

# GLOBAL SCIENCE AND SOCIAL SYSTEMS: THE ESSENTIALS OF MONTESSORI EDUCATION AND PEACE FRAMEWORKS

*From Childhood to Adolescence*

by David Kahn

*Inspired by Baiba Krumins-Grazzini's interdependencies lecture at NAMTA's Portland conference, David Kahn shows the unifying structures of the program that are rooted in the natural and social sciences. Through a connective web, these sciences explore the integration of all knowledge and lead to a philosophical view of life on earth, including human civilization. Kahn adds a new recognition of unified ecological summits that provide the real connectedness to the work that the next generation is doing to find global collaboration in making the world a better place.*

All is strictly interrelated on this planet. And one notes that each science studies only the details of a total knowledge. To speak afterward of the life of man on the surface of the globe is to speak of history. And each detail holds the child's interest by reason of its strict relation to the others. We may compare it with a tapestry: each detail is a

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piece of embroidery—the whole constitutes a magnificent cloth. (*From Childhood to Adolescence* 22)

To bring detached notions [to the child] is to bring confusion. We must determine ties between facts...by determining with the child the correlation between facts, as is appropriate to the human spirit, we create for him a philosophy—and why can't a child do philosophy? (*From Childhood to Adolescence* 58)

Montessori's theory of connecting everything that unifies developmental studies is based in a universal orientation that begins in *From Childhood to Adolescence*. It gives rise to linked frameworks in all kinds of interrelated confluences, declassifying facts but retaining the clarifying dynamic of the disciplines—science, history, and mathematics—in relation to needs of development, a developmental continuum, and a curriculum spiral. This theory of connectivity is first posited for abstract learning within the classroom but grows beyond four walls to a place-based closed community: the farm. Beyond the farm, the expanding learning of the older adolescent requires a global learning system that incorporates usefulness and mission that connects the adolescent to global realities.

So the “correlation-between-the-facts-philosophy” seems a likely starting point for a generalist-abstract position for the advanced elementary Montessori education. But let us think what specific kinds of details must be organized and what is Montessori's theory of science knowledge to get to the correlation of the facts. How does holistic learning about the natural world blended with human social consciousness find its moorings in the sciences as well as the social sciences and history? Mario Montessori quoted Maria Montessori:

We must give the children not only the world, but also a *clear* picture of Mankind in the world. So, a) How the world functions, and b) how mankind functions are two basic factors...To do this, base yourself upon fundamental facts that do not change no matter what the ideology is at any historical moment. (*Human Tendencies* 2–3)

## THE MONTESSORI ELEMENTARY INFRASTRUCTURE

### The Interdependencies: The Abstract Keys for Exploration in the Elementary by Greg MacDonald

The following Montessori training lecture introduces an iconic chart in the context of the elementary psychology lecture titled the “Human Tendencies (Universal Process).” The chart is named the Interdependency Chart. Let us step into Greg MacDonald’s lecture of that title.

Maria Montessori paid a great deal of attention to the interrelationships that existed between various living and nonliving aspects of the world. In *Education for a New World*, she pointed out that the cow performs all of the tasks that are necessary for the upkeep of grass, whilst providing milk at the same time. Grass in turn provides food for the cow, and knits together the soil, which would otherwise be carried away by the wind. She observes that:

Animals do not eat merely to satisfy themselves, but to fulfill a mission prescribed to them by their behavior,

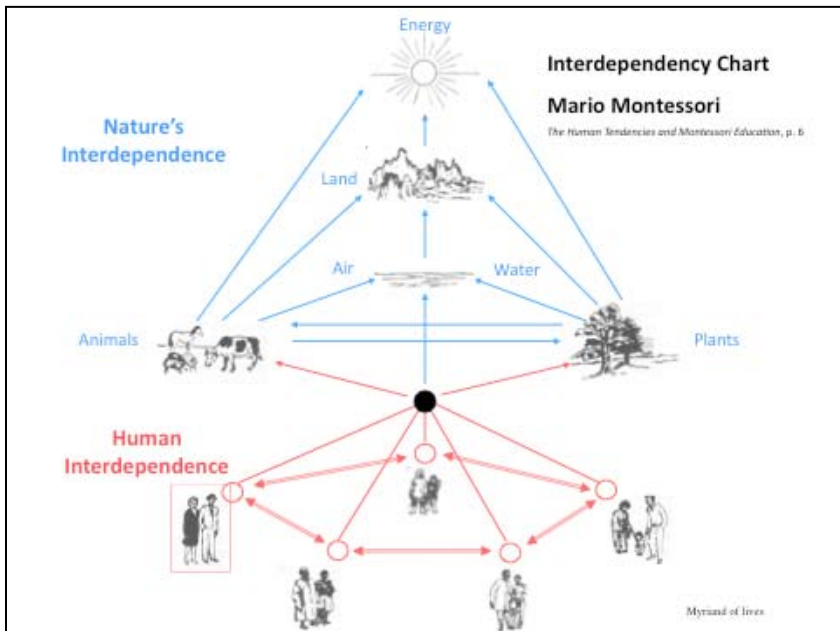


Figure 1. Interdependency Chart, Mario Montessori, *The Human Tendencies and Montessori Education*

in the interests of the harmony of creation, which is achieved by the collaboration of all beings, animate and inanimate. (26)

Every component of our world, Montessori noted, has a “cosmic task” to perform. This cosmic task is carried out as a result of the day-to-day actions of each, and contributes to the maintenance of balance and harmony for all. In *To Educate the Human Potential* (44–45), Montessori discusses the action of water as it acts as a “furniture remover,” removing carbon dioxide from the air as it falls as rain and dissolving and depositing rocks. She refers to the work of bees, to the actions of earthworms, to the scavenging of crows and vultures, and to the filtering of the seas by such creatures as coral polyps (who build their homes with the filtrates), as further examples of cosmic tasks in action.

