

1987

Design Guidelines for Montessori Schools

Raquel De Jesus

University of Wisconsin - Milwaukee

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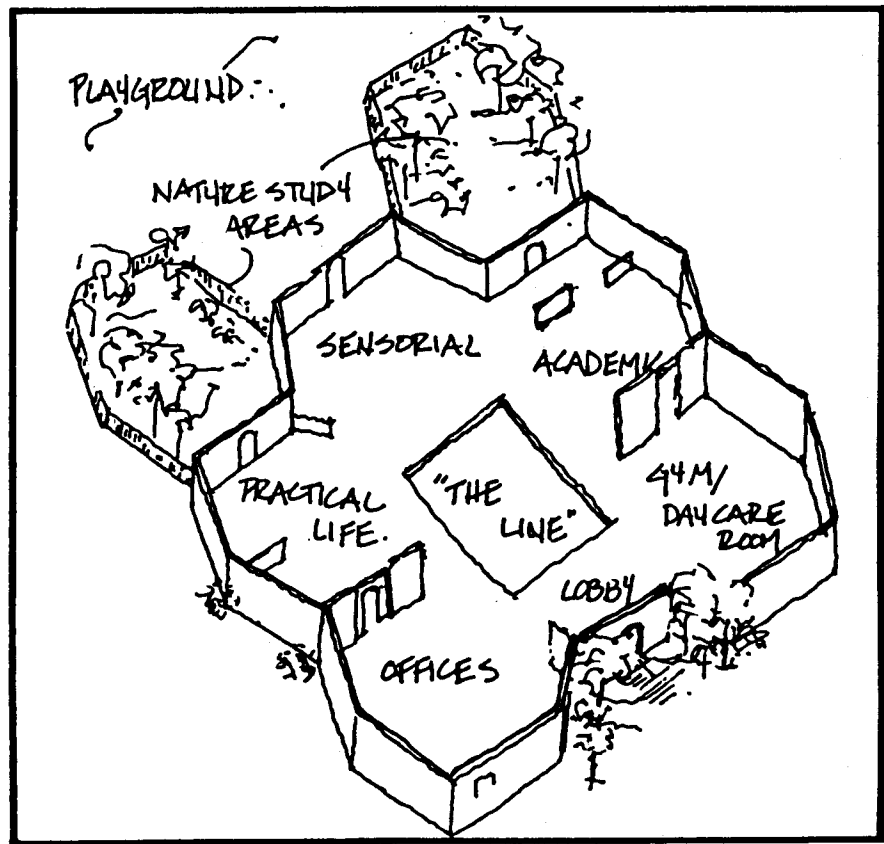
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DESIGN GUIDELINES FOR MONTESSORI SCHOOLS



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*Center for Architecture and Urban Planning Research
University of Wisconsin-Milwaukee*

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Abstract

The purpose of this thesis is to provide architects, designers, and teachers with design guidelines they must be aware of when designing for the child's environment necessary to enhance the Montessori method of teaching. This thesis is based on three types of information gathering: 1) the reading and analyzing of books written by Montessori and her followers, 2) interviews and inventories done in six Montessori schools, and 3) existing environment-behavior criteria for early child care environments. The results of this research is analyzed and design guidelines for Montessori schools proposed.

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*A mis padres:
Luis M. De Jesus y Raquel Mendiola*

*Aquellos que me dieron su amor
y apoyo incondicional, y que me
dieron la mejor de las herencias:
mi educacion.*

*To my parents:
Luis M. De Jesus and Raquel Mendiola*

*To them, who gave me their unconditional
love and support, and gave me
the best of all inheritances:
my education.*

CONTENTS

<i>Acknowledgements.....</i>	<i>1</i>
<i>Introduction.....</i>	<i>2</i>
<i>History of the Montessori Method.....</i>	<i>6</i>
<i>Content and Context Analysis of Montessori's Recommendations.....</i>	<i>10</i>
<i>Methods and Settings.....</i>	<i>18</i>
<i>Description of Montessori Schools in Milwaukee.....</i>	<i>20</i>
<i>Description of the Prepared Environment.....</i>	<i>26</i>
<i>Design Guidelines for the Prepared Environment.....</i>	<i>31</i>
<i>I. Freedom.....</i>	<i>31</i>
<i>II. Order and the Didactic Materials.....</i>	<i>45</i>
<i>A. Daily Living Exercises/Practical Life.....</i>	<i>51</i>
<i>B. Sensorial Materials.....</i>	<i>54</i>
<i>C. Academic Materials.....</i>	<i>56</i>
<i>D. Cultural and Artistic Materials.....</i>	<i>58</i>
<i>III. Beauty and Atmosphere.....</i>	<i>66</i>
<i>IV. Community Life and Parents.....</i>	<i>70</i>
<i>V. Nature.....</i>	<i>74</i>
<i>VI. Related Issues.....</i>	<i>78</i>
<i>Conclusion.....</i>	<i>85</i>
<i>References.....</i>	<i>86</i>
<i>Appendix A.....</i>	<i>90</i>
<i>Appendix B.....</i>	<i>96</i>

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INTRODUCTION

The purpose of this thesis is to provide architects, designers, and teachers with design guidelines they must be aware of when designing the adequate environment that will provide and support the "prepared environment" in Montessori classrooms. This prepared environment is a physical and psychological situation made ready for the young child in order to enhance the child's opportunity to learn through experiences provided for the child (Rambusch, 1962). The thesis is based on three types of information gathering: 1) the reading and analyzing of the books written both by Montessori and her followers, 2) interviews and inventories done in six Montessori schools in Milwaukee, Wisconsin, and 3) the existing environment-behavior criteria for early child care environments.

The Montessori Method concentrates on enlarging a child's experience and on making the conversion of natural curiosity into learning patterns. The child's individual potential is set free for self-development in a "prepared environment" which includes a teacher or directress, and the didactic materials, which are a system of exercises to be utilized by the child in designated ways,

for specific purposes. The goals of the Montessori Method are the development of self-confidence, independence, self-discipline, and love of learning (Orem, 1971).

