

Montessori Education: What Is Its Relationship with the Emerging Worldview?

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ABSTRACT

The classroom structure of traditional education has been modeled on the defining characteristics of the mechanical worldview, including linearity, hierarchy, reductionism, objectivity, outcomes, and empiricism. The advent of a participatory worldview has brought a new set of priorities including non-linearity, interdependence, process, relationship, and ecology. A Montessori classroom structure embodies these emerging characteristics. The Montessori approach is based on a non-linear developmental model. It provides a form of education that is not limited to mechanistic cognitive development, but integrally involves all aspects of human development, and is thus well-aligned with the qualities of the emerging worldview.

Introduction

As a physics and math teacher in traditional schools, I had been well-indoctrinated into the world of empiricism and objectivity. Not only was I part of that system, having studied one of the most empirical fields available, I was also responsible for then teaching some of its most basic tenets, passing them on to the youth so that they too would understand the importance of facts, data, measurable quantities. But I must confess, secretly I felt like a fraud. While I taught how to reduce experimental error, I couldn't help but mention to my students that maybe there is more to life than just what can be measured. While I was explaining how General Relativity was finally proven accurate, I couldn't help but venture just a little bit into quantum mechanics and Schrodinger's Cat and the EPR question of non-local awareness. I felt guilty about it sometimes, but I just couldn't let my students finish my class thinking those equations were all there is. The problem was, I wasn't sure what else to offer them. They were certainly open to anything; we discussed ESP, alien abductions, and the strange dreams they had of being visited by people who had passed. But beyond those forays into scientifically forbidden territory, I didn't know what else to do. All I knew was that something was missing in their education. And consequently, in mine too.

I began to adopt a view of teaching as a vehicle for getting to know oneself. The students *thought* that they were just learning about thermodynamics, but I knew better – that thermal conductivity lab activity was actually a way for them to learn about themselves and their place in the world. It was a nice theory, I felt, and it comforted me for a while.

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I was teaching younger students, eighth graders around age 13, when I hit another wall. This time it was their apparent lack of interest in anything. Given the opportunity to explore any topic they wanted, many of the students were stymied. How could a 13 year old know himself so little that he didn't even know what he was interested in, I wondered? This was not a simple adolescent malaise. How could they have no interests? This was extremely disturbing to me.

Considering what I know now about Montessori education, it is no coincidence that soon afterwards I received my first full-fledged passionate explanation of Montessori education while traveling on a bus to a meditation retreat. My seatmate was a Montessori teacher from inner city Washington DC, and when she learned that I was also a teacher (a rather disillusioned one), she immediately began sharing her experience about Montessori education, speaking of Cosmic Education, trinomial cubes, and the Timeline of Life. The terms were completely foreign terms to me and I was confused, yet something was extremely intriguing and her passion and commitment were clear. She had seen what this approach accomplished for children in very difficult environments, like Washington DC. She spoke of the inner development of the child.

After the meditation retreat, I began investigating Montessori education for myself. As I read Maria Montessori's writings, flowery and idealistic yet brilliant, there was a deep resonance. I knew she had discovered what I had felt was missing. The problem was deep and systemic, and yet somehow so obvious that I couldn't believe I hadn't noticed it before. It was structural. It was simply the restrictiveness of the education system that squelched the natural development of children. The system was designed for the adults, not the children.

Over the next ten years I received my Montessori training and eventually taught in my own Montessori classroom. From high school seniors, I shifted to teaching 9-12 year olds. Gradually I began to take an even deeper systemic look at education and the structural differences between the traditional approach and the Montessori developmental approach. I have discovered the enormous potential in restructuring an educational philosophy in ways that are based on nature, and are in fact very simple and straightforward. There is nothing magical or exotic about Montessori education. Having been in both worlds myself, traditional and Montessori, I now see clearly that the difference between them is also simple: it is a simple, yet profound, chasm between two worldviews.

THE MECHANICAL WORLDVIEW AND TRADITIONAL EDUCATION

From modern schools in the cities of China to small mud hut schools in villages of Kenya, schools look the same: children of the same age passively receive instruction in information and skills being doled out by an adult at the front of the room/hut/auditorium. Even among wildly varying cultures, the nature of schools is numbingly similar. Students progress by level annually, competing for grades, extrinsically motivated by rewards and punishment. They learn from textbooks. They take exams. Their day is broken up by separate subject matter instruction according to a predetermined schedule. The majority of the world's people can probably relate to this description in some form or other, since 90% of children attend school at some point in their lives. (Meyer, 1992)

This traditional education system is frequently compared to the factory model, and its rise does indeed correspond with the Industrial Revolution and the world of the machine. The factory provided a model for governments to scale up to education for all, with maximum efficiency and a focus on producing identical final products out of unrefined raw material: the uneducated child.

However, the factory aspect is in fact only a small component of the Western model of education. The factory model and the Industrial Revolution were natural outcomes of the the mechanical worldview that emerged from the work of Isaac Newton, Rene Descartes and others.. A materialist, mechanical worldview was constructed according to mechanistic physical laws: the world was deterministic and predictable with specific rules and constraints. The human mind had no role in the functioning of the universe. Understanding came from reductionism and breaking the world down into parts. The focus on the physical construction of reality led to primacy of an objective view. The world seemed to neatly operate following laws of linearity and cause and effect, just as mechanical formulae could predict the physical behavior of matter.

Mathematical and scientific laws became the new religion; the beauty, power and efficiency of mathematics that could predict physical phenomena and drive machines was also applied to human beings and society through approaches such as behaviorism and empiricism. The power of measurement took great hold, qualitative and non-measurable quantities were deemed as irrelevant. With the scientific revolution, the principles that were used to great effect to learn about how the world works, to create machines, and change how life was physically lived, were then liberally applied to nearly every aspect of human existence, including the education and development of children, since the mechanical laws seemed to be wholly complete and universal.

And so in taking a closer look at the principles behind the structure of traditional modern education, we can identify aspects that indicate more than just a factory model of production. They reflect an entire worldview.

The chart below identifies some of the defining characteristics of the mechanical worldview, and corresponding characteristics in traditional education.

**An Overview of Correlations Between a Mechanical Worldview
and the Structure of Traditional Education**

Mechanical Worldview	Manifestation in Traditional Education
<ul style="list-style-type: none"> • Hierarchical structure of reality • Competition necessary 	<ul style="list-style-type: none"> • Rigid hierarchy of Policy - Administrator-Teacher-Student • Competition is primary mode • Authoritarian structure • Students are at the bottom of the hierarchy.

Mechanical Worldview	Manifestation in Traditional Education
<ul style="list-style-type: none"> Objective external reality has primacy 	<ul style="list-style-type: none"> Inner world of the student is ignored. The focus is on the external set of information. Inner world of the teacher is also ignored. The teacher is to teach objective information objectively, with no personal involvement. Subjectivity is minimized, avoided. Inner motivation of the student is not considered. External authority is the source of knowing. Inner knowing has no value. Teacher is seen as the objective imparter of information.
<ul style="list-style-type: none"> Linear outcomes and causality. Mechanistic. 	<ul style="list-style-type: none"> Individual variation of students rarely taken into account Input-output model. Information in, test performance information out. Expectation that the same approach will work for every student. If it doesn't, the problem is with the student. Rewards and punishments as external motivators are considered necessary. Internal motivation is not considered valid or relevant. Quantity of information is emphasized. More is better. One-size-fits-all approach with curriculum and pedagogy.
<ul style="list-style-type: none"> Empirical emphasis Quantitative 	<ul style="list-style-type: none"> Emphasis on measurable outcomes. Testing. Non-measurable aspects of education (social skills, attitude, sense of community) are ignored. Skills-oriented Statistical approach to success. Bell-curve means that some must always fail.
<ul style="list-style-type: none"> Reductionist 	<ul style="list-style-type: none"> Clear-cut divisions across disciplines. Discrete and unconnected approach.
<ul style="list-style-type: none"> Materialistic, rationalistic 	<ul style="list-style-type: none"> Emotional aspect of learning is denied. The inner world of the student plays no role in learning. Belief that Students come empty-minded. Students' previous experiences are not considered useful or valuable. Experiences outside of school are not considered 'education'.
<ul style="list-style-type: none"> Dualistic Logic-based 	<ul style="list-style-type: none"> Focus is on the cognitive. Other realms such as spiritual and intuitive are ignored and even suppressed.

THE EMERGING WORLDVIEW AND WHAT IT MEANS FOR EDUCATION

With the advent of quantum mechanics and Einstein's relativity, aspects of the mechanical worldview of physics began to crumble. No longer was the universe coldly predictable and certain; instead it was probabilistic, chaotic and creative. No longer was the human being an objective aloof observer; instead our presence seemed to somehow be directly linked to physical reality. The idea of a participatory worldview with a subjective and interactive universe took on greater meaning. New viewpoints emerged in other sciences besides physics. In biology principles of ecology and interdependence developed, and complex systems replaced hierarchical conceptions of organization. In medicine a greater acceptance of the interplay between mind and

body emerged. Organizations and businesses also began to show signs of the manifestation of this new worldview, with its emphasis on creative and unpredictable change rather than predictable, mechanically-driven outcomes. This new worldview emphasizes process, other modes of knowing, relationship. Complex systems and feedback loops replace hierarchical and linear structures. Instead of domination and control of nature, the new worldview encompasses community and relationship with nature. Interdependence replaces reductionism. It is a paradigm of collaboration rather than competition.

