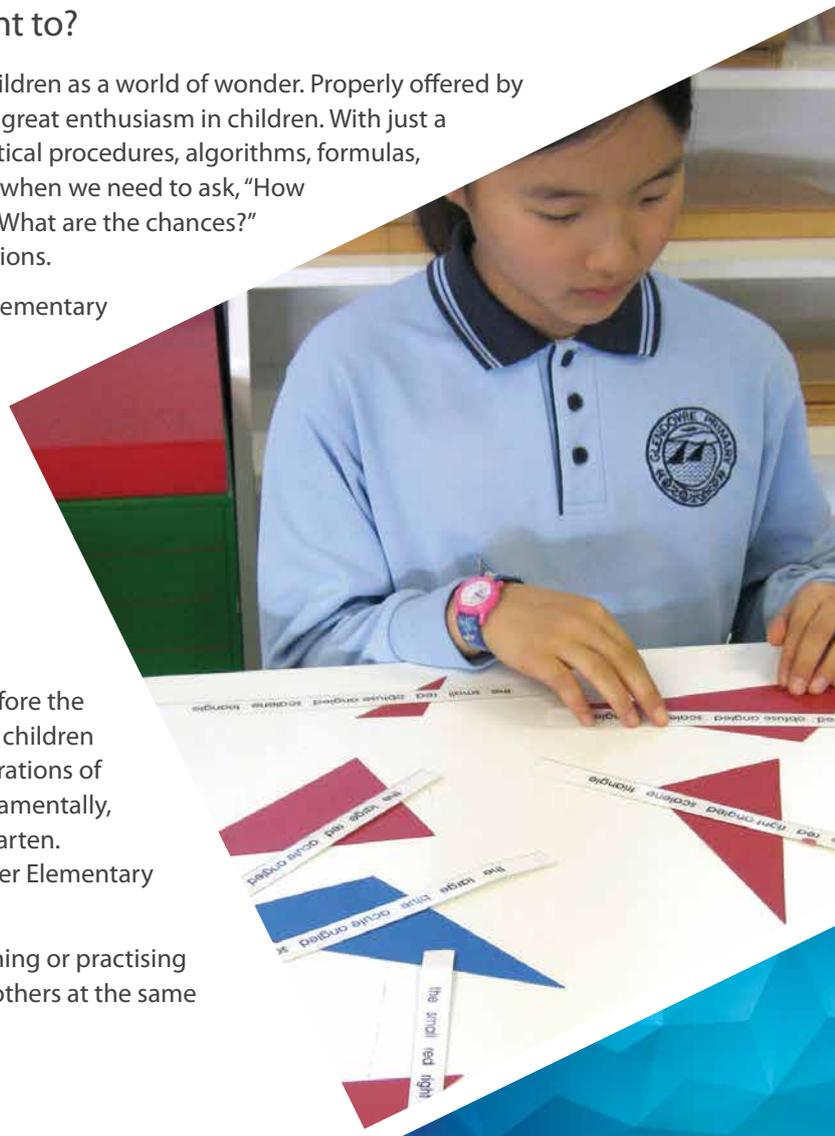
In the Montessori program, mathematics is introduced to children as a world of wonder. Properly offered by Montessori guides, mathematical concepts should generate great enthusiasm in children. With just a few numbers at their command, children discover mathematical procedures, algorithms, formulas, and geometrical figures. Mathematics also serves our needs when we need to ask, "How much?" "How many?" "How large?" "How far?" "How fast?" or "What are the chances?" Mathematics is a tool to answer these and many other questions.

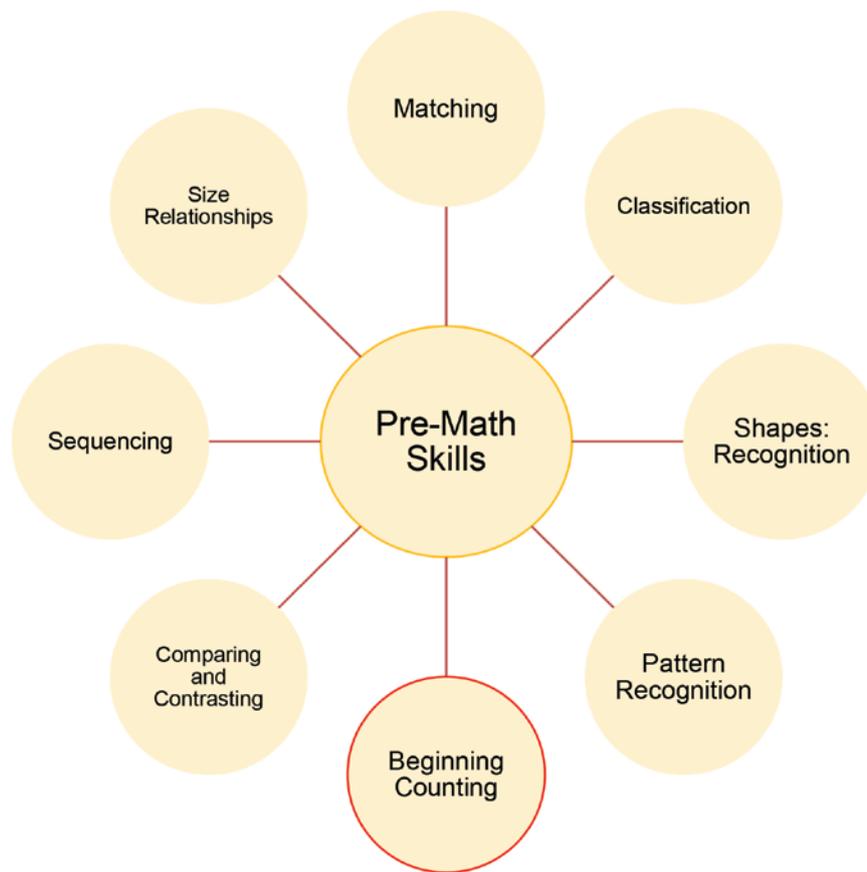
Montessori Mathematics is complex, divided into two complementary parts: arithmetic and geometry. Like geometry, arithmetic is spread out over the six-year Elementary period. In most Montessori teacher albums or teacher manuals, there are literally hundreds of presentations and exercises in arithmetic and geometry. In this article, we will look at the key ideas that underpin arithmetic work throughout the Montessori Elementary program, with a particular emphasis on the six-to-nine-year-old level, or Lower Elementary.