It is examples such as these that Montessori wanted us to bring to the children’s attention. The place and history of humanity, which Montessori saw as continuing the process of evolution of the cosmos (*Education for a New World* 27) must also be studied in relation to the other aspects of the world. In this way, the sensitivity of the children to ecological matters may be enhanced, and a sense of responsibility for the stewardship of the earth, and all that it contains, may be born.

If this result is to be obtained, then the various experiences that the children have had in such areas as geography (“Work of Water” and “Work of Air”), biology (“Needs of the Plant,” “Body Function Material”), and history (“Fundamental Needs,” “Time Lines of Human Beings” and “Civilizations”) should be augmented by a study of communities in nature, known to the biologist as *ecosystems*.

An ecosystem is an interacting community composed of living and nonliving elements. Such a study brings together the children’s studies of living and non-living aspects of the earth. The concept of the ecosystem provides the children with an organizing framework for the information that they have accumulated in the course of their studies. It is a concept most appropriately introduced in the 9–12 class, as by this time sufficient material will have been acquired to make the ideas that the concept of an ecosystem con-

tains most meaningful (Greg MacDonald, unpublished course notes taken from the Montessori Introduction of the Interdependencies, Elementary Course).

### Chart of Integrated Studies by Jean Miller and Camillo Grazzini

A classic commentary on the Interdependency Chart is Jean Miller and Camillo Grazzini’s Montessori chart of integrated elementary studies of life systems as a representative “plan” that brings to bear symbolically all at once: organisms, social systems and ecosystems, as well the flow of evolution and civilization (history) emerging from the “cosmic fables” about life origins. This chart was developed by Grazzini and Miller to materialize the systems of the elementary program completed by NAMTA for parent education about a knowledge-systems approach that synthesizes the whole of the elementary.

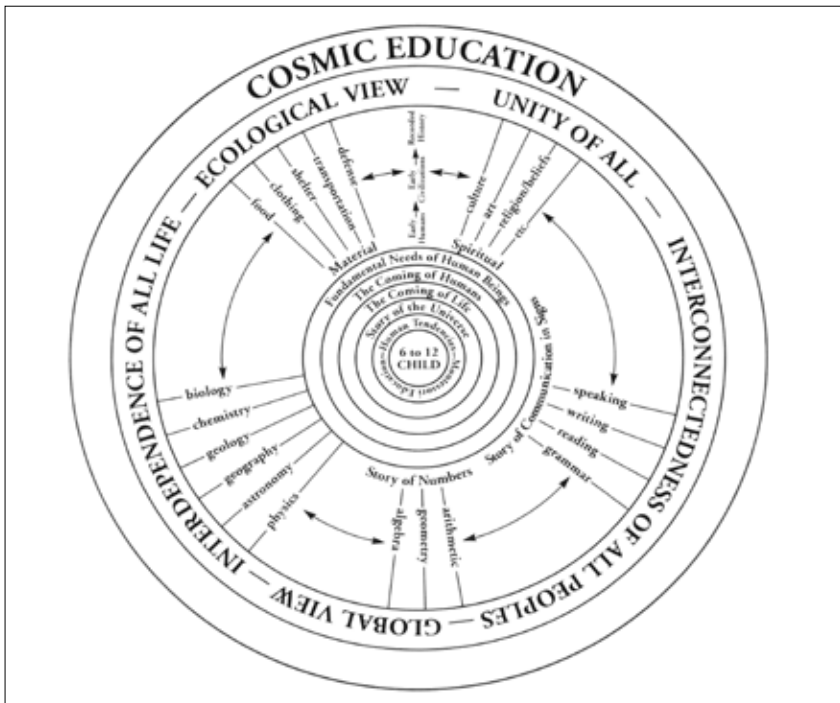


Figure 2. Cosmic Education and the Disciplines, Grazzini and Miller

This is the Montessori big picture constituting “networks of the mind” (the disciplines) converging onto a finalistic cause on the outside perimeter—finalistic meaning something unknown in the future that is nevertheless exerting a global force or calling on the learner’s present orientation (to ecological unity and universal understanding). There is no educational or science pathway for elementary children that is like this in the history of pedagogy...as ambitious as what is represented on this chart, and at the same time to date the chart remains under construction in its dynamic scientific interaction with children’s knowledge and truth. This learning framework belongs to the child, again calling (vocation) on the child to see beginning at age six these problems of the environment and life systems and just how they are interconnected and interdependent. They cannot be studied in isolation or within each discipline silo. The past is at the center of the chart as is the present in the telling of the Universe story; the future purpose for each maturing human is at the outside of the chart along the circumference as it reads—“unity of all, interconnectedness of all people, global view, interdependency of all life.” The chart is about dynamic systems which are literally in flow, real operating cycles of nature which are continuous. This whole web of life and all of its parts can connect all the disciplines, not through artificial abstractions but through living systems or learning systems that are organic and fit snugly to psychological and social structures creating a unified perspective of knowledge as embedded in the totality of life, and not theories. Montessori put this big picture into a quaint little phrase—“sowing life, not theories.” The intent of the big picture is to create an unconscious kinship of the “myriad of things.”

