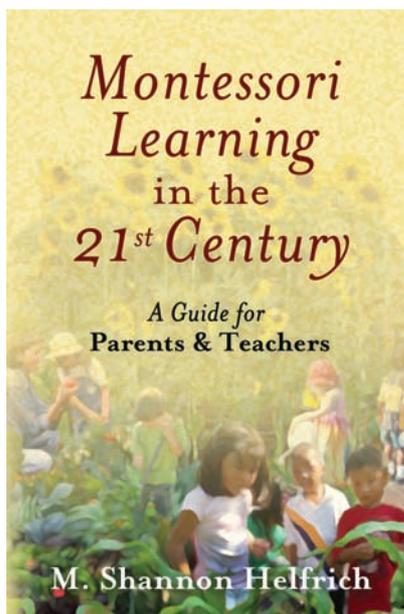


The Relevance of Montessori in Modern Times

By Shannon Helfrich

Shannon Helfrich is a primary level trainer, lecturer, consultant and examiner for the Association Montessori Internationale. She has been involved in Montessori Education since 1971. Shannon holds Bachelor of Science and Master of Science degrees and the AMI Primary Diploma. She served as the Director of Training of the Montessori Institute Northwest Portland, USA from 1988 to 2003, the Australian Montessori Teacher Education Foundation in 1999 and 2002 and is the founding Director of Training for the Montessori Training Center of New England in Hartford, CT, USA. Shannon is an Adjunct Professor for Loyola College in Maryland. Shannon is currently Director of Training for International Training Center of Montessori Education of China.



Excerpted from Montessori Learning in the 21st Century: A Guide for Parents and Teachers by M. Shannon Helfrich (NewSage Press 2011).

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Dr. Montessori's Findings and Current Brain Research

Montessori teachers and parents, often called "Montessorians," might consider it a current fad or a novel approach to look at Dr. Montessori's philosophy of child development through the lens of brain research. However, a revisit to Dr. Montessori's own writings reveals that we are simply picking up the study where she left off.

As a Montessorian for nearly forty years, I have always believed that the study of the brain and what we call intelligence can deepen our understanding of child development and provide greater insight into the basic needs of children. One cannot read far into Dr. Montessori's works without getting a sense that this was important to her as well. A couple of years ago, I had the opportunity to read a rare first edition of Dr. Montessori's first book, *The Pedagogical Anthropology*, which we had just purchased for the library at the Montessori Institute Northwest where I was working at that time. When I gingerly opened the book Dr. Montessori wrote in 1913, it was with delight and affirmation that my eyes fell upon several early diagrams of the brain.

Her diagrams reflect some of the earliest understandings of the nature of the human brain. Dr. Montessori's work at the Orthophrenic School in Rome was a systematic study of the nature of the brain. For instance, she took cranial measurements of children's heads as they grew, which reflected changes in the brain. Early brain studies held the hypothesis that race and possibly culture influenced the size of a human brain. Dr. Montessori wanted to explore the idea that good health and living conditions were a greater factor than genetics or cultural exposure. I believe Dr. Montessori created these drawings during her earlier cadaver studies in medical school.

When we put Dr. Montessori's brain study into the context of the early twentieth century, we can see the inherent limitations. There was no way to really study a living human brain without breaching the cranial cavity. Simple characteristics associated with brain density or assumptions regarding parts of the brain used for specific functions could only be explored with cadavers' brains. And yet, the scientists of Dr. Montessori's day were intensely interested in the knowledge and insight that brain research could provide for understanding human beings.

Dr. Montessori soon shifted her focus from looking at cranial measurements to looking at children whom she could observe in their everyday lives. From these observations, she made many incredible interpretations of what was happening in a child's brain.