Pre-Math Skills

Mathematical thinking, including arithmetic, begins long before the primary school years: there are several fundamental abilities children need to understand to carry out the basic concepts and operations of Elementary arithmetic. These are called *pre-math skills*. Fundamentally, these skills should be introduced before and during kindergarten. However, they must be reviewed and maintained in the Lower Elementary class to ensure success with the arithmetic curriculum.

There is considerable overlap among pre-math skills. In learning or practising any of them, children are likely to be engaging some of the others at the same time. The eight essential pre-math skills are as follows:





Matching

When two (or more) items or amounts are matched, it is called pairing or one to-one-matching.

Classification

This consists of establishing a set of categories and placing items in the appropriate category. The particular items or objects are unimportant; the mathematical point is the act of classification, or sorting, itself.

Shape Recognition

Although identifying and naming shapes technically lies in the realm of geometry, fluency in these skills leads to better work in arithmetic. This is because naming shapes is a form of classification, and also because arithmetic and geometry overlap significantly.

Pattern Recognition

Pattern recognition is the ability to identify regular arrangements of numbers, shapes, colours, sounds, or other characteristics in objects, words, designs, or arrays.

It is perhaps one of the most important pre-math skills, as well as a continuing mathematical skill. Recognising patterns is essential in understanding all mathematical systems. It allows us not only to see underlying arrangements or plans, but also to expect and predict what is coming.

Comparing and Contrasting

Comparing consists of finding similarities between various objects or items. Contrasting, on the other hand, focuses on identifying differences.

Sequencing

This consists of putting things in order. These may be events that take place over a time period, objects differing in dimensions, levels of sound produced, varieties of texture, or intensities of colour, to name a few examples.



Size Relationships

This is a special type of comparison or contrast focused particularly upon sizes and/or quantities.

Beginning Counting

Considered an early arithmetic skill as well as a pre-math skill, beginning counting refers to counting from 1 to 10 or from 0 to 10. It includes developing an understanding of the idea of quantity, numerical sequence, value, name, and written numerals.

Even in the early Children's House years, children are prepared for beginning counting through the Cylinder Blocks, the Pink Tower, the Brown Stair, and the Red Rods, each constructed in a series of 10. The children absorb the concept of 10 as the base of the decimal system. Thus, readiness for more abstract counting is nurtured.

Edouard Seguin, known as the father of special education and a great influence on Dr Montessori, identified the first real difficulty in formalised arithmetic as counting itself. Seguin realised that very young children counted by merely repeating the names of numbers without understanding the meaning of quantity. When he tried to teach children with special needs, he found that they could not go beyond the unit to think of groups of units. Thus, he developed a set of rods of different lengths, each rod representing a different quantity that could then be given different names. The units were physically bound together to form the groups of numbers 1-10. Montessori adopted Seguin's Number Rods and they are still used today as the first Montessori material to introduce beginning counting. They are the first solution to the problem of understanding quantity and its relationship to number.



Michael Dorer

Michael Dorer is an internationally-trained Montessori educator, specialising in Montessori curriculum and materials, and Montessori teacher education. He has worked with children from toddlers to middle schoolers in Montessori education beginning in 1969, and with teaching graduate student adults in Montessori education since 1978.

Michael's educational background includes a doctorate in Instructional Leadership, and Montessori credentials from both the American Montessori Society and the Association Montessori Internationale. Michael wrote the charter for the world's first Montessori charter school, and also has broad experience in working with public and charter Montessori schools.

Michael has served as President of the International Association of Montessori Educators, the Minnesota Montessori Alliance, and The American Montessori Society; with extensive time on each of their boards.

Michael has written and published Montessori album textbooks. His latest book is The Deep Well of Time: The Transformative Power of Storytelling in the Classroom from Parent Child Press.

Michael is the Founding Director of the Institute for Montessori Innovation at Westminster College in Salt Lake City, UT, and is past Director of the Center for Contemporary Montessori Programs at St Catherine University in St Paul, MN. He is presently a Senior Consultant for The Montessori Foundation.