We can compare some characteristics of the emerging worldview with the mechanical worldview. (Elgin, 2009):

Mechanical Worldview Characteristics	Emerging Worldview Characteristics
<ul style="list-style-type: none"> • Hierarchical structure of reality • Domination, control of nature • Independence, isolation • Competition 	<ul style="list-style-type: none"> • Parallel structure, systems and feedback • Ecology, interdependence, community with nature • Collaboration
<ul style="list-style-type: none"> • Objective external reality has primacy 	<ul style="list-style-type: none"> • Subjectivity is valued. • Involvement
<ul style="list-style-type: none"> • Linear outcomes and causality. • Product-oriented • Mechanistic 	<ul style="list-style-type: none"> • Non-linear process, complexity • Process-oriented • Relationship
<ul style="list-style-type: none"> • Empirical emphasis • Cognitive 	<ul style="list-style-type: none"> • Other realms of knowing • Awareness
<ul style="list-style-type: none"> • Reductionist • Fragmentation 	<ul style="list-style-type: none"> • Connection, process • Interdependence
<ul style="list-style-type: none"> • Materialistic, rationalistic • Logic 	<ul style="list-style-type: none"> • Aliveness • Intuition
<ul style="list-style-type: none"> • Dualistic • Separateness 	<ul style="list-style-type: none"> • Wholeness • Universal consciousness, collectivity

It can be seen that the traditional education system, with its mechanically-based principles, shares very few principles of the emerging worldview. It is unlikely that many descriptors from the emerging worldview column would be applied the atmosphere or structure of a traditional classroom. There is compelling evidence that the principles behind Montessori education are a much better fit with the emerging participatory worldview.

A BRIEF HISTORY OF MONTESSORI EDUCATION

Montessori education originated in Italy beginning in the early 1900's, developed by Maria Montessori and later in collaboration with her son, Mario. In 1896 Maria Montessori had become the first woman physician in Italy, but due to a number of twists and turns in the path of her medical career, became an expert in human development and education, ultimately establishing a developmental education model based on her own work with children. Her developmental model and the resulting methodology arose out of her scientifically-oriented observations of children and their growth patterns and behavior, based on her training as an

experimenter. Many of her observations about development were well ahead of her time, and many have been proven accurate through recent research in neuroscience.² (Stoll Lillard, 2005)

Montessori placed a heavy emphasis on the role of empirical observation, but she was far from being exclusively an empiricist regarding educational techniques and cognitive processes. Montessori also embraced the intangible processes of spiritual and psychological development as an inseparable part of education. Thus her approach to education enfolded nature, the intellect and the spirit, following the guidance given by nature.

Montessori was heavily influenced by the societal upheavals of her time. The world was seemed to accelerate her focus on education. In children, she saw in children the solution to the crisis that humanity was facing. Between WWI and WWII, she continued to develop her model and engaged with other great thinkers of her time, including Gandhi, and Theosophical Society members such as Rabindranath Tagore and George Arundale.

Consequently, Montessori channeled her intense concern about politics and the crises of humanity into passionate writings about the connections between children and education, and peace and unity. The world situation refined her perspective on educational philosophy and methodology, as she felt more and more strongly that the only way to alter humanity's destructive path was by starting with the children. "Averting war is the work of politicians; establishing peace is the work of education." (Montessori, 1949) As we will see, this is accomplished through the structure of the approach, not through prescriptive or didactic measures or lessons.

MONTESSORI'S DEVELOPMENTAL MODEL

Developmental models form the backbone of psychology by offering structures to understand cognition, moral development, physical development, ego development, societal development, etc. However, despite the obviously developmental nature of education, there is surprisingly little connection made between psychological developmental models and actual pedagogy. Educational psychology generally introduces new educators to Jean Piaget's stages, perhaps Kohlberg's stages of moral development, Maslow's hierarchy of needs, Bloom's taxonomy, and behaviorism. However, the focus generally rests on how these conceptions influence the educational setting without addressing how to adapt the traditional educational structure to children's developmental needs. Behaviorism was an important exception to this gap between psychology and education. The outcomes orientation of behaviorism fit perfectly with the linear cause-and-effect structure of education, and schools adopted massive systems of external reward and punishment as motivators. In contrast, Montessori education bases its pedagogy on a developmental model in order to directly inform an approach and structure that best matches children's internal development. Following extensive observations of children and her work in psychology and anthropology, Maria Montessori established a developmental model that describes the stages and processes of child development from birth to age 24. The model is overlaid against the backdrop of nature, ensuring that the educational structure follows the lead of nature and children's innate development, similar to the nature-based principles behind emerging fields such as biomimicry, sustainability and social ecology. In contrast to a school

² Interested readers are also referred to *The Scientist in the Crib* by Alison Gopnik for recent research in cognitive science that upholds many of Montessori's developmental observations from 100 years ago.

structure that subscribes to and emulates the old paradigm of domination of and separation from nature, Montessori pedagogy is based on collaboration *with* nature.

In order to fully understand the principles driving the structural differences of the Montessori approach, we must first understand the developmental model. Montessori's model spans the time from birth to age 24, divided into four 6-year planes: The First Plane: age 0 to 6, The Second Plane: age 6 to 12, The Third Plane; age 12 to 18, and The Fourth Plane: age 18 to 24.

According to the model, each plane is characterized by *sensitivities*, areas of growth potential that are particularly acute or sensitive during those times. Understanding the sensitivities is critical for being able to design an education structure that resonates with the natural state and needs (sensitivities) of the child. It is important to recognize that these are human developmental characteristics, not cultural. We will elaborate on the details of the specific sensitivities in the next section, but in brief they are:

First Plane (0-6): language, order, sensorimotor

Second Plane (6-12): moral awareness, imagination and abstraction, culture and knowledge

Third Plane (12-18): physical transformation, money/finances, work

Fourth Plane (18-24): spirituality, purpose

As a child transitions from one plane to the next, with the corresponding shift in sensitivities, change is dramatic. These transitions can feel like a metamorphosis, creating what nearly seems to be a new child with each new plane. "The characteristics of each are so different that the passages from one phase to the other have been described by certain psychologists as 'rebirths'." (Montessori, 1938, p.1) Many parents can relate to this phenomenon when their shy, tentative preschool child suddenly wants to start exploring on her own, or their cheerful young child becomes a morose and argumentative teenager. All of the transitions are continuously trending in one direction: towards increased independence with the goal of integration:

The individual passes from one plane of independence to another – physical, mental, moral, economic, spiritual – always urged on by the forces of Nature itself, forces which are inherent and irrepressible and whose aim or goal is always that of the complete, fully formed and fully functioning adult human being, an adult not only adapted to his time and place but also capable of adapting new situations and circumstances, ultimately an adult who can work for the good of humanity and can participate in humanity's mission on this Earth. The aim of the force of Nature is always towards the complete, fully formed, fully functioning independent adult human being. (Grazzini, 2004)

THE SENSITIVITIES AND CHARACTERISTICS OF EACH PLANE

The First Plane (Primary Level, Age 0-6)

This plane encompasses four sensitivities as observed by Montessori. Two sensitivities of this plane from age 0 to 6 are Motor Development and Language Development. Nature has designed

development so the child can move on her own and communicate for herself as soon as is developmentally possible. This is the child's entry onto the path of independence, towards reducing physical dependence on parents and others.

In addition, there is the sensitivity to the Senses. Together with movement, these correspond to the concrete sensori-motor stage of Piaget.³ The drive for sensori-motor development is particularly led by the work of the hands of the child. The child's natural urge to touch and manipulate everything in the physical environment is Nature giving instructions on how the child will best learn and develop – through self-directed physical activity. The hands can be seen as extensions of the brain. It becomes clear that if a child's natural urge to touch is punished or blocked, that energy will not disappear but will perhaps take on another form or another behavior that is often less desirable.

Finally, Montessori observed a sensitivity to Order in these First Plane children. This age child, particularly before age 3, is very attuned to routine, to the details of the physical environment, to the details of imitating how others do things precisely. It seems the sensitivity to order is designed by nature so that the children can learn by precise imitation of the actions of others.

This plane is so momentous in life that Montessori divided it into two sub-planes. The first is from birth to age 3. Montessori called this age child a 'spiritual embryo', in the same way that for the first 9 months in the womb the child was a physical embryo. As a physical embryo, the child's physical body became unified and complete. In the same way, for the first three years of life, the child's psyche can be said to be embryonic, undergoing the process of unification towards completeness of the personality, of the psyche. It is the time of development of basic mental functions, and is done unconsciously. The process is fully driven by nature, and is made possible by the child's interaction with the environment and other humans. The child's mind is absorbing every bit of input and along the way, the child is in the process of creating herself. Montessori called this child the Unconscious Creator. The infant may seem empty, but in fact is anything but. The child is full of the potentialities which will determine her development. The process continues from age 3 to 6, although the child's consciousness and memory have awakened by then. The child is driven towards refinement of the senses through conscious experiences, and exercising of the will.

Since the urge to develop in this way is so strong, driven by nature, it is vital that Nature within the child be given the freedom and space to follow its impulses. For example, small children often love to repeat actions over and over, such as stacking and unstacking blocks. Through this process they are developing themselves; they are practicing in the same way that an adult practices piano or tennis.