One common criticism about Dr. Montessori's observations and findings is that she did not clinically document her theories about the nature of the child's mind. Dr. Montessori understood that the technology required to accomplish a so-called "proof" did not exist in her lifetime. However, Dr. Montessori did write extensively regarding her discoveries and empirical understanding of the brain. Her book, *The Pedagogical Anthropology*, was exclusively about her studies of the human brain. In this book, she wrote prolifically about her theories on the nature of child development, and in particular, the nature of a child's developing mind.

The question begs to be asked: Can Dr. Montessori's ideas – first formulated more than one hundred years ago – still be effective in working with children today? The answer is unquestionably, Yes!

In essential ways, the child today is the same as the child of yesterday and the child of tomorrow. Dr. Montessori used her keen powers of observation to study the nature of the child across many cultures, but she never had the technology to verify her theories. Today's researchers have the benefits of a myriad of scientific methods for measuring learning in children. The modern challenge and delight is to combine the power of technology with the power of observation. In many ways, current brain research offers an analytical explanation of Dr. Montessori's insights and theories in much the same way that scientific tools available today confirm Albert Einstein's theories.

One might think it strange to explore educational theory (pedagogy) through neuroscience, but Dr. Montessori actually began her professional career studying the brain. Dr. Montessori's theory of child development provides specific aspects and observations that today can be examined in the light of current neuroscience. It is exciting to consider Dr. Montessori's finding through the lens of modern science, and to confirm what she realised through years of working with children, regardless of sociological circumstances or culture.

Understanding what Dr. Montessori learned about children's development and ways of learning, now confirmed scientifically, will help educators and parents alike. This enlightening information will help deepen parents' and teachers' understanding of how their daily interactions impact children.

CONCLUSION ONE: “How a brain develops hinges on a complex interplay between the genes you are born with and the experiences you have”.²

In *Rethinking the Brain*, Shore notes the neuroscientists’ new findings: “The brain is affected by environmental conditions, including the kind of nourishment, care, surroundings and stimulations an individual receives. The impact of the environment is dramatic and specific, not merely influencing the general direction of development, but actually affecting how the intricate circuitry of the human brain is ‘wired.’”³

In Dr. Montessori’s book, *Spontaneous Activity in Education*, her empirical findings were in line with what neuroscientists found. She wrote: “Intelligence...is the sum of those reflex and associative or reproductive activities which enable the mind to construct itself, putting it into relation with the environment”.⁴

Furthermore, in Dr. Montessori’s book, *The Absorbent Mind*, she explained: “The child has an intelligence which is not conscious though it often seems to be endowed with reason. It begins with knowledge of his surroundings. This is an intense and specialised sensitiveness in consequence of which the things about him awaken so much interest and so much enthusiasm that they become incorporated into his very existence. The child absorbs these impressions not with his mind but with his life itself”.⁵

Dr. Montessori observed that a child’s needs cannot be met adequately by any hereditary pattern, but must be guided by other influences that enable a child to become a unique individual who belongs to the specific culture or society into which he is born and raised. The language created by the child, the aspects of coordinated movement, and the understanding of social norms and taboos – none of these could possibly be hard wired into the brain. In fact, we know that the brain is not even fully developed physically at birth. Almost all the brain cells needed throughout life are present at birth, but these cells are immature at best. The brain will grow in density as it creates new dendrites (extensions of nerve cells) and synaptic connections.

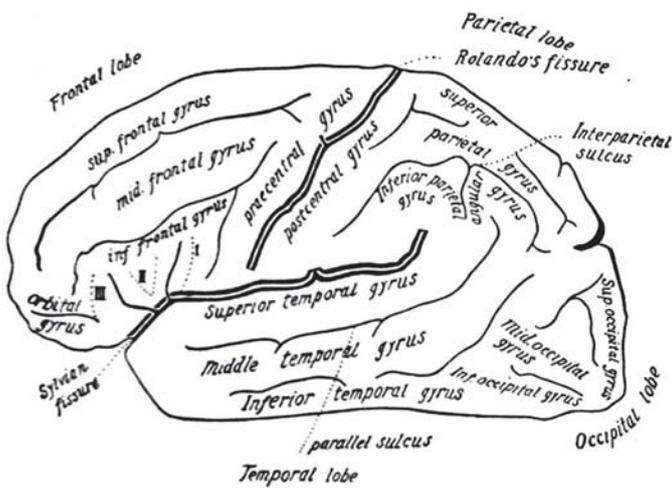
CONCLUSION TWO: “Early experiences have a decisive impact on the architecture of the brain, and on the nature and extent of adult capacities”.⁶