The character of the built environment of child care centers has an important impact on early cognitive development. Children learn through a series of interactions with the socio-physical environment, which includes teachers, parents, staff and other children, and the designed environment. The quality of these interactions depends upon the possibilities for engagement which the environment provides (Moore, Lane, Hill, & Cohen, 1979). An enriched environment will therefore accelerate the development of perceptual, motor, and cognitive skills (Baird and Lutkus, 1982).

The design guidelines in this thesis are not intended to provide all the information required for the successful preparation of project designs. Environment-behavior researchers have already provided design criteria, patterns, and guidelines, in order to aid designers in setting goals for the design of a variety of early childhood building types. These manuals can be used for the planning, programming, and design of children's environments. Some examples of these manuals are: Environmental Criteria MR Preschool Day Care Facilities (Texas A & M University, 1969), Recommendations for Child Care Centers (Moore, et. al., 1979), and Patterns for Designing Children's Centers (Osmon, F.L., 1971). The usefulness of these existing environment-behavior criteria is that they have already analyzed the general concepts of child-

environment relationships and have a fundamental goal in common: to help children become competent learners.

Why must we have a manual for Montessori schools, and not follow one set of guidelines for day care centers? Because just as there are different reasons for day care centers, there are also different ways of viewing their goals. There are different viewpoints, life styles, child rearing practices, and educational values, so it seems more likely to create dynamic learning experiences for children than a simple, uniform constructed model. The development of children cannot be viewed separate from the social context in which it takes place. What is especially useful for one place, may not be so important in another.

ORGANIZATION OF THE REPORT

Before analyzing the results of the information gathered, we must first look at the historical background, in order to understand what forces made the Montessori Method an important educational philosophy. This section will be followed by "Content and Context Analysis of Montessori's Recommendations" which not only analyzes Montessori's books but also lists the basic differences between Montessori Programs and other learning environments. "Methods and Settings" describes the purpose of the observation methods used to gather data in the Montessori Schools. The following section "Description of Montessori Schools in Milwaukee" includes the type of buildings and philosophy found at each school. "Description of the Prepared

Environment" defines the six components which the design guidelines are based upon. And the last section of this Thesis is the "Design Guidelines for the Prepared Environment" which states the design guidelines to be used by the user.

HISTORY OF THE MONTESSORI METHOD

Maria Montessori was born in Italy, in 1870. In 1894, she graduated from the University of Rome, becoming the first woman to receive a medical degree in Italy. For 12 years she followed medical and educational pursuits: she was a graduate student in psychiatry, assistant director of the university psychiatric clinic, a lecturer in anthropology, a teacher of mentally deficient children, and a teacher trainer (Orem, 1971).

As she visited asylums for the insane she took an interest in the mentally-deficient children who were grouped together with the insane. To her, mental deficiency was a pedagogical problem, rather than a medical one (Standing, 1957). She believed that a special educational treatment could change their mental condition, a view shared by Jean Itard (1775-1838), and Edouard Seguin (1812-1880); both had previously worked with mentally deficient children (Rambusch, 1962).

Working 13 hours a day with the mentally deficient children, she developed the didactic materials which allowed them to perform reasonably well on school work previously considered far beyond their capacity. After a few years she presented the children from the mental institutions at the public examination for primary certificates, where they passed the exams that were meant for normal children (Orem, 1971).

According to Montessori, if these children could be brought to the academic levels reached by normal children then there had to

be something wrong with the education of normal children (Montessori, 1964). She became concerned with the application of the new didactic materials to the normal personality, and at the age of 28, she became directress of a tax-supported school located in the worst slum of Italy, the San Lorenzo Quarter.

The San Lorenzo Quarter was an area of crime and poverty where most children were left unattended while the parents were away at work. The government decided that it was cheaper to place all the children in one room and pay someone to look after them, rather than to constantly pay for the damage they were doing (Orem, 1971).

So in 1907, the first "Casa dei Bambini" (Children's House) was opened. Maria Montessori observed the children as they showed themselves to be in a natural environment. Maria Montessori considered a natural environment to be one where everything is suitable for the child's age and growth, where possible obstacles to development are removed, and where the child is provided with the means to exercise the child's growing faculties (Lillard, 1972). Inducing from her observations certain principles, she consciously constructed a prepared environment, which will ensure certain child responses (Rambusch, 1962). This prepared environment consisted of the directress, who also lived in the San Lorenzo Quarter, and the didactic materials Montessori had created.

As the weeks went by, the children exhibited a degree of concentration, self-discipline, serenity of spirit, and respect for the rights of others, which was not observed in the mentally

deficient children. Montessori discovered "that children possess different and higher qualities than those we usually attribute to them. It was as if a higher form of personality had been liberated and a new child had come into being" (Orem, 1971).

Due to widespread reports, visitors came to the first "Casa dei Bambini", not only from other parts of Italy, but from other parts of the world. Consequently, Montessori worked out her own system for the propagation of her ideas and training of teachers in her method. These International Training Courses were given in Italy, France, Germany, Spain, England, Austria, Ceylon, United States, South America, and India (Standing, 1957). These training programs concluded with the issuance of a certificate which allowed its possessor to describe themselves as a Montessori teacher but prohibited them to be an instructor in the Method (Montessori, 1964, b). In other words, she allowed only disciples, no collaborators.

The Montessori Method was enthusiastically welcomed in the United States before World War I. At least eight books on the Method were translated and published between 1912 and 1915, but in contrast to other European countries where the Method was further experimented with and was accredited, no growth or development of the Method took place in the United States. According to Emma Plank, in Montessori in Perspective, the enthusiasm in which new ideas are accepted and propagated in the United States carries a destructive element: there is a similar disposition to disregard and forget them, and to move forward. There is no climate for continuing "movements".