But since the process in the child is unconscious, if that impulse is blocked, such as by an adult who only sees the stacked blocks as an end goal and stops the child from repeating, thinking he has 'helped' the child stack the blocks, the natural energy of the child is stymied. This is where unnecessary help to the child becomes a hindrance to development, resulting in a diversion of the child's natural energy. In many cases, it is this kind of external block of energy that results in

³ In fact, Piaget did much of his observation of children in a Montessori school in Switzerland and served as head of the Swiss Montessori Society in the 1930's.

children's misbehavior. "And gradually we educators are confronted with a simple fact: that to help the child is not what he needs, and indeed that to give help is an impediment for the child."(Montessori, 1938, p.3)When children are allowed to do as much as they are able on their own, and tasks that they are capable of doing are not done for them (such as carrying objects, putting on shoes, etc.), then the child's energy can flow and the child develops more freely. The child realizes that through his own efforts he can be independent and can achieve things he has set his mind to. And thus "liberty is not to be free to do anything one likes; it is to be able to act without help." (Montessori, 1938, p.3)

Summary

The First Plane child's sensitivities are:

- Language
- Motor
- Sensory
- Order

Important principles that inform pedagogy:

- The drive to develop is an irrepressible energy of nature, and that energy should be allowed to flow freely without extra help or interruption during times of concentration.
- The child's innate tendency for order helps him learn through imitation and repetition.
- Nature has designed children to learn directly from their environment through movement and work with the hands.
- Awareness of the world is concrete.
- The natural drive is towards physical independence.
- The child is full of potentialities that drive development with the aim of unification of the psyche and personality. This child is creating herself.

The Second Plane (Elementary Level, Age 6 to 12)

With the onset of the second plane, the child undergoes a remarkable change. This child is no longer interested in order, and often becomes messy and less attentive to detail. In addition, having mastered physical movement, language and refinement of the senses, nature now takes development to a new level of sensitivity and independence.

The First Plane sensitivities were almost exclusively physical, except for language development. The Second Plane child's sensitivities are entirely different, taking on an intellectual and moral imperative. Firstly, the child of this age is developmentally attuned to moral development and questions of justice, fairness and right and wrong. This child is extremely focused on questions of rules, and often demands to know the reasons behind decisions.

A sensitivity to abstraction and imagination awakens. These children can undertake symbolic representation such as math and written language. They can imagine the past, other cultures, and places they have never seen.

This makes possible the third sensitivity: an intense interest in learning, in exploring human culture in all its facets, becoming aware of connections and one's place in the world. These children can imagine other times and places and are no longer limited to the concrete aspects of the world within their reach. They are intensely curious, intellectual powerhouses. A great deal of their developmental energy is invested in intellectual growth.

These children also become tougher, more argumentative and questioning, particularly due to their sensitivity to morals and ethics, but have stabilized emotionally after the turbulence of early childhood. Again, independence is increasing, this time moving towards mental and moral independence, as well as independence from the family. They much prefer to learn on their own, from peers, or from stories, rather than directly from an adult.

All of these characteristics have profound implications for the nature of education at this level, which comprises elementary school from first through sixth grade. This is called Cosmic Education in Montessori education, and will be explored in more depth in a later section.

Summary

The Second Plane child's sensitivities are:

- Moral development (justice, fairness, right and wrong)
- Abstraction and imagination
- Human culture/intellectual knowledge

Important principles that inform pedagogy:

- The child has an overwhelming need to know *why*, and is focused on reason.
- The child questions rules and is extremely sensitive to issues of fairness.
- The child has a greater need for mental and moral independence, and needs to have experiences in the wider world beyond the classroom.
- The child has an intense desire to learn, is very intellectually curious and driven.
- This child is extremely social, and is experimenting with power and relationships. He prefers to be in a group.
- The child's imagination is very strong, and results in a love of learning from story.
- The newly developed ability to abstract means that symbolic representation is possible, opening up worlds of human culture and knowledge to the child.
- The child is driven to understand human society and culture and is sensitive to connections and structures within it. She is also beginning to think about her place in the wider world.

The Third Plane (Adolescence, Age 12 to 18)

This plane is the (in)famous plane of adolescence. Once again, the child undergoes a transformation. Much like the First Plane, this plane also a plane of creation and has a strong physical and emotional component accompanying the metamorphosis into adulthood. In fact, the intellectual component becomes less prominent, since the energy of development is focused on attaining an even greater level of independence towards becoming an adult with financial independence.

The sensitivities of this plane include physical maturity, a drive to do productive work with financial reward, and belonging. This is the age that benefits most from making money for working hard. This age is also intensely driven to belong to a peer group. They also need to have adults that they can look up to and who will protect them and yet also help them enter society. At the same time, their psychological upheaval requires that they be provided with grounding opportunities. In fact, Montessori called this age *erdkinder*, or children of the earth, since they benefit so much from activities that connect them with the earth such as gardening, hiking, building, etc.

Summary

The Third Plane sensitivities are:

- Physical maturity
- Finances/money and work
- Belonging, social connection

Important principles:

- They benefit greatly from connection with the earth to ground their psychological, emotional and physical upheaval.
- The child is driven by the desire for productive work to make money, desiring economic independence.
- The child needs the modeling of adults who are passionate about their work. She benefits from mentors who will help her in her transition to adulthood.
- There is a decrease in intellectual drive, and an intense focus on social connection and development.

The Fourth Plane (Young Adult, Age 18 to 24)

After the turbulence of the Third Plane, the Fourth Plane is a time of relative calm. The trend of development is now towards the spiritual. This young adult is driven to explore reasons of existence, looking for meaning and a personal mission in life.

The challenge to development at this stage is temptation. This age will face temptations of power, possession and indolence. The goal of this plane is to learn how to deal with these temptations and to develop a sense of meaning and direction in one's life.

Summary

The Fourth Plane sensitivities are:

- Spirituality
- Facing personal temptation: power, possession, indolence

Important principles:

- This young adult is striving to find meaning and direction in life.

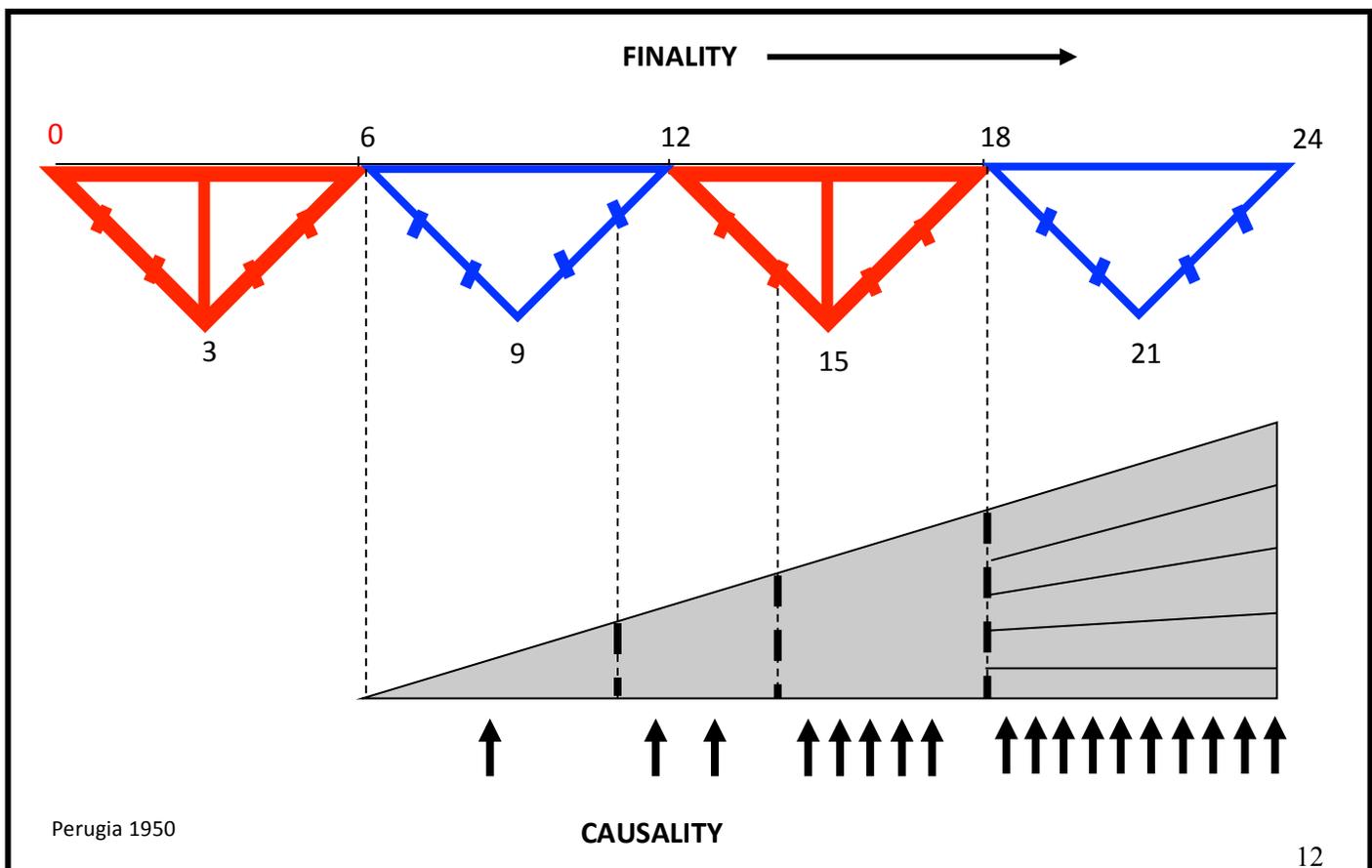
- He is learning how to deal with external temptations, and finding inner strength in the face of such challenges.
- There is a striving for spiritual independence.
- After completion of development, the individual is adapted to his/her time and place and capable of adapting to new situations.