The neuroscientists and educators at the symposium stated, “The brain has a unique way of developing that sets it apart from every other organ in the human body. Gradually creating and organising billions of brain cells in a predetermined manner during early childhood would demand more information (in the form of genetic coding) than the body could possibly dedicate to this purpose. Nature solved this problem by evolving a more economical system”.⁷

It is important to note the tremendous, ongoing brain activity in infants and toddlers and how this is reflected in the creation of synaptic connections. The developing brain produces billions of neurons and synaptic connections, many times more than it will eventually need. In the early years of life, the brain development of infants and toddlers proceeds at a staggering pace with approximately 100 billion neurons creating synaptic connections within the first three years of life. Each neuron has the capacity for up to 100,000 synapses through its dendrites.

By the age of three years, a child’s brain has built 100 trillion synapses.⁸ This would be an overwhelming system to bring into some semblance of organisation. So the brain begins to organise itself by linking cells stimulated by the same event or stimulus. The more times the event occurs or the stimulus is taken in, the more connections are made. This process also allows cells that do not receive further stimulation to be discarded (or unlinked) from the system. These cells contain superfluous, unrelated information and are irrelevant as part of a singular piece of learning. The brain begins to search out patterns of similarity as a means of simplifying the organisational schematic.

The growth of dendrites and synaptic connections in the brain is not enough for the child’s development within the first three years of life. A parallel aspect in brain development is the growth of the brain’s cerebellum, which will grow dramatically for a short period of time



Brain diagram from “Pedagogical Anthropology” (Helfrich Photo Collection)

Today, we have the advanced technology to study the brain in action as humans at all phases of development participate in numerous life activities. Amazingly, Dr. Montessori’s theory on childhood development holds up under the scrutiny of modern neuroscience.

In June 1996, a group of prominent educators and neuroscientists met in Chicago to correlate all the current brain research. Participants exchanged many points of view for two days at the symposium and published a paper titled, “Brain Development on Young Children: New Frontiers in Research, Policy and Practice”. Educational researcher and writer, Rima Shore, took these findings and additional information extracted from the neuroscientists’ presentations and summarised them in her book, *Rethinking the Brain: New Insights into Early Development*, published in 1997.

Shore noted that neuroscientists at the symposium acknowledged that as recently as the 1970s they still believed the structure of the brain was already genetically set at birth. Up until that time, neuroscientists tended to underestimate the importance of a child’s early life experiences and their impact on brain development. Neuroscientists also did not recognise that a child was an active participant in his or her brain development. However, at the 1996 symposium, the neuroscientists presented information that dramatically shifted science’s view of brain development in young children. They enthusiastically acknowledged the influences of early childhood development and the child’s role in his/her brain development. This was an astounding and crucial admission on the neuroscientists’ part. Even more powerful was the concluding statement by this eminent panel of scientists and educators who wrote:

Indeed, brain research is one of the most exciting and fruitful scientific endeavors of the last decades of the 20th century. But unless this research finds its way into our homes and health clinics, our early childhood centers and classrooms, America’s schools and human service institutions will remain locked in a 19th-century paradigm.¹

New Understandings of Childhood Learning

As the neuroscientists and educators looked at the implications of current research, they arrived at five significant conclusions regarding early childhood learning. If we look at the five conclusions reached by the neuroscientists and examine them in light of Dr. Montessori’s writings, there are striking parallels between what Dr. Montessori observed one hundred years ago and what neuroscientists are confirming today.