American educators responded in three ways: 1) a minority attacked Montessori's work on the basis of her educational theory and practices, 2) some attempted to incorporate Montessori's method in existing school structures, and 3) many defended their existing school system for its weaknesses. In the United States Montessori schools were established on a private basis, (unlike Europe where they were publicly developed), so financially able parents placed their children in Montessori schools (Publications Committee of the National Association for the Education of Young Children, 1974).

After spending her life teaching and writing books, Montessori died in Holland, in 1952. Many regard her as the founder of a new method of education for small children. Presently, Montessori's principles and practices can be found in educational programs from the nursery school to seventh and eighth grade levels.

CONTENT AND CONTEXT ANALYSIS OF MONTESSORI'S RECOMMENDATIONS

ANALYSIS OF MONTESSORIAN REFERENCES:

In order to understand what Montessori specifies for the prepared environment, the books written by Montessori and her disciples were read and analyzed. Until now, the Montessori message in America has been promulgated by former disciples of Maria Montessori: E.M. Standing, R. C. Orem, and Nancy McCormick Rambush. The most important book written by Montessori is The Montessori Method which focuses on the education of children from three to six years old. Two other important books are Spontaneous Activity in Education, a theoretical and philosophical book, and The Montessori Elementary Material, a teaching manual (both books are concerned with the education of children from seven to eleven years old).

Montessori's writings have the spirit of reform that was emerging in the early part of the century. She has a creative and intuitive way of seeing and describing the developmental needs of children and observing which tools help them in their growth (Lillard, 1972). A major finding in her books is that Montessori describes the prepared environment with both abstract and detailed descriptions but few explicitly stated principles. For example, she defines the environment as "free and full of order"

and then describes the desks as having white tops so if the child touches them with dirty fingers they can notice what they have dirtied (Montessori, 1964, b). This "gap" between her descriptions, from the high rhetorical descriptions to the precise descriptions of the environment, provide the basis for this thesis: to give architectural meaning to those highly abstract descriptions.

The main aspects of this philosophy that revolutionized educational methods are:

a) The design of an environment more in tune with the child's size, with furniture she had constructed according to their size. Montessori felt that fixed seats and desks of that time were made to make the child immobile:

"... the seats were separated and the width so closely calculated that the child could barely seat himself upon it, while to stretch himself by making any lateral movements was impossible. This was done in order that he might be separated from his neighbors." (Montessori, 1964).

b) Her theories of the sensitive period in the development of the child were new at that time. According to Montessori, there are three stages of development: 1) the Absorbent Mind Period, from birth to six years, 2) the Age of Instruction, from six to twelve years, and 3) from twelve to eighteen years old, where the "child", undergoes its most physical and mental transformation (Kocher, 1973). It is during the Absorbent Mind Period when the children's minds enable them to absorb the stimuli of their environment with remarkable facility, where they

are attracted to certain exercises, activities, or occupations with an interest and concentration they can never display again for that particular kind of work.

According to Edelson & Orem (1970), experiences during this sensitive period provide the foundations for later mental development. These findings reflect what we have mentioned before: an enriched environment will accelerate the development of perceptual, motor, and cognitive skills (Baird and Lutkus, 1982). Also, her discoveries of the child's need for repetition is stressed by modern child psychology (Publications Committee of the National Association for the Education of Young Children, 1974).

c) The Montessori Method is based on the principle of freedom in a prepared environment (Standing, 1962), where the traditional children's group was abandoned and children were left alone to pursue their own interests. To Montessorians, a free child is not one who can do anything the child wants, but one who behaves in accordance with accepted rules of the environment, and respects people and things (Orem, 1971). Therefore, when a child understands the idea of order and quiet, and wishes to rise and speak, they do it because they wish to, not because they are forced to (Montessori, 1964, b).

Regarding the success of the San Lorenzo Quarter there are two issues we have to consider:

1) Was its success due to several factors that we are not able to reproduce today? For example: a) These children had not been exposed to a "stimulating environment" or to an

"environment prepared just for them." Today's children have television, radio, electronic toys, and computers that influence their senses at a much earlier age. b) The Montessori school was one of the tenement buildings in the San Lorenzo Quarter. c) The fact that the teacher herself lived in the San Lorenzo Quarter was probably quite important.

2) The second issue Montessori mentions in her book, the Discovery of the Child: "The environment is secondary in the phenomena of life. It can modify, as it can assist or destroy, but it can never create. The source of growth lies within." (Montessori, 1967, p.63). Was this what happened in the San Lorenzo project? Probably a simple room, with a few pieces of furniture, but great accomplishments took place there. This is important for the designer, for the physical environment cannot be considered as the sole determinant of the behavior system since this weakens many aspects of the human-environment interface (Moleski, 1974).

The "wonders and miracles" of the Montessori Method have been widely publicized, but it has not been spared from some criticism by educators. According to the book, Montessori in Perspective (1974), the major criticism regarding the Montessori Method is the expected use of the highly structured didactic materials. The didactic materials are designed to teach specific concepts of size, space, contours, etc., but they may be used in only one way to fulfill the correct lessons they were designed to teach. According to educators, this limits the child in using them in an

imaginative way, such as discovering and creating different uses of the material.

Montessori also has been criticized in that even though the child is allowed to come together with others to work, most of the work is individualized work, and many feel that Montessori schools may not give young children enough experience associating with others of one's age group, cooperating, etc.

MONTESSORI IN CONTEXT:

In Moore et al's Recommendations for Child Care Centers (1977), four types of child care programs are described:

1) The Custodial Child Care Programs which meet the immediate needs of the child, overall well-being, safety, and health; it is similar to "baby-sitting."

2) The Developmentally-Oriented Child Care Programs where opportunities are developed for social, intellectual, and physical interaction within a context of security, trust, and care. These programs employ trained caregivers, have appropriate materials, program structure, goals and activities, and use consultants in health, education, nutrition, exceptional education, and other fields.

3) The Nursery School or Formal Preschools include mostly 4-5 year olds, are academically oriented educational programs, and stress emotional, intellectual, and social development. Since they are usually half days, they assume parents will provide health, nutrition, and other needs.

