Montessori and Tools for Life

An interview with Henk Barendregt

Henk Barendregt is a prominent Dutch mathematical logician, chair of Foundations of Mathematics and Computer Science at Nijmegen University, the Netherlands, and adjunct professor at Carnegie Mellon University; in 2002 he was the recipient of a Spinoza Award, the highest scientific award in the Netherlands. He has also gone through Montessori from 4 to 17. Ahead of our meeting he had answered some preliminary questions about his experience and connection with Montessori, revealing an unequivocal and passionate appreciation of the Montessori approach. At sixty some of his recollections of his Montessori school years seem as vivid and vital as at four. He remembers the engaged tranquillity when he first set foot in his Montessori classroom and likens it to the feeling of entering a temple of serenity.

We asked Annemarie Moorman, a former Dutch teacher trainer, and frequent contributor to the magazine of the Dutch Montessori Society, to quiz him some more. We travelled to Nijmegen University, and met in the brand new Science building, showing off its piece de resistance: a 100 kilograms Foucault pendulum hanging from the ceiling of the 14 metre high entry hall. Henk Barendregt occupies a book- and plant lined study in this building stripped of "pretty" decorations. As we walked in, he was unpacking, with great satisfaction, a collection of miniature geometric shapes just ordered via the Internet.

He spoke to us on the insights and independence gained from Montessori education, the beauty of mathematics and his outlook on life inspired by Buddhism.

From Concrete to Abstraction

Most people appear apprehensive about abstractions, but Henk Barendregt recalls with fondness his first *encounter* with a materialized abstraction: having to learn to work the zip dressing frame. Demonstrating the zipper on his cardigan, he revels 'isn't this beautiful, two pieces of cloth to be joined via the zipper, and should a piece of cloth get caught, we have a perfect control of error.' He recollects reading an article by Annemarie Moorman some years earlier and thanks her for pointing out so clearly that the control of error only works when the child has the ability to recognize the error, and thus acquire a new insight. The error acts like a guide, so that the child knows how to be heading in the right direction. By that token, material and the developing mind go hand in hand. His own mastery of the zip was sensational. Before, his mother had to help him get dressed. 'I can still see myself standing there, little arms outstretched, waiting. Now I was capable of doing it myself, and it dawned upon me "great, school will make me independent."'

His cousin always argued that dressing activities should be offered in context, as the degree of abstraction would be too great for children; she promoted using a doll. Barendregt counters with 'working with a doll will lead to play, whereas you are supposed to focus on and master the task in hand. Work is a moment of utter concentration, leading to the essence of understanding.' He knows that most people will try to question the validity of the dressing frames. 'They'll say the frames do not match the exact movements of getting dressed in real life,' but he would like to turn the tables on these criticasters by drawing a parallel with hypnosis glasses. 'When you wear those, reality is overturned: your right hand suddenly

appears to your left, and if you want to grab it you'll miss. But only after an hour or so our brain is capable to retranslate the images into a new reality. Our brain is an amazing instrument. Dealing with the abstraction of a dressing frame is truly not that difficult.'

The connection with mathematics is easily made, being made up of abstractions, and the absolute right and wrong. 'Maria Montessori made many choices where the material can only be right or wrong. As soon as you have experienced that sensation, you are capable of doing things whose outcome is not so black or white. That first experience of truth will give you a wonderful sense of stability; it leads to self-confidence and for these are things I am still grateful.'

Balance

The importance of sensorial development Barendregt immediately relates to Buddhism. 'It is so important to be able to meditate, to truly connect with your senses, a source of strength in times of adversity. If your only strength is rooted in concepts, your basis in life is fragile, and you can easily lose your footing.' He agrees that the development of the senses helps children get to know their environment, and that the development of the mathematical mind occurs not only through the material but through everything on offer. Not only do the children learn to see the world better, they also find a sure footing, a balance, or equilibrium. 'It could very well be the definitive basis. Our consciousness is made up of oscillating flashes; we have to create our consciousness through our neurons, and these flash and transmit. We have some one hundred billion (10^{11}) neurons with which we have to create something stable. That is partly achieved by how our body feels, our thoughts, our feelings. Our bodies are all sensorial, and feelings can either be pleasant or unpleasant. Finding a balance is at the basis of life, feelings of safety and security. Developing the fine motor sense also helps. I remember tracing the flower petals, and then colouring them. Mario Montessori once told me that many people criticize this activity, claiming it does nothing for creativity, failing to realize that it is intended to refine the motor sense for writing, rather than creativity. Writing is such a delicate movement and so crucial in the development of the hand.