The following are the five major discoveries documented by the neuroscientists at the 1996 conference regarding the brain as referenced in *Rethinking the Brain*. When I read these neuroscientists’ five basic conclusions, I was astounded and thrilled. As a Montessori teacher and trainer who passionately believes in Montessori’s theory on childhood development, this scientific proof confirmed Dr. Montessori’s empirical findings.

Let’s look at each of these conclusions in light of Dr. Montessori’s writings.

shortly after birth and again between six-and-fifteen months of age. (Brain development and maturation are discussed in Chapter Four.)

Dr. Montessori recognised the importance of a child's exposure to and relationship with the environment as the stimulus for brain development. She wrote in her book, *The Formation of Man*: "If the child, from birth onwards, has to create his personality at the expense of his environment, he must be brought into contact with the world...he ought to take part in it ... to be in touch with the life of adults. If he is to adapt himself to the environment, he ought to take part in the public life and to be a witness to the customs which characterise his race".⁹

Later in her life, Dr. Montessori wrote: "The child absorbs knowledge directly into his psychic life...a kind of mental chemistry goes on within him...the child undergoes a transformation. Impressions do not merely enter his mind: they form it...the child created his own 'mental muscles,' using for this what he finds in the world around him".¹⁰

Interestingly, scientists also make an important connection between the physical development and maturation of the brain and the child's relationship with the primary caregiver. In *Rethinking the Brain*, the neuroscientists stated: "A strong, secure attachment to a nurturing caregiver also appears to have a protective biological function... 'immunising' the infant to some degree against the adverse effects of stress and trauma".¹¹

Neuroscientists have confirmed that children learn in the context of important relationships. The best way to help very young children grow into curious, confident, able learners is to give them warm, consistent care so they can form secure attachments to those who care for them. Children who receive consistent responsive care in the first years of life are more likely to develop strong social skills. In his book, *The Biology of Transcendence*, Joseph Chilton Pearce quotes Lena Allen-Shore, Ph.D., founder of The Center for the Advancement of Human Potential in Philadelphia, Pennsylvania, stating: "Interactions with the mother directly influence the growth and assembly of the brain's structural systems that perform self-regulatory functions in the child...and mediate the individual's inter-personal and intra-personal processes for life".¹²

Dr. Montessori and her contemporary, Erik H. Erikson, a developmental psychologist who also studied Montessori education, recognised the importance of the child bonding with a primary caregiver – who, in those times was always identified as the mother. Dr. Montessori viewed this relationship between child and mother as the most important relationship in a child's life. In today's society, we can expand the reference to "mother" to also include any committed and nurturing primary caregiver.

Dr. Montessori noted that first and foremost, a primary relationship is essential to the child's early survival, and later, strongly influences the child's confidence in exploring the surrounding environment. She believed that if the child felt secure in the presence of her mother [or primary caregiver], then the child was more likely to take greater risks exploring the environment. Erikson went so far as to declare that a child's experience in bonding with the mother in the first twelve months of life would forever impact a child's capacity for trust and mutuality.¹³

CONCLUSION THREE: "Early interactions don't just create a context; they directly affect the way the brain is 'wired.'"¹⁴

In *Rethinking the Brain*, Shore reported the neuroscientists' findings regarding a timeline for brain development as quite different from what science traditionally believed—a belief that Dr. Montessori worked to change. The neuroscientists stated, "The brain's intricate circuitry is not formed at a steady pace; rather, it proceeds in waves, with different parts of the brain becoming active 'construction sites' at different times and with different degrees of intensity".¹⁵

The notion that brain development follows a set time line for the acquisition of certain skills and abilities is not a new idea. The recognition of prime times for learning has been around for many years. Whether they are called prime times, critical periods, windows of opportunity, or sensitive periods, they are all the same.