4) The Comprehensive Child Supported Programs offer varied curricula activities, services, and opportunities for children and their families. Their purpose is to support family life in the broadest sense, including quality child care, daily counseling, health, nutritional services, and other community services.

Recommendations for Child Care Centers (1977) describes two distinct approaches to early childhood education:

- 1) The highly structured teacher-directed approach is characterized by specific objectives carried out under the direction of the teacher. Adults set predetermined goals for children and plan specific lessons which such goals may be achieved. Their main goal is to prepare children for elementary school.
- 2) The free-choice, child-directed approach allows the children to direct their own activities according to their individual inclinations. The adults set the stage carefully in this model, then act as resources for the children rather than as initiators of programmed lessons plans. All activities, including play and child care activities like diapering, eating, napping, are regarded as having developmental and learning potential.

The Montessori Method is regarded as a developmentally-oriented child care program, with an especially trained teacher by the "American Montessori Internationale" or the "American Montessori Society", with appropriate materials (the Didactic Materials), and with a definite program structure, goals, and activities (the Montessori Method).

Montessori schools tend to be more child-directed than the teacher directed approach, since the child is allowed the freedom to work on self-chosen tasks in an attractive environment (the prepared environment), especially designed and equipped with the didactic materials to meet the child's needs. The Montessori Method does not emphasize learning through talking and listening, but learning through doing and manipulating without interruption. The central idea is that children cannot be educated by anyone else, they must do it by themselves or it is never done. But even though Montessori talks about the need of freedom to choose which didactic material to work upon, the child can only choose a didactic material the child has already been instructed in how to use, so the child does not have complete, absolute freedom.

Another important difference between Montessori schools and other early education centers is that within the Montessori classroom there is only one set of didactic materials, unlike other schools where there might be several sets of the same kind of toy. The didactic materials are arranged similarly in all Montessori schools. In other words, a child visiting a different Montessori school, will find the same didactic materials arranged in the same order. According to Montessori finding things in their proper places and putting them back again satisfies the child's need for order (Standing, 1962).

In conclusion, these are the basic differences between Montessori and other early learning environments:

- 1) A prepared environment that includes the directress and the didactic materials.

- 2) *The child can work on any didactic material as long as the child has been instructed in how to use it.*
- 3) *The didactic materials are single in matter and are aligned in the same way in all Montessori schools.*

METHODS AND SETTINGS

User programming studies are based on two factors: a) the research and analysis of the user group in a specific type of setting, and b) translating this research into design information useful for the designer (Zeisel, 1975). In order to understand the present needs of the Montessori school users (students, teachers, staff, etc.), of six schools in the Milwaukee area were visited. Multiple research methods, for example, field observations, interviews, map drawings, and observations of natural group behavior, were used to prevent biased information (Zeisel, 1975).

I have titled this section "methods and settings" and not observations because this word implies observing the children in each school for several hours, throughout several days, in order to obtain valid research data in the use of their environment, and how the environment enhances or inhibits their behavior.

Observations for several days were not possible for two reasons:

1) some schools did not permit the observation of classes in session, and 2) lack of time to undertake lengthy observation times. Nevertheless, each school was visited from three to four hours, the classrooms were "observed", and the teacher and/or director were interviewed.

The purpose of the inventories were:

1) To understand how the prepared environment is set up in the classroom (including arrangement of the didactic materials around the room).

2) Amount of square footage allocated for the areas that contain the didactic materials. To obtain this information, for each classroom visited a plan of the room(s) was drawn, with the space allocated (if any) for each section, and the type and arrangement of the furniture for each area.

3) The uses and dimensions of "The Line" (exercise area for fine motor exercises defined by floor markings).

4) New needs of the Montessori schools that Montessori did not address in the early nineteenth century, such as computers, audio visuals, etc.

The interviews were used to reinforce and refine data gathered by observational methods. The purpose of the interviews was to answer: 1) new issues that the Montessori Schools are facing , 2) present use and meaning of the different didactic materials, 3) specific needs of the prepared environment, and 4) interpret the meaning behind any previous observed behavior.

A sample copy of the interview forms can be found in Appendix A.

DESCRIPTION OF MONTESSORI SCHOOLS IN MILWAUKEE

This section covers the general information regarding the Montessori schools, while the detailed findings (those that apply directly to the design guidelines) are in the chapter of design guidelines.

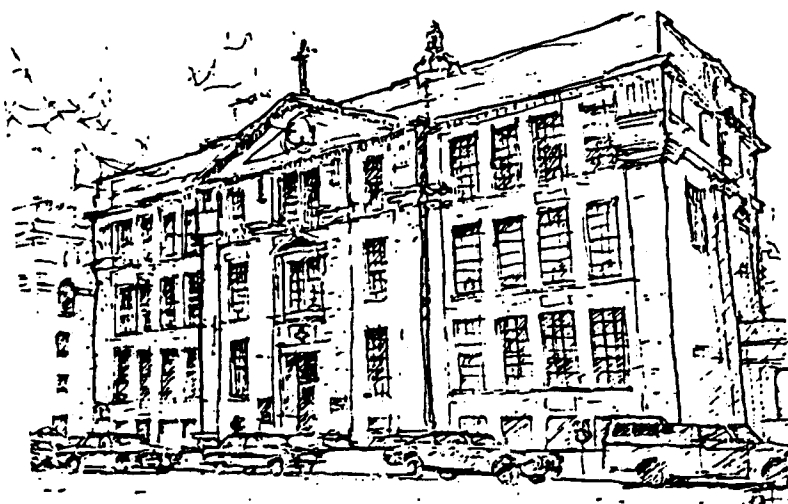
Out of ten existing Montessori schools in the Milwaukee area, six schools were visited; the rest could not accomodate me into their schedules. Out of six interviews done (one for each school) two were either teachers or directress, and the rest were the directors of the Montessori schools.