Rituals

Annemarie Moorman observes 'you are not interested only in arithmetic and math, but in the integral aspects of Montessori. You enjoyed the work because it was predictable. You were offered a ritual.' Barendregt nods, 'this is demonstrated beautifully in the book *The Little Prince* where it reads "il faut des rites." We need rituals. As the Fox says to the Little Prince "It would have been better to come back at the same time of the day, For instance, if you come at four in the afternoon, when three o'clock strikes I shall begin to feel happy. The closer our time approaches, the happier I shall feel. … But if you show up at any odd time, I'll never know when to start dressing my hearth for you..." And I think that looking forward to a presentation creates the same expectation.'

'I can also remember having to learn the adjective; our teacher would ask me "go and fetch me the chain." And I would come back with it, and she'd say "no, not this one." Only after having gone through this about ten times, she would say "yes that is the one I want." And should that chain be blue, she would say, "Yes, I wanted the *blue* chain." That gives you

a feeling of the importance of the word blue. We all loved it. I particularly enjoyed this as a ritual, a game. In this instance, the form had overtaken content, but the understanding did come at a later stage.'

The Permanence of Mathematics & Buddhism

'I gained an understanding from Montessori materials which was permanent. If understanding is only partially correct, then you need to sharpen and deepen it. A rectangle you can hold up in four different ways, and insert in four different ways. If it had not been for the knob, you could also have inserted it upside down. All those different ways to put the rectangle back into his "cot." These are things seen, felt, understood and remembered [misschien: loved, in 'plaats' van 'remembered'? Met een knipoog naar het liedje 'feel me, kiss me, love me'.].'

He pulls from the shelf his book *The Lambda Calculus, its Syntax and Semantics* and reads out the dedication: 'To my mother, who gave birth to me and showed me the use of mindfulness; and to Maria Montessori who taught me with her teaching and introduced me to the experience of truth.'

Barendregt considers mathematics to be much wider than numbers and form, something strongly realized by Montessori. 'She understood the essence of mathematics and was capable of expressing that through the materials. Some of the Montessori materials were pure bliss, such as the cylinder blocks, and the bead material representing decimal numbers. At home my father had taught me the algorithm of adding numbers. I could do it, bud did not understand. The golden material showed me in an instant the meaning of the algorithm, and that it was correct.'

Montessori understood the essence of mathematics

'The control of error is a wonderful aspect, especially for mathematics because it is such an objective science—unlike language. MathInderdaad een uitnodigend lied.
Youtube kon dit zo voortoveren.
ematics is more essential, also to life. It is permanent, and conceptual, because it is a human invention."' He draws a chart (inspired by the deeper Buddhist Teaching) to quickly illustrate this point.

	Temporary	Permanent
Absolute	Body/mind	Nirvana
Conventional/conceptual	Dress	Mathematics

'Mathematics is permanent: the circle existed before we came into the world; the trinity was there, before life. A dress is a conceptual notion, subject to changes in fashion. Body and mind are absolute. Similarly, a feeling of skin irritation, an itch, is absolute. The smell of a rose, a sensation, is absolute. Whether you use the word smell, perfume, or odour to describe

the sensation is purely a convention. And yet the content of that notion is crucial to our lives —which is why our senses are so important—they are the gateway to making contact with the absolute world. Mathematics offers some sort of hold, for it is permanent. Finding a balance within your body and mind offers more safety and security. Yet our bodies and minds grow old, and we die. Nirvana is unchangeable; whether you are young or old, it is not connected to yourself. In order to attain Nirvana we need to temporarily disconnect from ourselves. It is the empty background in which we percieve consciousness as a process of fluctuating forms.'

'There are so many aspects of Montessori that I can relate to Buddhism: the rituals, the abstractions, the materialized abstractions (a brilliant term, by the way), mental development, concentration and discipline. Sila, samadhi, paññña—discipline, concentration and insight & wisdom—all connected. Once you have experienced that, you will further develop discipline with the aid of your insight and concentration. This, in turn, will lead again to deeper concentration and greater insight.'

'It builds your *sila*– mental discipline that prevents you from daydreaming, the mindless talk from which there seems no escape—we all know it. An interference. Perfectly enjoyable on the odd occasion, but it is not the real thing for we are not fully aware. And, ideally, we must strive for complete awareness for then our suffering diminishes. If we are unaware, we identify with things, things that are changeable: if you hold on to illusions, you are buying a sure connection to suffering.'

'My first introduction to Buddhism happened at the Montessori Lyceum (secondary school): in our first lesson, my Dutch teacher held up something, and asked what it was. It was so unmistakably a piece of chalk that no one dared answer. He then threw the piece against the heating and hundreds of little slivers flew about. He asked: "what is it now?" This intriguing question made me curious: it turned out to be connected to Zen Buddhism. When I was a post-doc in California, I met some Zen monks and took meditation classes with them, and to my delight rediscovered the mat. This is my world, no one will disturb me here.'