Montessorians and other early childhood educators readily recognise that a child seems to learn certain skills and abilities spontaneously during certain periods of development. Once these windows close or the sensitive period passes, the learning requires a much greater conscious effort and is never as optimally integrated into the child's developing personality.

For instance, children's brains between birth and age six years are completely open to learning and integrating into their lives any language they are exposed to. During this sensitive period for language, a child can easily become bilingual (or more) and speak the language(s) without an accent. However, as adults, learning a second or third language requires much more focus and effort. I studied both Spanish and German as a young adult, but I never really *learned* either language, and I have not retained what I learned. Now in the sixth decade of my life, I am studying Mandarin Chinese with some hope of a slightly better result. However, I fully accept that I will never speak Mandarin as well or as confidently as a native speaker.

Dr. Montessori recognised this phenomenon in the writings of Dr. Jean Itard, who worked with the wild boy, Victor. Dr. Itard reflected on his constant struggle to humanise Victor. Even simple tasks like eating with proper utensils and speaking in clear sentences were impossible tasks. Victor's life in the forest, isolated from human society at a very young age, left Victor unable to create a clear spoken language. While he was able to master a small, limited vocabulary and to even recognise some of these words in written form, Victor was never able to formulate thought or to communicate with complete sentences reflecting thought. The window of opportunity, or sensitive period for language, which ends around the age of six, was over by the time Victor was exposed to spoken and symbolic language. Victor's limited capacity for learning language reflected the struggle of a child who had missed this important sensitive period.

In more recent times, we have the circumstances of the Romanian orphans who did not walk or talk when they were rescued in the 1990s. These children had been kept in isolated crib-like enclosures with little or no contact with each other or with their caregivers. This left them with little exposure to spoken language. The children were fed enough to keep them alive but little more. They had no motivation to stand and all their movement was greatly limited by the size of the crib in which each child lived. Harry T. Chugani, M.D., at the University of Michigan, Ann Arbor, spent several years working with Romanian children and their adoptive families, trying to help the children overcome the limitations of learning to walk and talk far beyond nature's timeline.

In an article first published for the Association for Research in International Adoption, Dr. Chugani wrote: "The major finding in this study was that a substantial proportion (46 percent) of globally intact children who have experienced severe deprivation exhibit persistent functionally relevant impairments in one or more specific cognitive domains. The domains most often affected were executive functioning, language, and memory with 41 percent of the globally intact children evidencing problems in at least one of these domains. This is the first report of impairment in performance on a measure of sustained attention in children with such histories. Impairments in language, memory, and executive functioning are likely to have important consequences for adjustment to academic and social environments".¹⁶

Dr. Montessori recognised early along in her work that there were patterns of interest for children and resultant learning that appeared and disappeared at predictable intervals during child development. In her book, *The Secret of Childhood*, Dr. Montessori wrote: "Children pass through definite periods in which they reveal psychic aptitudes and possibilities which afterward disappear. That is why, at particular epochs of their life, they reveal an intense and extraordinary interest in certain objects and exercises, which one might look for in vain at a later age".¹⁷

CONCLUSION FOUR: "Brain development is non-linear: there are prime times for acquiring different kinds of knowledge and skills".¹⁸

In *Rethinking the Brain*, Shore wrote: "Scientists have learned that different regions of the cortex increase in size when they are exposed

to stimulating conditions and that the longer the exposure, the more they grow. While learning continues throughout the life cycle, there are prime times for optimal development – periods during which the brain is particularly efficient at specific types of learning. These periods are described as ‘critical periods’ or ‘plastic periods.’¹⁹

Neuroscientists have also come to understand that once the prime time has passed, opportunities for forging certain kinds of neural pathways appear to diminish substantially. This concept is built on the premise that development depends on the exposure of the brain to many kinds of stimulation according to a predictable timetable.

When there is a disruption of the normal developmental schedule of experience, neural connections are not made properly, and the cortical columns (a group of neurons in the brain cortex) that result are thinner than they should be. During developmental “prime times,” neurons can create synapses most easily and efficiently.²⁰

In Dr. Montessori’s theory of child development, these periods have traditionally been referred to as “sensitive periods”.