BUILDING TYPE:

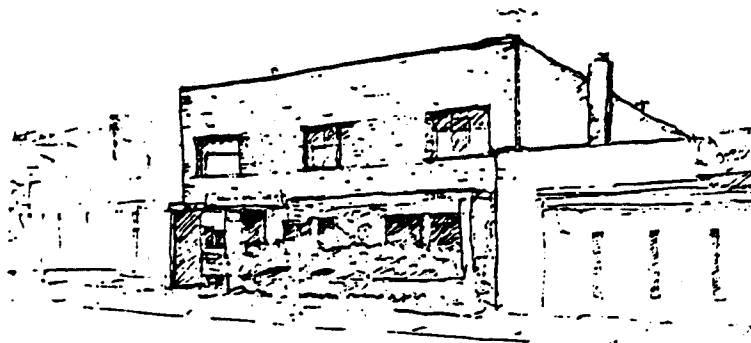
Montessori schools are located in all different kinds of environments: two renovated houses, two school buildings, a church's annex, and an office building (Refer to Table 1: Building Type and Philosophy, at the end of this chapter). The next diagrams illustrate the wide range of building types. Under each illustration, the name of the school and its location is given:



Lakeshore Montessori School: 1841 Prospect Ave.



*Montessori Downtown School and Day Care: 831 N. Van Buren
St.*



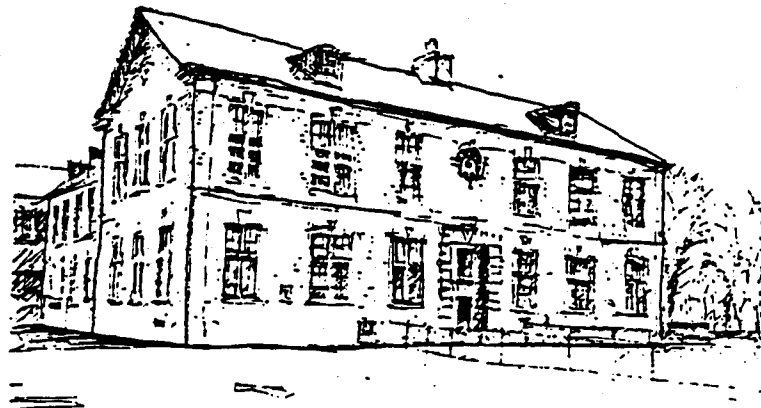
Montessori Family School LTD, 5806 W. Burleigh ST.



Milwaukee Montessori School: 4610 W. State St.



Highland Community School: 2004 W. Highland Ave.



Montessori New World School: 7240 N. Lombardy Rd.

It must be clarified that the complete building was not studied in each case. The purpose of this thesis is to look at the "Children's House", which includes the ages of 2 1/2 to 6 year olds and not the elementary Montessori schools that were located

within some of the same buildings. Highland Community School and New World Montessori School are the only two schools that also had the elementary grades. Therefore, only the first floor of Highland Community School, and one classroom in the second floor of New World Montessori were observed.

Lakeshore and Downtown Schools are the least integrated schools to a residential fabric. Family and Montessori schools are located on the border of a commercial and residential area, while Highland and New World Schools are located within the residential fabric.

MONTESSORI PHILOSOPHY:

Out of the six schools visited, three of them consider themselves to be "true" or "pure" Montessorian schools, meaning that they are more traditional in the Montessori Philosophy (refer to Table 1: Building Type and Philosophy). They accept Montessori teachings as being completely true, with no need to change or to adapt Montessori's teachings to today's children. The other three schools regard themselves as less traditional, accepting new forms of technology such as VCR's and computers, and believe that Montessori would have observed children in today's environment and accepted these new forms of technology as an important aspect of their environment. Regardless of this philosophical difference they all agree on the importance and exact usage of the didactic materials.

Table 1: Building Type and Philosophy

SCHOOLS	BUILDING TYPE	PHILOSOPHY*
LAKESHORE	RENOVATED HOUSE	●
DOWNTOWN	CHURCH ANNEX	●
FAMILY	OFFICE BUILDING	●
STATE	SCHOOL BUILDING	○
HIGHLAND	RENOVATED HOUSE	○
NEW WORLD	SCHOOL BUILDING	○

*TRADITIONAL ○
 NON-TRADITIONAL ●

DESCRIPTION OF THE PREPARED ENVIRONMENT

Montessori stresses the importance of the prepared environment for effective teaching and learning. This prepared environment, or "living lab" (Orem, 1971), is designed by an adult before the child enters it, and its aims are to: 1) help the child grow, 2) help the child grow physically independent, 3) satisfy his basic needs and tendencies, 4) help the child become self-sufficient, and 5) discipline the child (Kosher, 1973).

The two main components of the prepared environment are the directress and the didactic materials which are described below.

Directress: Even though Montessori and her disciples refer to the "directress", ("because she directs the child to learning" (Orem, 1971)), as a "she", two of the teachers interviewed were men. One of the directors suggested the use of the word "guide", and for the purpose of this last section, the word teacher and/or guide will be substituted for the word "directress."

The guide is the dynamic link between the didactic materials and the child (Montessori, 1967). The teacher is a perceiver of the child's needs, the preparer of the child's environment, the programmer with the materials and lessons, the protector of the child's right to learn, and must have the capacity and desire to observe accurately (Orem, 1971).

At first, the teacher may work collectively with the children (for example: tell them a story, play games, etc.), and after

conducting observations of the children the teacher attempts to instruct and present each child to the ordered and active life of the environment (Standing, 1962). The teacher must never force an activity on the child, because then it would not be the child's "spontaneous activity". The teacher does not have a desk or table, but a low chair like the children's, and moves constantly about the classroom (Rambusch, 1962).