GRAPHICAL REPRESENTATIONS OF THE DEVELOPMENTAL MODEL

Montessori developed two graphical representations of her development model. Both embody the non-linearity of development and demonstrate natural causality as determined by the developmental potential inside each child.

The graphic below is the first of Montessori's representations. (Grazzini, 2004) The red and blue triangles illustrate Montessori's planes of development, indicating the waxing and waning within each plane. Notice the non-linearity and punctuated style of the developmental progression.

In contrast, the large gray triangle on the bottom half represents the structure of traditional education as offered by society. The gray inclined plane illustrates the linearity underlying the concept of development. The line rises steadily and linearly with time, and the blocks of schooling are separated by vertical dashed lines.



There are different numbers of arrows underneath each gray block, increasing with age/time. These arrows represent the number of different subjects studied and the different teachers the pupil comes into contact with, so in a sense they represent the amount of knowledge being offered to the student.

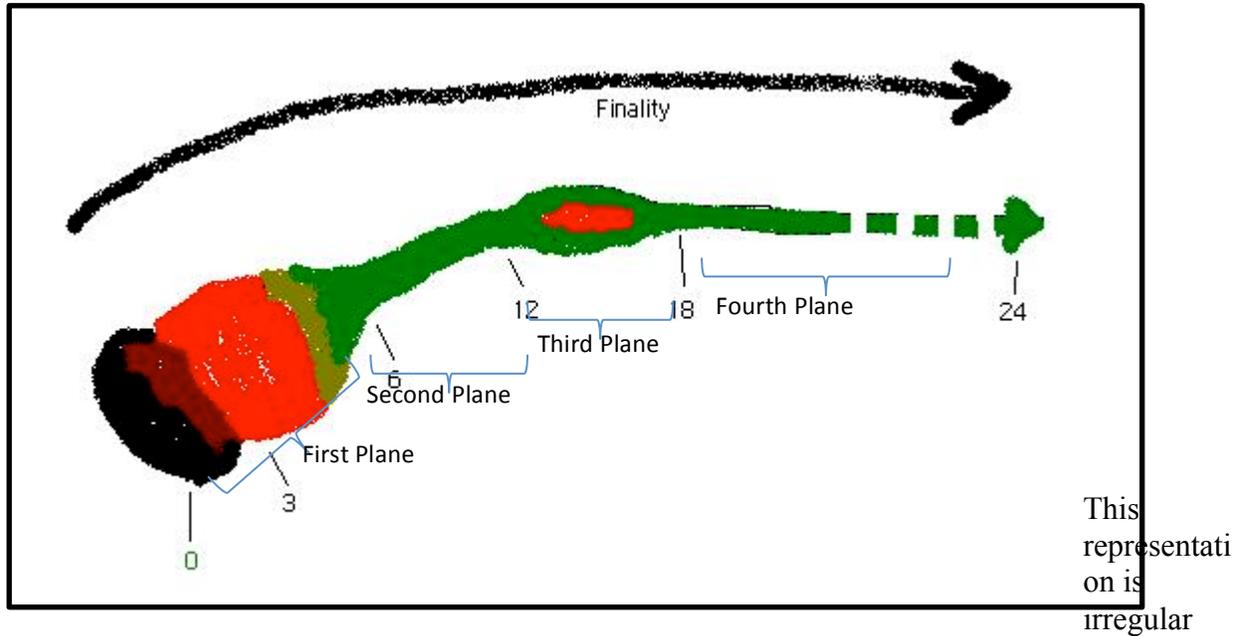
In the last block, the rows of lines represent the different faculties at a university. The underlying premise of this model is that intelligence and capacity to learn increase linearly with age: the older the individual, the greater the capacity to learn. However, this is not what Montessori observed and is not the model that Montessori has developed, in which intellectual ability waxes and wanes with development.

The traditional model operates under the premise of Causality: the teacher is seen as the *cause*, and the educated child is the *effect* produced by the teacher. It espouses the mechanistic input-output model and assumes that the information acquired by the child during the years of schooling is the direct result of knowledge and values transmitted by the adult/the teacher. The *adult* does the molding, the making. The child is not seen as the creator of himself and seems to play no role in his own development.

In contrast, in the Montessori model the arrow of Finality means that development progresses naturally, to an endpoint of the stages of development. Montessori takes a teleological approach, development being perceived as a natural process of growth rather than something that is structured or made. The cause and effect relationship between the child and the adult is minimized. Instead, it is the spontaneous, internal and natural tendencies towards development which provide the goal to be reached.. The role of education and the teacher is to support the process of development so that it proceeds as naturally as possible, offering education, knowledge and support *without* getting in the way of development.

Maria Montessori said that the reason that children's development has been so misunderstood is because it manifests in ways that adults don't understand, precisely because it is NOT a cause-and-effect relationship. It has more to do with growth, with future goals and is a future-oriented, unpredictable process, not a cause-and-effect linkage.

Below is another representation of Montessori's developmental model, designed in 1952 by Montessori a year before she died. (Grazzini, 2004) It conjures up much more dynamic images of development as a biological, organic, natural, non-linear life process. Each plane is given its own distinct character, transitioning and merging into the next.



with a lack of symmetry. The mostly-red bulges are followed by constricted sections that are mostly green. The creative planes, First and Third, are associated with the red bulges – times of great energy and transformation. The calm planes, Second and Fourth, seem to fade into the background, and are more uniform, more transitional.

The black bulb at the beginning represents all those energies that are found at the beginning of life, creative energies necessary for the formation of a human being. Montessori called this the ‘nebula.’ (Grazzini, 2004) Education can be seen as a way of helping those pre-existing energies find their natural channel, providing an outlet for development and construction of the person.

HOW DO THE PLANES OF DEVELOPMENT TRANSLATE INTO A PEDAGOGY THAT SUPPORTS NATURAL DEVELOPMENT AND A NEW WORLDVIEW?

In her comprehensive review of the Montessori approach to education, psychologist Angeline Stoll Lillard outlined the basic principles that underlie Montessori pedagogy: (Stoll Lillard, 2005)

1. Movement and cognition: Movement and cognition are closely entwined, and movement can enhance thinking and learning.
2. Choice: Learning and well-being are improved when people have a sense of control over their lives.
3. Interest: Everyone learns better when they are interested in what they are learning.
4. Extrinsic rewards are avoided: Tying extrinsic rewards to an activity, like money for reading or high grades for tests, negatively impacts motivation to engage in that activity when the reward is withdrawn.

5. Learning with and from peers: Collaborative arrangements can be very conducive to learning.
6. Learning in context: Learning in meaningful contexts is often deeper and richer than learning in abstract contexts.
7. Teacher Ways and Child Ways: Particular forms of adult interaction are associated with more optimal child outcomes.
8. Order in environment and mind: Order in the environment is beneficial to children.

This list heavily emphasizes learning and cognition. Other factors are also at play, however—those intangible aspects of education and development. Montessori education places a strong emphasis on understanding the flow of the energy of development, recognizing that how this energy flows, or is blocked from flowing, affects the development of the individual. “Energies that are repressed lead to inferiority complexes, the weakening of personality, lack of responsibility, listlessness, timidity, a tendency to bullying and to violence. All these phenomena create human beings that are maimed from the psychological point of view.” (Grazzini, 2004, p. 47) If, however, the energy of development is not blocked, then the natural state of children is to be confident, peaceful, curious, compassionate and independent.

Thus additional pedagogical principles link tightly with the developmental model in order to more fully support the development of the child

- Mixed age groups (3 years together in each classroom, grouped by developmental plane and sub-plane)
- Freedom (to choose work, to make mistakes, to work without help, to work together)
- Auto-education through self-correcting materials and work with the hands (especially for ages 3-6)
- Cosmic education principles (for ages 6 – 12)
- The teacher as guide. (For ages 3-6 the teacher’s role is provide an environment designed for the children’s exploration. For ages 6-12 the teacher’s role is to be the connection between the child and the rest of the world, to bring the world to the child.)

Applying these principles, it turns out, result in a structure that is aligned and complementary with the new worldview.

MONTESSORI CLASSROOM STRUCTURE AND HOW IT ADDRESSES DEVELOPMENT OF THE PSYCHE

How is a Montessori classroom structured in order to support education based on these developmental principles, and consequently in a way that embodies the emerging worldview? A Montessori classroom possesses distinctive structural characteristics based on an entirely different outlook on children’s capabilities and needs:

- **Mixed age groups.** A classroom contains a three-year age span of children from one developmental plane. This facilitates peer collaboration and instruction, and also develops the sense of a mini-society with more natural levels of seniority and expertise in the classroom. Tolerance and compassion for others is a natural outcome. Collaboration rather than competition is the primary mode of operation.