When I took to meditation, I rediscovered the Montessori Mat

The child loves silence in itself; however, there is something to add: that silence disposes the soul of the immobile being to something special, in other words silence does not leave us as we were before. This something special is certainly not an acquisition of culture because complete inhibition is an external state, but it acts upon an internal state. All thinkers and mystics are said to have sought silence because it predisposes to the interior attitude of meditation. As a

> beautiful environment with light, colour, perfume can have an influence on poetical inspiration, so silence gives us above all the surprise of possessing within us something which we did not know we had, spirituality, and the little child tends to feel this interior life, because he is by excellence the interior being. No doubt the child who has experienced it is no longer the same child, but a soul expecting something.
> Maria Montessori

More Abstractions

Barendregt points out that initially language is perhaps even more abstract than mathematics. For instance, the letter L is an ultimate abstraction—far more than the number 3. 'The L is just a token. The way Montessori has concretized abstractions is brilliant, she has made the abstraction familiar. Look at a notion like "Thursday"—so complex, yet most of us are able to grasp it. In that light we should be able to do better at mathematics, but we fear abstractions. Abstraction removes the idea. We try to fill the void with ideas; if we abstract we can no longer perceive the idea, a frightening prospect. We cling to comforting concepts. Zen Buddhism will try and overturn our preconceived ideas and disrupt our traditional way of thinking. I see fear of abstraction as fear of emptiness.To *abstract* literally means "to pull away," a threatening experience. That is why people are afraid of reductionism, a big mistake. Reductionism is beautiful: all of our science is based on it. First you examine the smaller parts to gain a better understanding of the whole. Montessori is not afraid to introduce abstractions to very young children. I think she is an absolute genius to have understood this.

Falling Standards

Barendregt is concerned at the falling standards in Dutch education. 'A colleague of mine has researched the Maths levels of Dutch students at age 17, and found them to be more or less comparable to the exit levels of elementary school students in the state of California.' He acknowledges that social and presentation skills are indispensable, certainly in today's society, but cannot suffer gladly the drop in academic standards. 'Our society says it needs highly trained people, and in order to achieve that standards are lowered to the point where 95% of secondary school students leave school with a diploma. It is like a government that decides to print money, when there is none left. It leads to gigantic inflation.' And with some frustration, Barendregt adds: 'politicians aInderdaad een uitnodigend lied.
Youtube kon dit zo voortoveren.
re rigid, and they allow the dumbing down of today's generations. Tailoring education to your average student, standardizing the level across the board, does a disservice to all students, regardless.'

With realistic Maths being widely embraced, there has been a lot of pressure on

Dutch Montessori schools to follow in the footsteps of traditional schools. Barendregt had been very concerned at this development, but relieved that Montessorians were finally standing their ground. He dismisses realistic maths off hand, arguing that it basically trains linguistic skills—'you have to wade through a sea of words before you can understand the object of the exercise.'

Cosmic Wonder

'Some time ago I watched a film on the importance of volcanoes and lava streams. If it weren't for volcanoes, erosion would cause the entire world to become as flat as our own Low Countries, and at 100 meters below sea level into the bargain. Thanks to the eruptions of volcanoes and the sliding of plates beneath each other, land gets elevated: that's why we are still around. Amazingly, there is a bacteria which lives many metres under the seabed, feeding on whatever waste manages to penetrate. Its metabolism is very slow, and it therefore takes the bacteria one thousand(!) years to replicate.

'These bacteria will survive comet collisions and atomic wars. I find it very touching that such a small organism needs one thousand years to replicate itself. I am also very touched by the fact that our Sun, who can only create elements up to iron. Our bodies, however, also need zinc. And this essential element is blown over from the stars. Supernovae that implode into a black hole produce so much dust containing zinc that they can provide us with this vital element. The saying 'we are made of stardust' is undeniably truthful. I like to think Montessori would have enjoyed that: she was filled with such a sense of wonder.'

Peace

'I do not only admire Maria Montessori for the depth of her intellectual accomplishments, but also her political agenda is fascinating. To create a better world through education. If you raise discontented people, you create room for politicians with distorted ideas that can build on those sentiments of discontent.'

'We can accept a child's occasional tantrum, it may still be relatively harmless and innocent, but thwarted adult behaviour can lead to warfare, something very guilty—and I regard it basically as the covering of our fears of the great void.'

'We are attached to worldly goods and ideas. If you can let go, life is less painful. In Buddhism, there is no God to give us a particular goal, we have to find one for ourselves, "let's lead a peaceful life." It is a formidable task to be at peace with yourself, others and the universe: to let go, not to be in charge, in the realization that all our lives we have been trained to rule and dominate. Living peacefully and happily with that thought leads us away from war.

We need suffering to decondition, and to engage in meditation. This is best done in a clearly defined context, for instance in a monastery, a completely prepared environment. Every time you meet your ego, it throws a spanner in the works, and you need to go back and repeat—until one is beyond self.

Montessori has given us a firm basis for peace. Lao Tse, the ancient Chinese philosopher and mystic, says, "Rule a large kingdom, like frying small fish." Be mindful in all you do. I find that a very Montessorian idea.'

Joke Verheul