Didactic Materials: The didactic materials, or "learning games" (Orem, 1971) are designed to capture and stimulate the child's curiosity, because they isolate particular sensory stimulus (Standing, 1962). They are based on the materials used by Itard and Seguin in their attempts to educate mentally deficient children (Montessori, 1967). The didactic materials are divided in four categories: daily living exercises (practical life), sensorial materials, academic materials, and cultural and artistic materials. The child "progresses" from one section to another, provided he has been instructed by the teacher in their use.

The materials progress from the concrete to the abstract and from the simple to the complex (Orem, 1966). The aim of the didactic materials is to educate the senses by means of repeated exercise (Montessori, 1964, b). They develop the child's "independence, self-confidence, concentration, compliance, coordination, and order" (Orem, 1971).

No child is allowed to use any didactic material until the child has been fully instructed in its proper use (Standing, 1962, 1957). A child may take a didactic material only from the place

where it is displayed and when the child has finished using it, the material must be put back in its place and in the same condition it was found. The child may never pass a material to a companion, nor take the materials from someone who is using them.

The child can work with the didactic material wherever the child chooses: on a table, or on a rug spread out on the floor, and use the object as long as the child wants (Montessori, 1967). Children are free to group together in order to work on a certain project, or request help from the teacher if they need to (Orem, 1971).

The most important characteristic of these materials is their "control of error" (Montessori, 1964, b; Orem, 1971), which provides the children with continuous evidence of the correctness or incorrectness of their performance. If the child is using incorrectly the didactic materials, the materials are put away, and used again some other day. If the child is interested in the didactic materials, then the teacher leaves the child free to the choice and execution of the work (Montessori, 1967).

Components: In the book, Montessori. A Modern Approach (1972), the prepared environment is defined with six components: freedom, order, beauty and atmosphere, didactic materials, community life, and reality and nature. Architecture is not the sole determinant of these components, it may enhance the best environment for these to take place, but there are other factors

that affect this environment: the teacher, school philosophy, culture, willingness of child to study, etc.

Since these six components are the basis of the prepared environment, they have been used as the set of issues that the architect must be aware of when designing the prepared environment. The purpose of this thesis has been to define architectural solutions that support these components. Main architectural issues such as siting, image, circulation, overall layout, scale, light, and views have not been mentioned as different subtopics. These issues have not been ignored; rather they are mentioned under the "component" of the prepared environment that best supports it. The attempt of this thesis has been to present and develop the issues that are unique to the Montessori philosophy.

The components have been changed and have been ordered in what I consider to be most important in the prepared environment. Therefore, the components have been divided as follow:

- I. Freedom
- II. Order and the Didactic Materials: These have been combined since order is reflected in the placement and usage of the Didactic Materials.
- III. Beauty and Atmosphere
- IV. Community Life
- V. Nature: The component "Reality" has not been dropped, it has been assumed to be in every component. Reality is having a

child scaled environment, and the appropriate materials to be used.

VI. Related Issues: Contains those issues that are presently important to the Montessori Philosophy, but do not fall into a specific category.

In this thesis a "classroom" refers to a room or set of rooms that contain within them one set of the didactic materials, have one or two directress, and a group of children that work there for extended periods of time (that is, they do not move from one room to another). Of the six schools visited, eleven classrooms were studied.

DESIGN GUIDELINES FOR THE PREPARED ENVIRONMENT

The design guidelines have been divided into the six components that make up the prepared environment. Each component contains three parts: 1) the Montessori Philosophy, which describes what the Montessori philosophy states about this particular component, 2) the Findings, which describe what was found in the inventories and interviews, and 3) the Design Guidelines which give detailed description in how to accomplish the needs and goals of that particular component.

1. FREEDOM

MONTESSORI PHILOSOPHY:

According to Montessori and her disciples, freedom is defined in several ways:

- Children have within them the pattern for their own development: this inner guide must be allowed to direct the children's growth, therefore, only in real freedom can the children reveal themselves (Montessori, 1964,a).
- Exists in relation to, and is limited by the rights of others (Orem, 1966).
- Place where child may learn in freedom (Montessori, 1964, a).
- Place where individuality, discipline, and spontaneous concentration occur at the child's own pace (Standing, 1957).

- The child needs freedom to interact (explore, move, etc.) in the environment in order to master movement (Kocher, 1973).

This freedom is reflected in the prepared environment by:

- Movable, flexible, and adequately sized furniture that permits the child to choose the most convenient position to enhance his inner freedom (Montessori, 1964, a).

- The free movement of the children and the teacher in the classroom environment (Orem, 1971).

- Freedom to use any didactic material (Montessori, 1964, a).

- Freedom to socialize, or to retire to a private area (Montessori, 1964, a).

FINDINGS:

How do we provide in architecture for a free environment? What type of layout and spaces will provide for the freedom and the exploration needed, which is the child's method of learning and developing independence? The motivation to interact with the environment exists in all children as a normal property of life.

Open vs. Closed Plan Facilities:

From inventories:

We must first look at the present layouts of the Montessori schools, before describing the ideal layout that will provide a range of interesting choices for the Montessori school. Two basic

floor plans were observed: 1) the self-contained classroom, and 2) small inter-connected rooms (2-3) , that are considered one classroom. It must be reinforced that a classroom in this thesis is a room or set of rooms that contain one set of didactic materials, and where the children work for extended periods of time, without moving from one classroom to another.

Of the eleven classrooms observed in the six schools, seven of the classrooms are self-contained classrooms, also known as a "closed plan facility" (Table 2: Floor Plan Analysis). Unlike open plan facilities, which have been architecturally defined with a minimum of interior walls so that several teachers and students will be working in the same, large area, self-contained classrooms are defined by walls and doors (Ross & Gump, 1978). The other type of layout is found in the two renovated houses, where several inter-connecting rooms are considered one classroom, offering a more open environment.