- **The Freedoms:** Children should have the freedom to work without interruption and without unwanted help, the freedom to make mistakes, the freedom to explore, the freedom to choose work. But these freedoms come with boundaries and responsibilities. Children can choose what they want to work on and when, but are held responsible for what they have been taught. They are encouraged to explore their own interests. Self-awareness is thus naturally supported. These Freedoms underlie the natural drive towards independence at each plane, and also emphasize the respect given to the energies of development.
- **Natural environment.** The classroom often looks like a busy home or a very large living room, with children working on the floor or at tables, often in groups. There are not rows of desks. Like a home, the furniture and furnishings are natural. The use of plastic and bright colors is minimized. Plants are plentiful; wall décor is natural and home-like, with quality artwork and cultural items. Beauty, order, nature and harmony are built into the structure of the classroom and the expectations of the children, who are involved in the care and maintenance of the environment.
- **Concentration.** Teachers do not interrupt a student who is working deeply and in concentration. Concentration is never to be interrupted, even with praise, questions, encouragement or comment. A child who is working is given the same respect as one would a co-worker who was deeply involved in a project, or someone who was praying.
- **Small group instruction.** Children are taught in small groups by the teacher and they then work independently and at their own pace. The teacher gives lessons based on readiness and mastery of earlier lessons rather than on age or grade level.
- **Uninterrupted work period.** Ideally, each day involves an uninterrupted 3 hour work period allowing children to receive lessons and fully engage in their work. This leads to periods of deep concentration, much like meditation. The students are largely self-directed; the classroom does not revolve around the teacher's actions and imposed structure.
- **Beauty, quality and creativity.** Student work is free-flowing, and often involves self-guided practice, and artistic renderings of concepts. This allows them to work in ways that they feel drawn to and which match their own cognitive style. Work is multi-dimensional and multi-media, and beauty and quality of work are stressed, as is creative and handmade work.
- **Prepared environment.** Shelves are carefully arranged with hands-on Montessori instructional materials in an orderly and attractive way. These materials are designed to offer experiences with specific lessons and principles. The children can then take whatever they need to do their work. Creative materials are also freely available, such as scissors, paints, paper, etc. Children are free to use what they need in order to create.
- **Community.** Proper greetings and social graces are emphasized. The development of compassion and empathy occurs naturally as the children share space and materials, work together in a free-flowing environment, and teach each other. Children regularly present their work to others. Communication happens naturally and purposefully.
- **Respect for children's abilities.** Even in classrooms with small children, glassware is used. The children cut and arrange flowers in vases, and light candles after being taught how to safely strike matches.

- **Teacher self-awareness.** Teachers are expected to self-reflect, to become aware of their role in the energy of the classroom and the work of the children. Besides observing the work of the children, they also observe themselves.

The manifestation of these principles results in a classroom that does not *look* structured: children are moving around the room, some talking to each other, some sitting with a teacher, some gathering materials, some cleaning up, some working alone or in groups. There is no single focus of attention in the classroom. But in fact, there is a strong sense of order, harmony and pattern. This is the picture of a classroom that is not linear or hierarchical in structure, but rather is a system, a complex and interdependent community.

This system is not geared towards producing a predictable product. It is a messy process, not clear-cut, not straightforward. There is a recognition of individual differences within the framework of development, and so the goal of this education is the teleological one that Montessori spoke of: that each individual be given the opportunity to construct himself according to the potential laid down by nature in that person's being. This does not mean that children will turn out perfectly, predictably, or will be without challenges. But when such freedom and opportunity is given, certain qualities can be seen to emerge which, Montessori believed, are the qualities of the natural state of children: being interested in everything (instead of having fears or dislikes of certain subjects), being independent, responsible, empathetic, confident, curious, social, engaged with the world. (Wentworth, 1999)

And so education becomes much less about conquering subject matter and academic discourse and skill, and instead begins to encompass inner development, individual growth, and a journey of transformation. The goal is a greater one, of knowing oneself and one's place in the world.

We can now begin to see how the Montessori developmental approach aligns with the emerging worldview. By replacing the word 'worldview' with 'educational structure' in the statement below, this description directly mirrors the differences between Montessori and traditional education:

In contrast to the previous fragmented and reductionist perspective, a new worldview (educational structure) was founded on interactions, involvement, relationship, process, story, non-linearity, complexity, systems, participation, intuition, awareness, aliveness, connection - rather than separation, pieces, fragment, linearity, causality, logic, distance, product. (Slaughter & Martin, 2002)

Separating these lists of defining characteristics makes the distinctions even more clear:

- Characteristics of the old worldview/traditional education: *separation, pieces, fragment, linearity, causality, logic, distance, product*
- Characteristics of the new worldview/Montessori education: *interactions, involvement, relationship, process, story, non-linearity, complexity, systems, participation, intuition, awareness, aliveness, connection*

It is important to look more closely at some fundamental yet subtle principles that underlie the Montessori approach in order to elucidate how this structure complements the new worldview, particularly regarding relationship, intuition, and connection.

RELATIONSHIP AND AUTO-EDUCATION IN THE PRIMARY CLASSROOM (AGE 3-6, THE FIRST PLANE)

The guiding principle of Montessori education is that nature has provided the inner drive and developmental pattern for human beings to learn what they need to at the right time. The job of the teacher/adult and the school, therefore, is to respect and collaborate with these natural processes of development.

In her book *The Psychology of Auto-Education*, Harriet Hunt (1912) found much complementarity between Maria Montessori's principles of auto-education and Henri Bergson's ideas of 'matter' and 'form' and the development of consciousness. Bergson identifies sensations and the faculties of perception as 'matter' and the tendency to establish relationships among them as 'form.' The newborn baby has 'matter,' (sensory perception) and 'form' will naturally help it sense of its world. "This discrimination between the form and the matter of knowledge has an important bearing upon the method of education." (Hunt, 1912, p.5) According to Hunt, Bergson states that once intelligence works its way up through the senses (matter) and establishes relationships (form), it can "turn inward on itself and awaken the potentialities of intuition which still slumber within it." (Hunt, 1912, p.41)

This tendency to establish relationship, what Bergson calls 'form', is what Montessori calls the *sensitivity to order* in the first plane of development (age 3 – 6). This drive to find order and relationship forms the basis for an important Montessori technique, auto-education. Rather than overtly *teach* small children about physical aspects of the world, the Montessori approach provides materials that are designed for the child to essentially 'teach himself' through physical experiences using the hands and the body. These are activities that provide immediate feedback to the child if they are not done quite correctly, and thus the child self-educates. Montessori developed an extensive set of attractive and enticing sensorial materials which provide opportunities to match shapes, colors, textures, dimensions, weights, even smells. When an error is made, items are left over unmatched. The child can see this herself and is then driven to try again.

To make the process of one self-education, it is not enough that the stimulus (the material) should call forth activity, it must also direct it. All the physical or intrinsic qualities of the objects should be determined, not only by the immediate reaction of attention they provoke in the child, but also by their possession of this fundamental characteristic, the effective collaboration of the highest activities (comparison, judgment). (Maria Montessori, as cited in Stoll Lillard, 2005, p. 175)

Even something as simple as providing light-weight chairs in the Montessori classroom has a specific purpose: light-weight chairs are knocked over more easily, so the child who is still learning how to walk with control of her body will receive immediate feedback if she knocks over a chair. This is in contrast to a traditional classroom where the emphasis is on sturdiness and

chairs are heavy – precisely so they *won't* be knocked over. In this case then, the small child does not have to learn how to correct her movements because she will receive no feedback from the environment.

Claude Claremont in *The Chemistry of Thought* (1935) reinforces the principles behind the process of auto-education, identifying the elements of thought that lead to complex units of action and understanding. “The process of classifying, experiencing and familiarizing results in the complex unit, undertaken without memory of every step involved along the way.” (Claremont, 1935, p. 37) In other words, auto-education results in the development of neural connections and sensori-motor pathways in the brain.

As an interesting comparison to the traditional education focus on testing and empirical results, these sorts of developmental processes described above cannot be tested or quantified. However, Montessori teachers can easily spot differences in the physical grace and coordination between students who enter their classes later in the Montessori system and those who began with the Primary level. It is clear that giving opportunities to small children to explore the spatial relationships and fine physical details of their world through auto-education has an impact on their own physical relationship with the world and how they move through it.

Montessori's approach was designed to lead the child from the education of movement and the senses to the world of ideas by tapping into the natural drive to establish relationships. Thus the material does not offer just content for the mind, but *order* for that content (Montessori, 1966). The pedagogy begins in the First Plane by developing sensory relationships of space, size, likeness, difference, etc. As the child develops, the pedagogy adjusts accordingly. In the Cosmic Education curriculum for the Second Plane, relationships of pattern, cause and effect, and abstraction become the focus.

THE ROLE OF INTUITION

It is through the process of auto-education that the child begins to develop an understanding of the physical world and relationships within it. The child is gaining such knowledge by himself and through his own experience, from an internal source of knowledge. By facilitating this natural process, the voice of intuition can stay vibrant. Hunt (1912, p. 48) explains:

The tendency to establish relations is the form of self-activity which, if recognized and directed in both its early and its later stages, will lead, through sensation and perception, to a grade of intellect far superior to that which is now produced – even, peradventure, to intuition.

Hunt goes on to describe the link between intuition and intellect, saying that intuition knows life from the inside, and intellect knows life from the outside. They seem to be going in opposite directions, yet their full development results in a more complete humanity. Therefore, the work of education is to develop intelligence that provides the ‘push’ to link intellect and intuition. (Hunt, 1912) This mirrors very closely Montessori's perspective, that the goal of development is to create a fully integrated human being.

The role of intuition extends to the teacher as well. Montessori speaks often about the spirit of the teacher, the need for the teacher to be aware of the ‘direction of life’ and to always be aware of the inner potentialities that are within each child. Unlike traditional education with its empirical and linear goals, Montessori is not referring just to the potential ‘to succeed’ in the outer world, but to the potential of consciousness towards a complete humanity. The Montessori teacher needs intuition on a daily level in order to know when to intervene with a child at the right time, but also on a broader scale, the teacher must develop a psychology of developing consciousness and relationship, as opposed to holding a perception of life as being full of unrelated individuals. (Hunt, 1912) In this way, Montessori is countering the reductionist approach of the old worldview.