The discussion continues to demonstrate the importance of the whole as providing wonder and motivation for the details of the disciplines. This implies that the elementary integration of everything is found in a deductive/inductive cycle going from the whole to the detail and from the detail to the whole, evoking the highest functioning of the imagination: “In the beginning...”

A synthetic view of the world refers to our planet as a whole, with all of its spheres and its environment of outer space; whilst the analytic view refers to various subject areas, all the various branches of knowledge...those branches of study that we call the disciplines or subject areas, must be a means to understanding the world and not an end in

themselves. And to understand anything in the real world, to help the child to understand anything in the real world, means that we cannot limit him or ourselves to one subject at a time, to one box or compartment of knowledge at a time. If we try to do this, the child will always ask what is the point of learning this or that, what is the point of learning geometry or geography or history, and study and knowledge will come to be seen as a useless and sterile thing, cut off from any living reality. But if the child is using geometry, geography, etc. to understand the world, to develop clear ideas about how the world and human society function then the work brings its own reward, self evident and emotionally satisfying, and the child is never left wondering, "What is the point of all this?" (Grazzini n.p.; n.d.)

**The Whole in Relation to the Parts: An Iconic Summary of Montessori's System's Approach to the Great Lessons**

Another dynamic elementary organization is the scaffolding of the great lessons mentioned earlier as cosmic fables. This scaffolding is a deductive technique for providing a framework for the study of all things and establishes a forward movement going from past to future like the Grazzini-Miller chart (figure 3) demonstrates. The stories begin with the Big Bang, indirectly revealing a support

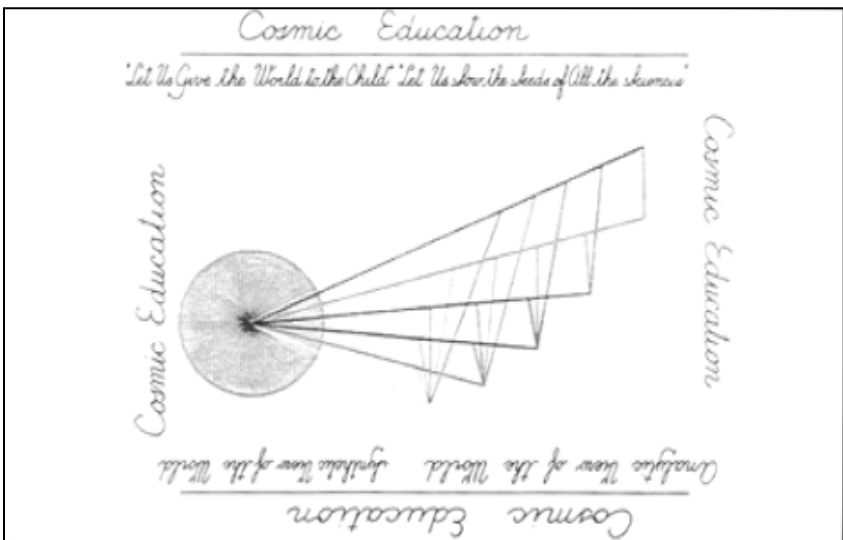


Figure 3. Cosmic Education: Schematic Representation of the Branches of Knowledge

system for evolution—the most comprehensive, dynamic drama of all time and places—the evolution of life on earth, the evolution of early humans, the evolution of civilization from settlement to city to empire that is captured by the sixth Great Lesson titled The Great River. The content of the Great Lessons is far reaching and impressionistic—“In the beginning...” is like “Once upon a time”; it makes you stop and call the imagination to front and center. “In the beginning” and the stories go deeply with a factual overview, but the real intent is to inspire with wonder the great questions of all periods of history. They are impressionistic ideas—where does the universe come from, what are its limits, what is our solar system, where did first life find its food, etc. Here they are in graphic form, each Great Lesson begetting the next time span with connected sequencing of great events in time, not told with complete accuracy but with an absolute conviction is that the patterns of history are pathways, not just to knowledge but of a fundamental faith in the positive outcomes of unfolding reality.

The Great River is sometimes referred to as a metaphor for human unity, which has been put forward by the previous section as the