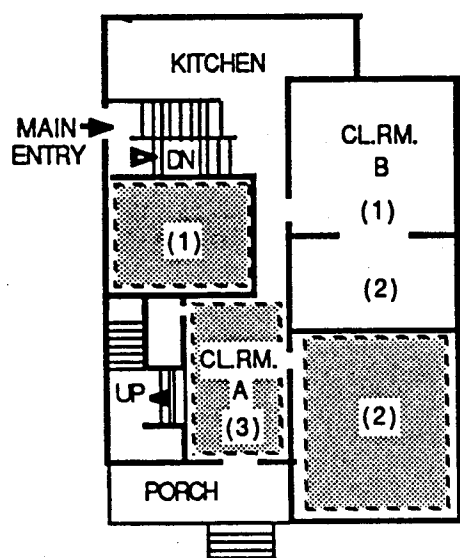
Table 2: floor Plan Analysis (Please refer to page no. 34).

SCHOOLS	CLASSROOM	AREAS	SELF-CONTAINED	SEVERAL ROOMS
LAKESHORE	A) 240 SQ.FT.	324		●
	17 X 16	272		
	13 X 22	286		
	B) 1) 240 S.F.	240		●
	2) 15 X 19	285		
	3) 14 X 18	252		
DOWNTOWN	A) 22 X 30	660	●	
	B) 17 X 24	408	●	
FAMILY	A) 36 X 28	1008	●	
	B) 28 X 44	1232	●	
MONTESSORI	A) 38 X 38	1444	●	
	B) 38 X 38	1444	●	
HIGHLAND	A) 1) 12 x 16	192		●
	2) 18 x 20	360		
	3) 12 x 18	216		
	B) 1) 16 x 20	320		●
	2) 10 x 20	200		
NEW WORLD	A) 22 x 36	792	●	

The average square footage for the self-contained classroom is of 998 square feet, and 737 square feet for the "several rooms". The two examples of a classroom consisting of small inter-connecting rooms are Highland Community School and Lakeshore Montessori School (Floor Plan 1 and 2). Highland Community School's first level is used for the Children's House, while the second floor is for the elementary grades (not shown). In this particular school, the first floor includes five separate rooms which are divided into two classrooms (A), one with two

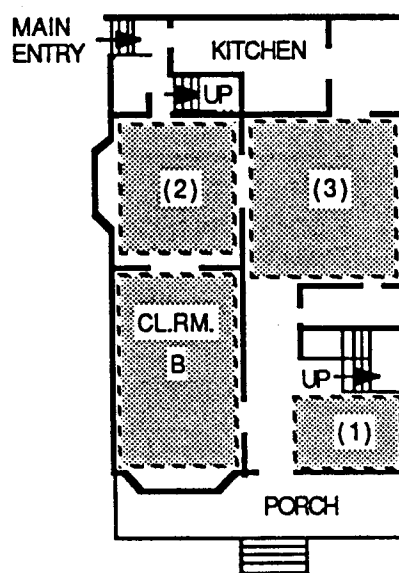
rooms, and the other with three (B). In the Lakeshore school, the first floor consists of a single classroom made up of three rooms, while the second floor's classroom is made up of three separate rooms (defined by four walls and doors) (not shown).

Floor Plan No. 1:



FIRST FLOOR/SC. 1"=20'
HIGHLAND COMMUNITY SCHOOL

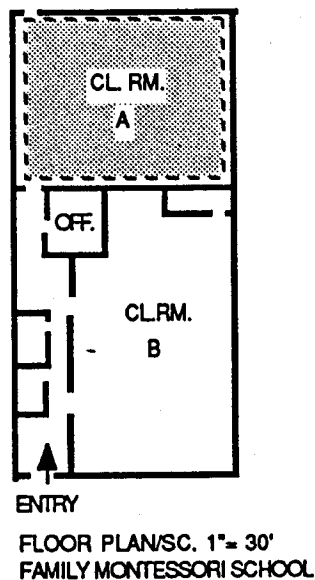
Floor Plan No. 2:



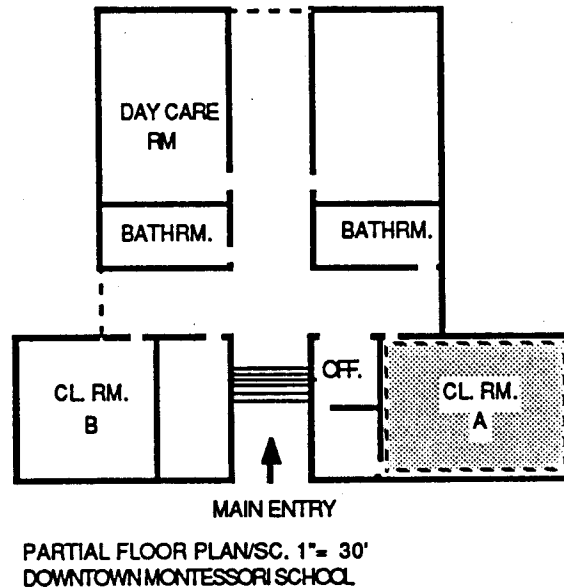
FIRST FLOOR/SC. 1"=20'
LAKESHORE MONTESSORI SCHOOL

Two examples of the self-contained classroom can be found in Family Montessori School, and Downtown Montessori School (Floor Plan 3 and 4). The Downtown Montessori School is located in the first floor of a church's annex, but part of the floor space is closed off by temporary partitions. The extra rooms are used for storage space. In these two examples, children stay in their own classroom throughout the whole day, where each classroom contains one set of the didactic materials.

Floor Plan No. 3



Floor Plan No. 4



Two major issues they mentioned regarding room arrangements are: 1) the importance of being able to observe the children, and 2) the need for the social and emotional interaction of having the young children observe and work with the older children. In the Montessori classroom, children from ages two to six interact in the same classroom environment. In the Lakeshore and Highland Schools, the fact that children are not as easily observed proved to be an asset since it increases the child's individuality and decreases the amount of input from the teacher, (an issue that all Montessorians favor, since children must be left alone to pursue their own interests). When the directors and teachers were asked if they preferred their present room arrangement: either separate, enclosed rooms, or if they preferred the small inter-connecting rooms (several rooms), all of

them chose their existing layout. Therefore, it seems reasonable to propose a floor plan that will combine the benefits of an open and closed plan facility which will enhance the individuality, freedom, privacy, and interaction of the child in the prepared environment.