PRIORITIZING THE INNER WORLD

Montessori once described watching a young girl of 3 or 4 stack and unstack blocks for 45 minutes, completely undisturbed by noise around her. Montessori’s experience and observations of children becoming deeply engrossed in an activity such as this, blocking out all distractions, alerted Montessori to the importance of concentration. As a result, the emphasis on concentration in Montessori education is striking. Concentration occurs when a child is fully and deeply engaged in a task for an extended period of time and can be seen at a very young age, particularly during the First Plane. When the teacher presents material of an activity to a child, the material may deeply attract the child. The child may choose, at that moment or later on, to undertake the activity himself. Because of the emphasis on freedom in the classroom, the child can repeat the activity as many times as he wishes.

This act of concentration is critical. Teachers watch for it as a sign of the child’s progress and development. Stoll Lillard (2005, p. 107) states that, “concentration in Montessori classrooms is thought to facilitate children’s access to inner guides that direct children to make constructive choices.” Psychologists agree; it has been shown that children seek out stimuli that is just challenging enough for them to learn and develop. Montessori saw it as the time that a child was developing herself internally, and it was thus of vital importance in the growth of a child’s nature; to thwart it would be to thwart the energies of development.

There seem to be some intriguing similarities between the process and effects of a child’s concentration and an adult’s meditation practice. When children emerge from a period of concentration, they appear rested and refreshed. (Stoll Lillard, 2005) This description, coupled with the nature of concentration, resonates with a description that many adults give of meditation. Meditators often describe feeling refreshed after meditating, even more refreshed than after sleeping. Stoll Lillard (2005, p. 105) describes a study of mindfulness meditation which found that meditators had more activation in the left hemisphere of their brains than their right, and is generally considered “happy pattern.” They report higher levels of well-being. Recently, attention has been paid to the role that meditation can play in therapy, identifying a positive correlation between meditation and an ability to focus on our internal world, resculpting neural pathways to improve one’s mental health. (Atlas, 2012) And in a Montessori classroom it is not uncommon for a child who emerges from a period of concentration to be swept up in feelings of love and affection, carefully putting away the materials and then coming over to her teacher and spontaneously hugging her, or smiling peacefully.

The respect given to children who are concentrating is analogous to that given an adult who is meditating or even praying, since it is so clear that the child is deeply involved with some inner work. By respecting and protecting the processes that happen in a child's mind during concentration, Montessori education is giving primacy to the inner world of the child, rather than the external world of adult perspectives and goals. Even though it is terribly tempting for an adult passing by a child trying to figure out which wooden cylinder goes in which hole to stop and interact with the child, helping or showing him how to do it, the adult's awareness of the power of concentration of the child means that she knows the child must not be interrupted. The goal is not the correct placement of the wooden cylinder; the goal is the child's development, and nature is driving that process, not the adult.

Therefore, much in the way that meditation can be said to facilitate getting in touch with one's natural state of being, when children are given the freedom to be and do what they need to developmentally, they become themselves.

Motivation is also an inner realm of the child that receives great respect in Montessori education. In his book *Drive* (2009), which addresses the old style of organizational leadership and the need for change, Daniel Pink describes Edward Deci's work on the topic of motivation. Deci discovered that external rewards were not sufficient motivators, and in fact intrinsic motivation was much more powerful. It seems that external rewards eventually became de-motivating: "When money is used as an external reward for some activity, the subjects lose intrinsic interest for the activity." (Pink, 2009, p. 8) Performance and motivation in traditional schools (and the organizational/business world) almost utilize external motivators, whether grades, gold stars, money, prizes, or bonuses, but Deci's findings show that this approach is fundamentally flawed.

Instead, Pink points out three true motivators, sources of intrinsic motivation: autonomy, mastery and purpose. Particularly in the area of autonomy, Pink outlines four essentials to intrinsic motivation, including the ability to choose task, time, technique, and team. (Pink, 2009) These findings strongly support the emphasis in the Montessori education structure on intrinsic motivation, and the de-emphasis on external rewards to motivate children. Children do not receive grades, or gold stars, or prizes for how many books they read in a week. Instead, by accessing a child's natural inner motivation and drive, Montessori education aids in the development of a strong inner voice and self-discipline. Daniel Pink (2009, p. 195) specifically states that Montessori education resonates with the key principles that he outlined in his book, including children naturally engaging in self-directed learning, teachers acting as observers and facilitators, and that children are "naturally inclined to experience periods of intense focus, concentration and flow that adults should do their best not to interrupt."

COSMIC EDUCATION IN THE ELEMENTARY CLASSROOM (AGE 6-12, THE SECOND PLANE)

When the child enters the Second Plane of development, the changes in sensitivities demand changes in pedagogy. This age child becomes intensely interested in questions of morality and reason, human culture, and the wider world. Cosmic Education is the elementary level Montessori curriculum designed to 'offer the world to the child.' The aim of cosmic education is nicely reflected by Harriet Hunt's description of 'Cosmos Consciousness' as proposed by

Edward Carpenter: “By intuition we come to a knowledge of the universe as a whole and to our own identity with this whole and a sense of kinship with all life.” (Hunt, 1912, p. 32)

Academic fundamentals at this level are taught using the same Montessori principles of auto-education and small group instruction. Abstract concepts are made concrete with specific materials; however, the goal is not simply mastery of skills. There is an important emphasis on quality and depth of effort which draws on this age child’s intense intellectual interest and energy. For example, children are able to use materials to find the square root of numbers such as 149,325, or to build a model of the cube of a trinomial, or analyze the grammatical structure of a complex sentence. But in cosmic education these fundamental skills are seen as the tools to be able to explore the deeper aspects of education: developing a holistic view of the universe and a sense of gratitude for and connection with the past, both human and universal, being able to see the universe as a field of interdependence, evolution and change.

In cosmic education, some standard approaches are used which support the teacher’s collaboration with the developmental forces at work in these older children. These include the cosmic stories, storytelling, timelines, going-outs, storytelling, and group work.

- I. **The Cosmic Stories.** The cosmic stories are the foundation of cosmic education. These five fundamental tales are told to the children at the beginning of each school year, from grades 1 through 6. They are, in order of presentation:
 1. *The Story of the Universe* (about the Big Bang and how the stars, solar system and earth came into being)
 2. *The Story of Life* (how Life slowly developed on earth, and how through creativity and experimentation it evolved into the life forms we have today)
 3. *The Story of The Coming of Human Beings* (presenting humans as coming onto the scene with three gifts : a brain that could wonder and imagine, a heart that could love others besides just one’s family, and hands that could create)
 4. *The Story of Civilization* (how written language developed around the world, the history of the alphabet, and how writing has changed humanity)
 5. *The Story of Numbers* (how and why human beings have developed systems of counting and numbers over the centuries, and the history of the Hindu-Arabic number system that we use today)

On one level, these stylized, engaging stories provide historical and factual perspectives. They are designed to inspire the curiosity of the children and set the stage for further study in the various subject areas.

But on another level, the stories aim to lay a critical foundational framework for an understanding of reality. The order of the stories is critical. They provide a holistic reference frame, starting with the whole universe and slowly funneling down to the earth and then to the details of human civilization. This outlook provides a foundation for viewing reality not through an individual, static, mechanical lens, but offers a much more holistic picture of a dynamic, creative universe, constantly changing and evolving. In addition, the stories are told with a strong thread of gratitude for all that came before us, including the efforts of the humans who struggled to learn and survive, and then passed on what they learned. We are now the benefactors of their struggles. This leads to a sense of connection with both the past and the future. All of creation is

imbued with value, since all creatures and aspects of the universe have played a role in this unfolding drama. Montessori's aim was high: to communicate to the children that "we shall walk together on this path of life, for all things are part of the universe, and are connected with each other to form one whole unity."(Montessori, 1948, p. 6)

It is intriguing to realize that Maria Montessori wrote these stories in the 1940's, yet they have been altered very little even up to today, and are told in Montessori schools all around the world. Today, Thomas Berry in *The Great Work*, Duane Elgin in *The Living Universe* and the movie *The Journey of the Universe* seem to directly support her understanding of what was needed. In *The Great Work*, when discussing the need to recover an integral relation with the universe, Thomas Berry (1999, p. 16) writes of Montessori's elementary curriculum and the cosmic fables:

She observes how this experience of the universe creates in children admiration and wonder, how this enables children to unify their thinking. In this manner children learn how all things are related and how the relationships of things to one another is so close that 'no matter what we touch, an atom, or a cell, we cannot explain it without knowledge of the wide universe.'

In fact, Berry dedicated his book to children.

II. Storytelling

Children of this age crave stories. This curriculum draws upon the human love of story as a way to pass on human culture as it has been done for eons. In this respect, the teacher is acting as an elder passing on 'tribal' wisdom to the next generation, rather than simply acting as a disburser of factual information. Storytelling is a mode based on relationship, and basing education on storytelling sets an entirely different tone in a classroom, one of conversation and sharing.

III. Timelines

The Elementary curriculum utilizes timelines extensively- long, meticulously detailed timelines of everything from human history to the rise and fall of civilizations. These timelines continue to graphically and concretely remind children of the flow of time and our/their relationship to the past and the future.