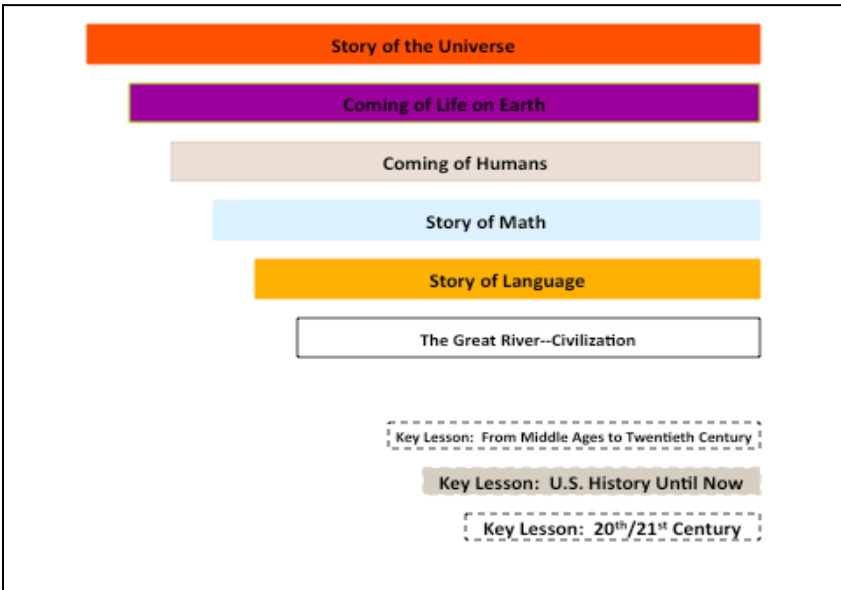


Figure 4. The Great Lessons



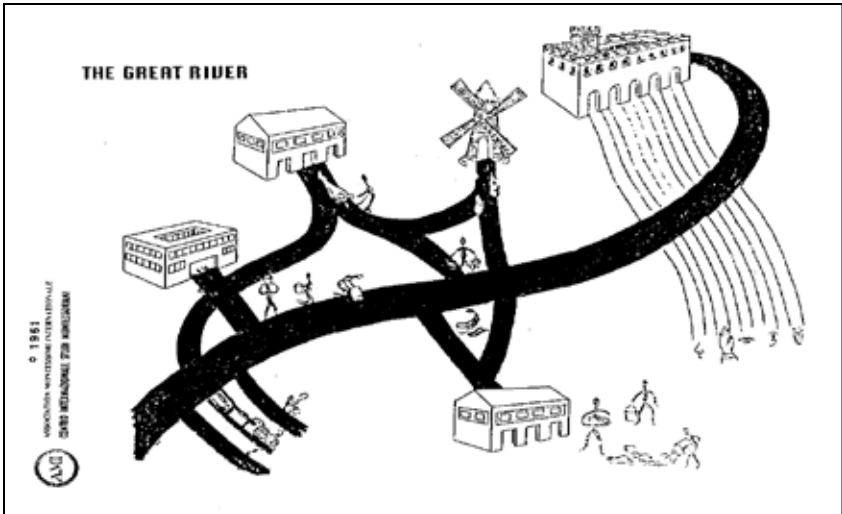


Figure 5. The Sixth Great Lesson: The Story of the Great River

evolutionary end of human history implicit in Montessori’s cosmic plan. In a literal sense, Montessori’s famous quote, “Humanity is an organic unity that is yet being born,” refers to human organs as they specialize in order to do the unified work of the human body. The world, then, is the body writ large, ready to become an effective unit wherein the organs work together to form “la nazione unica.”

There has been revealed to us a significant unity of method in all natural building. It is clear that nature follows a plan, which is the same for an atom as for a planet...These are found to be the basic principles of nature’s plan:

1. The freedom and independence of organs in their several developments
2. Development through specialization of cells
3. The unification of organs by the circulatory system of the blood.
4. Directive communication established by the nervous system.

Lastly the control of the nervous system gives sensitivity and animates....An organism is no mere collection of organs...

The brief review that we have taken of history of human civilization has been meant to show the same basic design at work, for civilization too is an organic unity being born. Like organs, the different centers of civilization have been nursed to strength in isolation, then brought into contact by which they merged into larger organizations...the brief review that we have taken of the history of human civilization follows.... (*To Educate the Human Potential* 7)

So once again an organic body system is the basis for analysis and synthesis, for putting together a holistic view of human scientific and historic studies writ large as evolving civilization. The almost-adolescent approach incorporates the histories converging on the great river, or what is sometimes referred to as the *single nation* (*nazione unica*) for its unifying message symbolized by the departments of the human body being unified by the circulatory system. This Montessori “city on the hill” symbolizes the way to human solidarity.

This peculiar use of the interdependency chart shows how it becomes a living chart. The web becomes actualized by the many performed occupations on the farm and each occupation finds a classified place under a web function with a tie-in also to the scientific and historic disciplines.

For the third plane, the exploration is even wider, encompassing the farm and the community of the rural area. It echoes what the children explored at the second plane: civilization and how it came about. But now the exploration takes place in reality because the adolescents are actually doing it. Cooperation with the land, cooperation in commerce, and cooperation in the cultural life of the rural society touch materially the things studied in the second plane and afford the adolescent the opportunity to see his or her place in society. (Stephenson n. pag.)

### **Scientific Classification of the Occupations on the Land**

Occupation projects represent the convergence of the work on the land and study in the classroom. Farming often requires a great deal of specialized intellectual and manual expertise. The farm school community addresses the need to develop this expertise through occupation projects, a concept originally conceived by John Dewey, who writes from education and experience:

The knowledge demanded is not a subject to be covered, but rather knowledge to be applied for the greater good of the operating community through the work of a common enterprise. Thus, the occupation's roots in meaningful work extend to the related contextual study, providing motivation for becoming the "expert" and infusing academic work with purpose and meaning as part of social life. (n. pag.)

Montessori as well begins to define a general education as farm life providing the framework for study:

Education should therefore include the two forms of work, manual and intellectual, for the same person, and thus make it understood by practical experience that these two kinds complete each other and are equally essential to a civilized existence. (*From Childhood to Adolescence* 65)

...work on the land is an introduction both to nature and to civilization and gives a limitless field for scientific and historic studies. ...there is an opportunity to learn both academically and through actual experience what are the elements of social life. (*From Childhood to Adolescence* 68)