The discovery of these powerful periods of intense interest and activity became the key to Dr. Montessori’s creation of an educational approach. With a poetic flare, she described these sensitive periods in *The Secret of Childhood*: “When some of these psychic passions die away, other flames are kindled and so infancy passes from conquest to conquest; in a continuous vital vibrancy, which we have called its joy and simplicity. It is through this lovely flame that burns without consuming that the work of creating the mental world of man takes place”.²¹

CONCLUSION FIVE: “By the time children reach age three, their brains are twice as active as those of adults. Activity levels drop during adolescence”.²²

The neuroscientists’ final conclusion as reported in *Rethinking the Brain* is that the first three years of life seem to set the foundation for all development that follows. If this is the time when the brain is most active in creating synaptic connections, then parents and educators must be sensitive to the first three years of a child’s life as the foundation upon which all further learning is built. It seems strange to say, or believe, that the potential for logical thinking, for planning, and for all later skill training is founded upon the neurological pathways built in the first three years of life.

The implications here are that a child must be assisted and supported in this early stage of development, for it will impact the remainder of her life. Since the 1990s, there has been a great push to refine the educational approach for children in Montessori settings before the age of three years. Infant communities are quickly becoming a significant part of the continuum of Montessori offerings.

Dr. Montessori wrote in *The Absorbent Mind*, “Man possesses creative sensitivities instead of hereditary models of behavior, and if it is due to these that adaptation occurs to his surroundings, then it is clear that the whole psychic life of the individual stands upon a foundation which must be laid down by them in the earliest years”.²³

Some might interpret this as a fatalistic point of view if a child’s early needs are not met. Indeed, it is important for parents and educators to pay close attention to the developmental needs of the child in these first three years of life. However, recent research does show that early intervention between the ages of three and six years can result in great improvements for the child deprived of early developmental stimulation. Even some of the less abused Romanian children were able to learn and function quite ably with intervention.

Children are quite adaptable through age six years and even through age twelve years. It is during this time that the child can work to overcome many of the limitations due to the lack of early stimulation. It doesn’t mean development is as easy as it would have been early on, but a child can “mend” many of the dropped stitches of development with active intervention.

For example, today, there are many children who benefit greatly from occupational therapy in order to overcome lack of coordination. Children

with sensory integration problems are helped greatly by therapies specifically geared to their distinct problems. Some children suffer from over sensitive stimulation and some children have the opposite problem with underachieving stimulation. Occupational and physical therapies help children learn how to cope and train the brain to better balance the sensory data coming in.

There is certainly much more to explore and understand about the nature of intelligence and this wonderful organ, the brain. We will delve into some of these implications in much greater depth in the following chapters.

The Essence of the Child

The Montessori tradition in education stems from Dr. Montessori’s work in the late nineteenth and early twentieth centuries. As long as the essence of the child remains the same, the essence of a Montessori approach to education will be the same. Only minor changes in methodology and approach have occurred over the many years since Dr. Montessori’s death on May 6, 1952.

The Montessori approach is based on the natural, spontaneous development of the child. A common guiding phrase among Montessori teachers and parents is “Follow the Child”. As long as the nature of the child unfolds in the same manner from generation to generation, the child’s developmental needs and the resultant learning will stay constant.

Dr. Montessori offers educators today the same insights into the nature of the child that she observed one hundred years ago. Montessori teachers bear witness to these same developmental phenomena everyday in their work with children. To bring the Montessori approach into the twenty-first century does not require that we change or invalidate the Montessori tradition. However, it does require that we look to current knowledge to better understand the nature of the child. This is no different from what Dr. Montessori did. She took the work of Drs. Itard and Séguin and integrated their findings with her own findings. By doing so, we continue the great tradition she modeled so wisely.

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