IV. Going – Outs

Developmentally, these children are ready to explore. They crave the experience of being a part of the wider world .Going-outs provide those opportunities to children at school. These can be small trips such as going to the store to buy pet food, or more involved outings to interview a baker. No matter the scale of the journey, these trips are always an adventure for the children, fulfilling their developmental need to explore the world safely. They begin to realize that they are an integral part of society and the world.

V. Group work and collaboration

At this age, children become extremely social. Rather than struggle against this natural development and forcing children to sit and work independently as often

happens in traditional schools, Montessori elementary classrooms work *with* this developmental desire to always be with friends. The classroom structure supports group work and collaboration. Whether collaborating on large-scale projects, or helping a friend understand a math concept, this age group learns best socially. Not only do students acquire concepts better when working socially, but implicit lessons about relationship, communication, conflict and collaboration often take precedence in such situations. Students have the freedom to learn how to be together and how to resolve conflict with struggles arise. Certainly there are practical issues at times, and the teacher's role is to make sure that the students conduct themselves responsibly within the social freedom they are given. Much of a teacher's energy goes to giving guidance in the realm of relationships and interaction.

This support of the energy of collaboration can be truly inspiring, since it means that competition is no longer the primary mode of operation. (This is also due to the lack of testing and grading in the class.) The level of empathy and caring for others in these classrooms can be astounding. Students support and help each other, and especially enjoy giving each other lessons in new topics.

INTERDEPENDENCE, COLLABORATION AND UNITY

Montessori stated that for the Second Plane child, we must 'provide the world'. But naturally that is a logistical impossibility. To address this, Montessori developed the idea of 'keys to the world' within the curriculum. These keys are overarching essential principles that can be applied over and over when looking the world and how it functions. They include, for example, the Fundamental Needs of Human Beings, Time, and Migration. But perhaps the most powerful, and among the most relevant for this discussion, is Interdependence.

The introduction to interdependence begins with the Cosmic Stories, as mentioned earlier. The stories present individual human existence nested within greater spheres of civilization, the natural world, and the universe. Gradually, connections are made across and within those spheres through additional stories and curricular practices. For example, in a vital lesson called, "Where Do We Get Our Bread?" the children trace the path of the bread they eat through queries such as, "Who has ground the wheat? Where did the wheat come from? Who baked the bread? What other ingredients are in the bread? Where did they come from? Who were the first people to make bread?" It doesn't take long before the children are actively noticing the economic interdependence all around them. As Mario Montessori (1957) wrote, "The reality of Society is that everyone is dependent on everyone else."

Through classroom studies, Interdependence is also addressed historically, exploring human migration, trade, exploration, conflict, technology, and innovation, etc. through the lens of interdependence and connection. The successful implementation of one person's idea depends on what others had provided up to that time; ideas are also interdependent. This awareness extends to the natural world and ecology. Each aspect of the world has a cosmic task that links it to the rest of the world. The butterfly serves to pollinate the flowers, while the flowers feed the

butterfly, and eventually the butterfly may feed a bird, and the chain of interdependence flows outward.

Becoming aware of interdependence in the world is somewhat like having blinders removed from one's eyes: one can never go back to not having that awareness, and it deepens over time. It is natural, then, for children to begin to make connections between human actions and the natural world. Environmental issues such as pollution, energy consumption, and agriculture come to the forefront as issues of human cause and effect. Because of their high sensitivity to justice, children in the Second Plane are particularly attuned to these issues. They become very indignant at the 'wrongness', the unfairness, of an animal losing its habitat due to development, or pollution clogging the oceans due to dumping. Through the thread of interdependence woven into the curriculum, they develop a rich awareness of our ecological existence.

In his book *The Evolving Self* (1993, p. 274), Mihaly Csikszentmihalyi states that "Gregory Bateson believed that the first thing children should learn was how the various life systems are interconnected: What is the relationship between the food we eat, the garbage we produce, and the survival of fish in the sea?" This statement exemplifies the curricular goal of Cosmic Education, aiming to bring this awareness to the surface in children as a key that they will be able to use for the rest of their lives in order to understand the world and their place in it. As Csikszentmihalyi (1993, p. 275) emphasizes, "Perhaps the most urgent task facing us is to create new educational curriculum that will make each child aware, from the first grade on, that life in the universe is interdependent."

However, this approach could easily remain an intellectual and theoretical curriculum topic in the cognitive realm. Therefore, it is important to also see how the children in a Montessori classroom *experience* interdependence for themselves. Since the classroom contains three age groups, the teacher must out of necessity conduct lessons in small groups for those children who are ready for the particular topic. This means that the children in the room must help each other, since the teacher is not always available if she is in a lesson with others. The older children act as elders and frequently give support to the younger ones. The younger ones admire the older ones and ask for their help. This results in a classroom structure that is not hierarchical with the teacher at the pinnacle and the students at the bottom. Instead, the structure is much more parallel and systems-like, with multiple feedback loops overlapping as students interact and depend on each other. The classroom is a complex ecosystem. It functions the way the world functions. It is a microcosm of human society, operating the way human beings do – in groups, collaborating. In this way, the students are experiencing a world of interdependence and flow of their own creation. They directly experience the importance of depending on others and being dependable themselves in the 'ecosystem.' This is not explicitly stated but is the children's direct experience in the classroom. It sets the tone and expectation of interdependence. They are constantly being reminded of the value of all roles in the ecosystem of their class.

It is then perhaps not surprising that the atmosphere of such a classroom has a much lower sense of competition, and a greater emphasis on collaboration. Interdependence certainly requires collaboration. And with the minimal emphasis on grades and tests, there is much less to compete over. Even power structures are minimized with the multi-age classroom, where seniority based on age takes precedence, rather than personal power or manipulation. These classrooms, despite having such a vast range of abilities and ages compared to a traditional classroom, exemplify a remarkable level of healthy community, echoing the lessons of biodiversity in nature. There is a

unity that emerges out of the diversity due to the vital roles of all parts of the system. Even children who have difficult or challenging personalities are absorbed into the unity rather than rejected.

It is, however, important to acknowledge that the normal range of child behavior exists in a Montessori environment; the classrooms are not utopian. Children argue, fight, defy and compete. But the scale of this behavior is greatly reduced because of the classroom structure, and the children show the ability to accept and collaborate beyond what many people think possible. In fact, it is not uncommon for parents of bullied children to send their child to a Montessori school because of the reputation of acceptance and community in such schools.

Thus, the interdependence in the classroom creates a strong web of connection that echoes interdependence on a world scale. Mario Montessori (1957) extends the idea of interdependence to also include service, both human and ecological:

When one considers life, in the past or in the present, one finds this sort of service which seems to say, I give my life and I give my energy in order to contribute some item essential to the life of something which is to follow me.'...Going deeper into this philosophical speculation, one finds something strange, that in every case there seems to be an apparent egoism, which masks the hidden reality of Service.

He reminds us that "...there is among the different components of the world an inter-dependence that makes it all one unit." This spiraling of convergence, from one to many and back to one, is a critical aspect of the emerging worldview. We can see it exemplified all over the world, from the internet and its vast ranges of personal expression merging into one network of communication, to global trade patterns, to in the merging of cultures even as nationalism strengthens. Mario Montessori, as early as 1957, expressed this beautifully:

One realizes that the Unity – for the achievement of which the United Nations has been created and towards which everybody aspires – is there already. It is here. It is only our poor minds that are incapable of accepting the fact that it is here. But we are united. All of us. Not only that, but if we were not united, we would be unable to exist. We could not exist.

To say to a group of children sitting in a circle on the floor of their classroom, "If it weren't for the work and cooperation of thousands of human beings over thousands of years, creating everything that you see around you, we would all be sitting here naked on the grass," indeed is a powerful statement. The children look slowly around the room and realize that everything they lay their eyes on was made through the involvement of thousands of people, just like simple bread. Such an image draws us all together as human beings who have been able to exist only through interdependence, and it is through interdependence that unity is reached. The effect that experiencing an education situated in such a unified yet individual, interdependent environment has on the awareness of a child cannot be underestimated.

THE TEACHER IN MONTESSORI EDUCATION

The role and function of the teacher in a Montessori classroom changes with respect to the developmental stage of the child. In the First Plane, in the Primary class of age 3 to 6, the teacher is not meant to impart much information, but maintain the environment in such a way that it attracts the children to interact with the materials. Since the materials and activities are the means for the child to develop herself through work with the hands, and since the child has a sensitivity to Order, the beauty and order of the classroom are of primary importance. The teacher shows the child how to use each material, and the child is then free to undertake the activity whenever she wants and as long as she wants. This supports the process of auto-education. The child learns and develops due to her interaction with the environment; the teacher is there to offer the developmentally supportive environment to the child.

In the Second Plane, ages 6-12, the child becomes more aware of the wider world and can now abstract. Consequently the role of the teacher changes; the pedagogy shifts towards Cosmic Education. Now the teacher becomes a conduit between the child and the world, offering knowledge and skills that will enable the child's exploration. Lessons are given in small groups, and the children then undertake their practice and application of new concepts and knowledge. They are free to take this knowledge in different directions, not prescribed or limited by the teacher. They can follow their own interest.