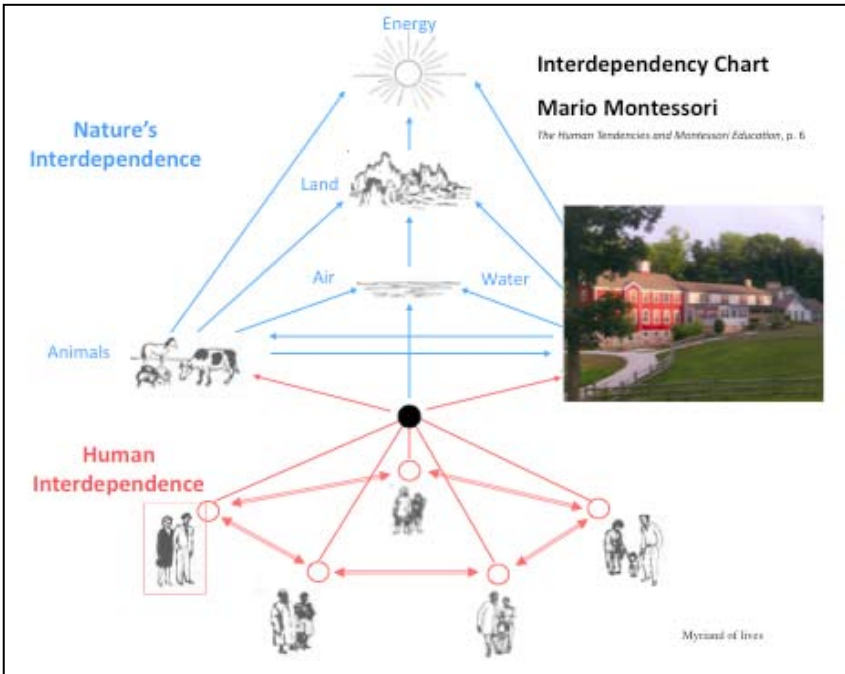


Figure 6. The Interdependency Chart and the Early Adolescent Transition to Land

From a current list of Montessori occupations on the farm from Hershey Montessori School's Adolescent Community, we can derive a course of study and work. Any occupations list could be classified as a lesson in the science disciplines.

**Cumulative Occupations List by Laurie-Ewert Krocker for Hershey's Adolescent Farm Campus**

1. Organic Gardening (2015)
2. Chickens (2013)
3. Food Preservation (2013, 2012)
4. Nutrition (2014, 2013)
5. Structures (2013)
6. Microeconomy (2013, 2012, 2011)
7. Chicken Habitat
8. Child Development (2016)
9. Sugar Bush (2013)
10. Animals (2012)
11. Alternative Energy (2013)
12. Water/Food Quality (2014)
13. Biology (2013)
14. Simple Machines (2012)
15. Bovine/Swine (2013)
16. Equine and Pasture (2012)
17. Sustainable House (2012)
18. Bioshelter
19. Bees
20. Astronomy
21. Fungi

## Occupations Classified as Science Lessons 2001–2002

- Chemistry
  - Atoms and molecules
  - Chemical structure and function of carbohydrates, proteins, and fats
- Physical Science
  - Solar radiation and electromagnetic waves
  - Earth's rotation and tilt
  - Radiation and matter: reflection, transmission, and absorption
  - Thermal mass
  - Water cycle and basic weather principles
  - Motion, acceleration, and force
  - Newton's Laws of Motion
  - Simple machines: lever, pulley, wheel, axle, inclined plane, wedge, and screw
  - Work, power, and simple machines
  - Energy and transformation of energy
- Economics
  - Economic models
  - Economic math
  - Supply and demand
  - Budgeting and forecasting
  - Profit and feasibility studies
  - Business ethics
- Archeology/Local History
  - The history of Huntsburg and Sylvester Clapp
  - Genealogy of Huntsburg families
  - Archeological excavation
  - Handling, identifying, cataloguing, and displaying historical artifacts

- Scientists and Scientific Contributions
  - Louis Pasteur: cell biology, pasteurization, disproving spontaneous generation
- Science and Culture
  - The cow in history and mythology
  - Factory farms: mass production of meat animals
  - World hunger
  - Food and body image
  - Healthy diets
  - History of greenhouses
  - The biosphere and environmental issues: acid rain, nuclear waste
  - Tools and humanity: the history of tools and the nature of humans
- Scientific Method/Lab Skills
  - Scientific research and the scientific method
  - Using a dichotomous key
  - Using a compound microscope
  - Using the metric system/unit conversion
- Basic Biology
  - Metabolism
  - Cell structure: organelles
  - Plant cells
  - Animal cells
  - Types of cells: nerve cell, blood cell, muscle cell, skin cell, bone cell
  - Cell division: mitosis/meiosis
  - Microbiology: yeasts, molds, bacteria
  - Food chains and food webs

- Zoology
  - Characteristics of mammals
  - Characteristics of birds
  - Systems of mammals: digestive, respiratory, nervous, reproductive, circulatory, skeletal/muscular (pig, cow, human)
  - Human digestive system
  - Systems of birds: digestive, respiratory, nervous, reproductive, circulatory, skeletal/muscular (chicken)
  - Classification of mammals: cow, chicken
  - The evolution of mammals: cow, chicken
  - Genetics: role of chromosomes, dominant and recessive traits, probability of inheritance
  
- Botany
  - Parts of the plant: leaf, stem, fruit, flower, seed, root
  - Plant processes: photosynthesis, transpiration, translocation
  - Plant classification
  - Genetically modified organisms
  - Hydroponics

**Web Classification of the Occupations on the Land:  
A Paradigm Shift**

The web function is fundamentally worked and studied by the student living in a community. The web emerges from the need to belong to the land and shared responsibility is a function of the web functions. The ability to see patterns and relationships in doing the occupations is a web function. The ability to experience social connection in the work is enhanced by the farm. The need to use science to trace patterns of cooperation is web ecology. Again the ecological exchange of information is a result of many years of

advanced timeline epochs each viewed in geological dimensions, what is often called deep ecology (Capra 6). Here is why a farm makes perfect deep ecology:

1. It requires interdependency of human cooperation in managing nature within the context of community.
2. Interdependency is defined by division of labor and how division of labor interfaces as a whole-farm enterprise. (Wood lot managers harvest wood for the wood-burning furnace.)
3. The farm keeps life in balance because of the interrelated parts.
4. Knowledge is associative as parts cooperate and need each other. (Plants need water. People need oxygen.)
5. Facts emerge out of a joint perception, wisdom, and caring based in a community history.
6. The farm has a human history and a natural history that are interrelated.
7. The farm recognizes the value of nonhuman life and of the inorganic elements necessary to support life: carbon cycle, nitrogen cycle, watershed, etc.

The important part to remember is that the web is a way of learning and knowing throughout the elementary and adolescent years. The adolescent personalizes information because the adolescent belongs to a community; learning information or data is not the main purpose for learning. Rather, the adolescent retains knowledge through the members of the community that they collaborate with. Abbey discovered the muskrats in the pond, Dominique harvested the wild leeks; this is an associative process, it is not just cause and effect. This needed information enables the students to make a farm grow and to understand the events of nature where they live as they share the information regarding their respective occupations. Indeed, the knowledge paradigm of the farm's web of life conveys the highest principles of learning through the totality of connections in order to understand detail. The learner's questions become the basic means to understanding: They are not didactic, not for achieving on tests, but for the sake of the production and exchange within the context of an adolescent community.



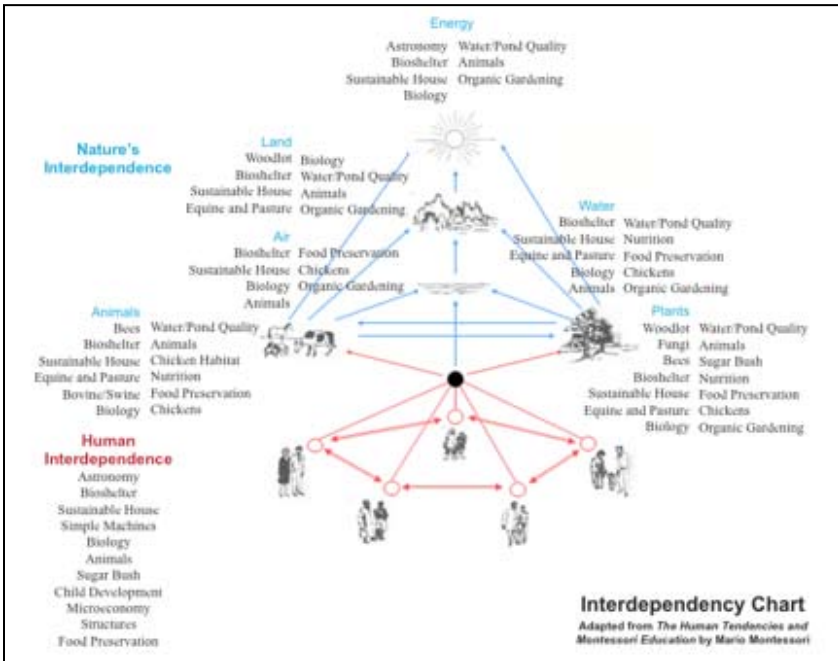


Figure 7. The Interdependency Chart and Occupations on the Land

### THE 15–18 ADOLESCENT: DEVELOPMENTAL READINESS FOR LINKED SUMMITS—CREATING A GLOBAL PLAN OF WORK AND STUDY

Montessori’s writings are the least specific for this age group. But there are implications that the older adolescent has different needs than the younger, and of course they are coming into adulthood with adult maturation. Montessori seemingly recommends formal learning but in the context of real life experience (“a sense of direction”):

...the child should have a holiday for...three years. This will coincide with the age of physical development, of puberty...I should like to see children leave their narrow homes and go into the hills or to the sea, or into the country, where they will be in touch with nature and learn some practical trade. Here they can meditate and their innate sense of justice and life will blossom tranquilly under ordered labour and this natural existence.

I can imagine these children returning to their formal studies when they are sixteen, feeling that they understood

something of life and have achieved a sense of direction.  
("Disarmament in Education" 259)

The characteristics of the older adolescent seem to emerge as a more socialized human being. The importance of these emerging characteristics, which I have collected from my colleagues who teach students between 15–18 years old, suggest a unique set of learning environments and approaches like all of Montessori. Quite clearly a major developmental leap is forming at this age.

1. New maturity—synthesizing knowledge-based formal studies
2. Higher metacognition—applying the formal disciplines to practical challenges
3. More objective sense of reality and social relations—extending to the larger community, from local to formal global social mission—"the mission of man."
4. More accepting of peer and adult shortcomings—social newborn
5. Enjoys freedom and responsibility
6. Looks to individual trajectory (Kahn, Power Point Slide, 2014)

There is no definitive research yet on older adolescents within the *growing up Montessori* context, so what is stated in this above list is a likely compilation by practitioners. However, Montessori seems to highlight the significant characteristic the "mission of man" without defining a specific kind of problem-solving except that the problems tend to be of a social, associative kind and be ever present in the older adolescent's developmental process.

The first reform in education must be to offer a wide environment and to multiply the possibilities of association and of activity. It is during the period of adolescence that interest in the construction and functioning of society presents itself in germinal form in the individual consciousness. Now, society is built up by various activities and not by purely intellectual ones. The greatest element in the

construction is the growing sentiment of the conscience of the individual, which develops through and by means of social experiences. (*From Childhood to Adolescence* 89)

Thus we see the adolescent is propelled towards society and his mission, which is still obscure. But there is a kind of call that asks from him to dedicate himself to something serious in life. We also see a power, a calling which does not yet have a well defined and achievable goal. ("The Adolescent —A Social Newborn" 76)

This then could be the age at which great feelings can strike like lightning. This shows that not only on the physical side there are a great many dangers in adolescence, but also on the psychic side. There are so many problems that humanity has to consider. We must not only look at them, but also solve them in such a manner that we support the realization of the greatest powers that exist in the mysterious and magnificent soul of the adolescent. ("The Adolescent —A Social Newborn" 78)

The general idea taken from this Montessori literature is that there is a critical sensitivity period with adolescents for making an impact on the world, and this period requires technical knowledge and collaborative strength. What is also interesting about this 15–18 period is the adolescent's social needs for relationships around a meaningful point of engagement for humanity and the environment. This bonding happens quickly among the adolescents who are total strangers but come together for a common cause. An instant social community of adolescents is formed to effectively make contact with scientists (real experts) that are thematically organized around ecological reform.

The International Montessori Adolescent Summit brings together youth from Montessori schools around the world to tackle one current global issue at a time and to build on the universal Montessori skills necessary to act locally and globally. At each summit, adolescents apply these skills acquired in their Montessori experience to global realities:

- an ability to identify the significant components of a problem,
- a capacity to focus and concentrate on an issue,

- an ability to ask essential questions about a problem,
- a habit of conscious conversation in a problem solving capacity,
- a desire to engage in dialogue that builds trust and innovation, and
- a hope to construct bridges across local, national, and international sectors. (Patton, Fisher, & Ury)

### **The MISP Summits as Stepping Stones to the Global Social Unity of the Montessori Adolescent**

The Montessori Institute for the Science of Peace (MISP) was one of the first Montessori organizations to propose a summit system of experiences as an ecological composite both local and abroad. The selected themes are relevant to current events and intense ecological crises, which the students are addressing in their hometowns. The first requirement for joining a summit is that the school group has a local project that provides the corresponding experiences to the special summit abroad (for example, local water study to study water in a culture other than your own, with attending experts to establish a mission both locally and in a different country).

The web approach to holding seven summits corresponds to the seven active agents of the Interdependency Chart. The summits can be implemented around the world in a unified theme because the web of life organization ties all summits together with regard to connecting interdependency. No summit stands alone because the web is interactive and converges on nature's unity of life on earth, which is fundamental to Montessori's view of modern science. The unified results of the summits will be present in Prague's Montessori International Congress, 2017. This means that local ecological summits can invite other international schools and then meet with all summit participants in Prague with interfacing and integrated results.

#### **Web-Interdependent Summits**

1. Energy—Energy Summit
2. Land—Soil Summit

3. Water—Water Summit
4. Animals—Animal Summit
5. Plants—Food Summit or Deforestation Summit
6. Humans—Human Organization Summit, the human role in building a sustainable world
7. Air—Air Pollution Summit

Complex global issues are a compelling and developmentally appropriate subject for Montessori middle and high school youth. The Montessori Model United Nations conference offers a structure and format for global perspective-taking from upper elementary to early adolescence, using the United Nation venue for their productivity. The International Montessori Adolescent Summit for ages 14–18 takes the adolescent into real-world institutions using cities around the world for its place-based learning staging areas.

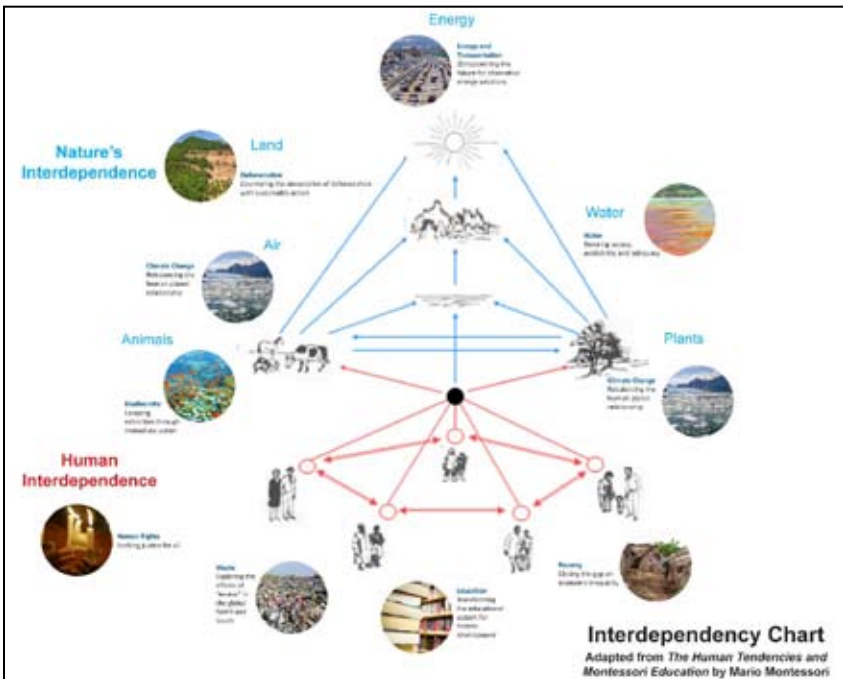


Figure 8. The Interdependency Chart and the Web Organization of the Summits

The Montessori Adolescent Summits are organized by the Montessori Institute for the Science of Peace (MISP) and are made possible by the support of the North American Montessori Teachers' Association (NAMTA) and the Montessori Model United Nations (MMUN). We will schedule seven summits in 2017 in strong cities for each respective place on the interdependent chart and then bring the results together to see what the convergence brings about in the form of an international group.