Since a Montessori classroom is not organized around the teacher but in fact is designed to be a place of flowing, spontaneous exploration, a teacher must possess a number of skills that are not required in a traditional classroom. One is a keen ability to observe the children in order to know or intuit what they need and what they are ready for. The teacher becomes a sort of guru in the sense of knowing just the right time to give a particular lesson. It also means being able to provide a spontaneous lesson when a child expresses an interest, rather than being limited to a prescriptive curriculum, syllabus or time frame. Every Montessori teacher receives training on how to observe astutely, and in fact most teachers try to find time regularly to just sit quietly and observe their class in action. This practice is a way to maintain a sense of the healthy functioning of the classroom community, and supports the recognition of patterns and interactions that may be occurring in the class in order to know how to guide the class or particular children according to their needs.

Such a practice requires self-awareness. Otherwise, there is a risk of the teacher not being aware of his own biases and needs, which could hinder his understanding of the child. Montessori wrote, "We insist on the fact that a teacher must prepare himself interiorly by systematically studying himself." (as cited in Stoll Lillard, 2005, p. 265). This emphasis on self-study and personal preparation is quite distinctive from teacher training in traditional education, which focuses almost exclusively on how to impart information rather than on one's personal psychology or involvement in the process. It is this separation that has given the impression of a traditional teacher's growth and education as being complete' and separate from the education of their students, and is the manifestation of an objective observer mindset. In contrast, the non-linearity of a Montessori classroom with the emphasis on growth and development for both the teacher and students results in an open-ended journey of education. The model becomes participatory and relationship-oriented, as together the teacher and students create their educational environment.

This is not to say that a Montessori teacher does not prepare, and does not follow a curriculum. Certainly all good teachers do so to ensure that their students acquire fundamental skills and

knowledge. But the way it is accomplished is not through a prescriptive syllabus that imposes a schedule and rigor. It is instead through the teacher's skill at offering lessons to the right children at the right time that curricular demands are met. Thus the teacher is free to allow the classroom to flow, with her guidance.

This freedom and flow sometimes manifests as a sort of collective intuition, or collective flow. The classroom becomes a complex system, with various forms of feedback and interdependence. Conversations in class will spark additional discoveries and investigations; students follow their own interests or are inspired by others; they find that their studies lead them to other connections. It is especially exciting when the flow results in striking synchronicities between work in the classroom and things happening in the wider world. Students and teachers may experience moments of "reading each others' minds." Classrooms busy with the hum of activity sometimes spontaneously fall silent and a sense of collective, calm, focused energy permeates the room. Thus it may be that when the teacher flows with the children's energy, rather than trying to control the energy or produce a particular outcome, other levels of interaction can reveal themselves in the community. The degree of human connection in such a community is quite strong, and visitors to Montessori classrooms often remark about the sense of warmth, compassion, peacefulness and support that is tangible in the environment.

Particularly at the Cosmic Education level, the teacher is a cultural storyteller, an elder passing on cultural wisdom. Seeing teachers in this light, they are much more than technicians: they are transmitting the repository of wisdom and human knowledge to the next generation. These exchanges are based on relationship and not on technique or information, and especially since the children are with their teacher for three years, deep relationships are formed.

A FINAL COMPARISON OF WORLDVIEWS AND EDUCATION STRUCTURE CORRELATES

Having explored the philosophical and curricular aspects of Montessori education and identifying how they dovetail with characteristics of the emerging worldview, it is helpful to review the mechanical worldview and education comparison chart from earlier, this time including comparative points from the Montessori approach:

[See the accompanying Worldviews file.]

CONCLUSION

Despite its sometimes lofty philosophical, even mystical, language, Montessori education is extremely practical, grounded and realistic. Any form of education must necessarily include fundamental skills and educational content, and these are addressed solidly in Montessori education.

What is at issue here is not content or even methodology, but the structure and underlying belief system of education. The mechanical worldview and its accompanying educational system has been serving a vital role in the development of civilization, but it no longer meets the evolving needs of human society as the world becomes less linear and more complex. We have seen that Montessori education principles and pedagogical techniques fit cleanly with the defining characteristics of the emerging worldview. There is also concrete evidence of new worldview manifesting in social organizations, economics and the daily workplace. The characteristics that

are coming to define the new organizational paradigms are the same ones that match the emerging worldview, and which can also be identified within Montessori education structure and philosophy.

In his 2010 TED talk, Sir Ken Robinson proclaims the need for an education system that nurtures creativity and gives students the forum to explore their passions. Robinson goes on to reinforce that the linear model of education results in a lack of diversity, an emphasis on conformity and an expectation that if a series of steps is successfully followed, an expected outcome will be met. However, “human communities depend on a diversity of talent, not a singular conception of ability.” (Robinson, 2010) Montessori education and the emerging worldview demand a “grow” mindset – a perspective of education as an organic process in which inner drive, inner energy, and inherent creativity are respected. Outcomes are unpredictable, and the result is a diversity of talents and skills. As Robinson (2010) stated succinctly, “We create our lives symbiotically as we explore our talents in relation to the circumstances they help to create for us.”

For many years, the mechanical worldview provided the illusion of control and predictability. The material world does have many predictable aspects, of course, so the idea has been easily supported for some time now. But the greatest illusion of all was the idea of being able to predict and control the outcomes of human beings, especially during times of intense growth and development such as in child development and education. The qualities of Montessori pedagogy are relationship and process-oriented and emphasize connection with the universe, the natural world, and other human beings. Considering that the model of Montessori education is based on non-linear human development rather than predictable mechanical outcomes applied to human beings, it seems likely that the Montessori approach, while being over 100 years old, may actually be very well-aligned to the worldview that is now coming into view. As the new worldview emerges, we are being forced to let go of the comfort of predictability and face/embrace the flow of process, creation and interaction. Just as a Montessori classroom offers freedom within limits, human potential gives rise to infinite variations of interest, passion and creativity within the patterns of human development. Holding this perspective, education can become a co-creative journey, open-ended and alive with connection and possibilities, yet practical and grounded in the reality of natural development.

ADDENDUM

AN OVERVIEW OF MARIA MONTESSORI’S LIFE AND WORK

The trajectory of Montessori’s life led her from medicine to education, often interacting with some of the leading progressive voices of her time. As a young medical doctor, she began in pediatrics and psychiatry; by the end of her life she was a world-reknowned progressive educator and peace activist. Her path also included many personalities who were enlightened in their thoughts and outlooks, such as the Theosophists and Gandhi, and Montessori both contributed to and was influenced by these interactions.

This brief outline of her career provides an overview of the evolution of her work in education (Kramer, 1976)

1. Montessori studied pediatrics and psychiatry, graduating from medical school in 1894.

2. She was assigned to work with children in asylums. Influenced by Itard and Seguin's methods, Montessori began researching and experimenting with methods of teaching developmentally disabled children in the asylums.
3. After extensive work in the field, she gained a reputation as an expert in working with these children. Montessori headed a new training institute for teachers of children with disabilities who were perceived to be unteachable, and developed new methods of teaching for them. The children began to learn and her methods gained attention.
4. Montessori developed the idea of scientific pedagogy, and returned to university to study philosophy/psychology.
5. In 1906 she was invited to start a school for young children of ghetto families in Rome. She wanted to try her methods on mentally normal children. She also became involved in the Theosophical Society at this time.
6. After setting up the school and training a teacher, Montessori observed the classroom and the children's behavior, their tendencies. From their outward behavior in a free environment, she began to discern inner patterns of development. Montessori developed and refined teaching materials based on children's reaction and use. She altered the role of the teacher towards being a guide instead of a leader. She developed hallmarks of her method and laid the groundwork for the early childhood Montessori approach.
7. 1920s-'30s. Word spread about Montessori's successful and new approach to education. She received international acclaim in the US, Switzerland, India, and set up training centers in Europe. She was embraced by Freud, Piaget, Tagore, Gandhi. Jean Piaget became head of Swiss Montessori Association and based much of his work in cognitive psychology on his experiences in Montessori schools. Even Mussolini knew Montessori, when she began writing about education and its relationship to peace, they had a falling out.
8. In 1939, she was invited to India by the Theosophical Society to run Annie Besant's school in Adhyar. From 1939 to 1946 Montessori was interned in India as an Italian national. During this time she taught all over India and began working on curriculum and philosophy for older children, age 6-12. She and her son developed materials, stories, and the principles of cosmic education. She also became increasingly passionate about peace and world unity.
9. Montessori expanded her developmental model of the planes of development.
10. She became more involved with peace and education and was nominated for the Nobel Peace Prize three times. She conducted trainings and set up training centers all over Europe, India, Sri Lanka.
11. Montessori died in 1952.

Montessori had been involved in the Theosophical movement since 1907. Interest in Montessori education in India began as early as 1913, and by 1929, Rabindranath Tagore had opened a number of Tagore-Montessori schools. In 1931, Montessori met Gandhi in London when he gave a speech at the Montessori Training College. Gandhi was also very interested in Montessori's work and utilized a similar approach in his ashrams. (George Sydney Arundale, 2010)

In 1939 George Arundale, the president of the Theosophical Society in Adyar, India, invited Montessori to take charge of the Besant Memorial School on the society's campus. She ran the school for three years, heavily influencing the institution. She had planned to come work with George Arundale for a short time, but upon the start of World War II, as an Italian national in

British India she and her son Mario were interned in India for seven years in total. During this time, the cross-influence of theosophical doctrine is very evident in Montessori's work, with her emphasis on unity and the belief that 'justice and love guide the cosmos.' This would become the bedrock for her cosmic education curriculum for older children (age 6-12). She continued to develop her curriculum while teaching children and training teachers, and the influence of theosophy and Indian philosophy on her approach is readily evident today in Montessori education philosophy and cosmic education.

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