### **A Unified "Nation" of the Adolescent**

As a citizen, the Child must be recognized in its human dignity and it must be respected as the Builder of Man. The importance of the child's personality must be consecrated among the moral principles of humanity, because upon the child depends not only the physical constitution of man, but also his moral character. The future of Society is therefore connected with the Child as unconditionally as effects are connected with their causes.

That childhood [adolescence] be considered as a Nation, the Nation of Humanity; that, since its population is the most numerous and its importance paramount, its authority outweigh that of any other nation, as its members form part of all nations and represent their most sacred interest, the interest of Life and Existence. That, therefore, when a League of Nations is formed with the aim of organising a peaceful society, the Nation of Childhood be legally represented. (Montessori "The Aims of the Social Party of the Child" 56-57)

### **Ecological Internationalism of Adolescence in Montessori Terms**

The first question must be, "What are these interdependent summits really for?" They are looking to synthesize environmental global awareness wherever there is a Montessori adolescent program. This is a need for a unifying high school curriculum to bring the adolescent into this "nation of humanity" mentioned in the above excerpt from the "Aims of Social Party of the Child." Then subsequently, Valerie Katz, Montessori High School at University Circle science teacher, summarizes very similar goals in her IB course outline for Environmental Systems and Society with a passage from Maria Montessori:

Biologists today consider life to be intimately related to the existence of the earth as a whole. This concept can shed light on the need for a social order, for this view is closer to the truth than the common notion, which holds that living creatures are forced to conform to nature and bring about changes in their species through their efforts to do so. This is the conclusion at which those who view life as a struggle for survival and a process of adaptation have stopped. But there is another view, a broader view of life, that will lead us to a different conclusion. To what environment must we adapt? To the earth, the soil, the continent on which we live. The earth must be regarded as having been created by animal life, for the earth's soil as presently constituted is the work of forms of animal life. How can the air and the sea remain pure and their chemical composition unchanged? (*Education and Peace* 94)

Valerie Katz explains in contemporary terms.

Environmental Systems is a comprehensive course designed to provide students with the principles, concepts and methodologies necessary to understand contemporary environmental issues of both local and global proportion. Through literature, familiarity with current scientific research, and student-centered discussion, participants will explore topics of global climate change, energy use, ecosystem dynamics, land use, water quality, air quality, and population growth. The interconnectedness of all life will serve as a unifying theme for this course. Emphasis will be placed on the critical role of humans in promoting sustainability through conservation and technological advancement. Students will research topics of personal interest and, working collaboratively with peers, will begin to propose solutions to modern environmental problems. This course is designed to promote critical thought about real-world developments. (unpublished IB syllabus )

**SYSTEMS THINKING SHIFTS FROM THE PARTS TO THE WHOLE:  
MONTESSORI SUPPORTS AN INTERDISCIPLINARY, HOLISTIC, AND  
INTEGRATED CONTEMPORARY LEARNING THEORY**

If the high school shows a tendency to build departmental silos that lack unity of purpose, Fritzjof Capra identifies a living-systems approach that brings out maximum effort of the student when there is an organic relation of the environmental components; then and only then does knowledge hang together (36–54). Understanding the

living world as a network of relations is a contemporary perception, contrasted with model of “building blocks,” which harkens back to Newtonian physics. The updated version of network knowledge theory is that everything flows, which is very close to Montessori’s concepts of polarized attention and that integration emerges from uninterrupted work time. The Montessori passage above suggests that the interrelated biological functions purify the planet and restore nature and this is another positive attitude that emerges from an interdependent perspective.

Taken together, these observations of the role of interdependency in the development of the child and adolescent suggests that environmental, experiential, and social experiences, such as summits, will result in focusing a school in evolutionary processes. And the deeper the ecological study and nature study, the less separation of the knowledge centers occurs. As Montessori points out, history provides the unifying story of life and biology provides the web of life, creating an ordered structure that weaves together all subjects into a fabric that motivates adolescent idealism.

There is a beautiful web metaphor in *From Childhood to Adolescence* (6) that gives us still another commentary on learning. The spider’s web occupies a much larger space than does the animal itself. The web represents the spider’s field of action in acting as a trap for insects. It is constructed according to nature’s plan. A thread secreted by the spider joins two branches to support of any kind, then the spider weaves the rays. The construction proceeds according to a plan. Finally the spider weaves the thread around the center, going around at an always carefully calculated distance.

Montessori stresses the importance of order and precision in the capture of the prey (knowledge), and this web order remains for all stages of the child’s self-construction, widening like the spider web is the range of interception of knowledge. Summarized in “A Simpler Way” by Margaret Wheatley, a systems-thinking educator:

When we model our organization (schools) on standards of machine efficiency, we are telling ourselves to reduce everything. An emergent world needs messiness to make more possible.... We think of systems as rigid structures (schools). But they are really fluid relationships that are



'webby' and nonlinear and unknowable through traditional forms of analysis. We can't know a system by its parts. It is unknowable by analysis and is irreducible. (n. pag.)

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