From Existing Environment-Behavior Literature:

There have been controversies on the impact of open plan versus closed plan buildings on the behavior of children. A negative factor found in open plan facilities is the distracting levels of noise, but, nevertheless, they provide more settings for behavior, encourage more active, initiating behavior (selecting, choosing, asking for help, giving opinions, etc.), smaller group sizes, and more supervision time by the teacher. Unlike the open plan facility, the closed plan lacks opportunities for the child's autonomy, initiative, self-esteem, and sensory stimulation, but activity stays within one place with less distraction (Moore, et.al., 1979).

What type of layout will provide both the open and closed plan benefits while decreasing its negative consequences? Cohen, McGinty, Armstrong, and Moore, in "The Spatial Organization of an Early Childhood Development Center: Modified Open Space, Zoning, and Circulation", (Day Care Journal, 1982), suggest a space divided that allows the best of both open and close philosophies, with a mixture of open areas with smaller enclosed spaces. Moore, in "The Physical Environment and Cognitive Development in Child Care Centers" (Moore, in press), defines

modified open spaces as the "organization of the indoor space of a child care center into a variety of large and small activity spaces open enough to allow children to see the play possibilities available to them, while providing enough enclosure for the child to be protected from noise and visual distractions" (p. 19).

Some characteristics of the modified open plan facility that can be directly applied to the Montessori prepared environment are: (Cohen et. al., 1982) .

1- Visibility of most children's areas from the entry of the building (may help decrease any anxiety that the child may feel by approaching an unknown building, or situation).

2- Partial enclosure of all activity spaces.

3- Partial separation from one activity space from another.

4- Visual connections between different activity spaces, thus allowing the younger child to see what the older child is doing.

5- Variety of space sizes including a few large open areas, for example, the area that requires the use of the "the Line" (refer to Cultural and Artistic materials, under the heading II. Order and the Didactic Materials) for gross and fine motor activities, and smaller enclosed spaces for quiet activities, such as the math and reading areas of the didactic materials.

6- Partial but not total separation of staff areas from children's activity areas.

7- Partial, but not total separation of functional areas from children's activity area.

8- Partial but not total separation of different age groups, so that the younger children working in the Practical Life and Sensorial Sections can still observe the older child at work.

9- Partial but not total separation of circulation from activity space.

10- Clear visual connections and convenient areas to outdoor space, which is a fundamental component of the Montessori philosophy.

The modified open plan facility can offer the Montessori teacher with zoned areas that provide spatial separation for the different Didactic Materials areas, yet still provide opportunities for visual, oral, and physical contact between different age groups and activities, which they also desire. These modified open plan facility spaces will support higher levels of exploratory and self-initiated behavior, stimulating cooperative play, social intercourse among children, and opportunities for the child to control the environment (Moore, in press).

Square Footages:

It has been found that adequate amounts of space must be available for children's activities in order to ensure quality in developmentally-oriented child care programs. According to Montessori the classroom environment must be spacious, with open floor space, in order to 1) permit children to work on the floor, and 2) to allow for the free movement of furniture; but it must not be too big or it will lose its homeliness (Montessori, 1964, a; Standing, 1957).

According to Moore et. al. (1978) some of the major categories of space in child care centers are as follow: a) primary usable activity space, b) secondary activity space, which includes staff space and other assignable spaces (storage, lockers/cubbies, etc), and c) non-assignable space (circulation, partitions, walls).

In the observations and inventories done in the Montessori schools, the major primary spaces were measured. According to Section 409, page 2 of Recommendations for Child Care Centers (Moore, et. al. 1979), the calculation for the gross square footage for child care building and site are as follow: 35 net square feet per child is the minimum, 42 net square feet per child is adequate, and 50 net square feet per child is generous.

As can be seen from Table 3: Square Footage Analysis, of the eleven classrooms measured, six of them are below or right on the the minimum level required with an average of 30 square feet per child, one of them is a little higher than the adequate with 44 square feet per child (New World Montessori School), while four classrooms had equal to or more than the generous amount with an average of 58 square feet per child.

Table 3: Square Foot Analysis (Please refer to page no. 41):

SCHOOLS	CLASSROOM	AREA SQ.FT	no. CHILD	MINIMUM 35 sqft/c	ADEQUATE 42 sqft/c	GENEROUS 50 sqft/c
LAKESHORE	A) 18 X 18	324	24	●		
	17 X 16	272				
	13 X 22	286				
	B) 1) 240 S.F.	240	24	●		
	2) 15 X 19	285				
	3) 14 X 18	252				
DOWNTOWN	A) 22 X 30	660	18	●		
	B) 17 X 24	408	18	●		
FAMILY	A) 36 X 28	1008	20			●
	B) 28 X 44	1232	20			●
MONTESSORI	A) 38 X 38	1444	24			●
	B) 38 X 38	1444	24			●
HIGHLAND	A) 1) 12 x 16	192	22	●		
	2) 18 x 20	360				
	3) 12 x 18	216				
	B) 1) 16 x 20	320	22	●		
	2) 10 x 20	200				
NEW WORLD	A) 22 x 36	792	18		●	

It is interesting to note that Family Montessori School, and Montessori School are the only two schools whose classrooms have the more generous square footages, and also have the more defined areas in the classroom. It might be possible to predict that more generous amounts of square footages per child (50 square feet per child) might permit the teacher to create more defined areas within a "closed" classroom.

Furniture:

According to Montessori, flexible, movable furniture had a another purpose: to teach the children that when a chair fell over it was because of their own awkward movements (similar movements among fixed desks would have passed unnoticed). Therefore, children have a way of correcting themselves with an obvious, and positive proof: the chair and tables remain silent and unmoved (Montessori, 1967).

From the inventories, it was found that all of the schools have small, child-size, movable furniture, but they lack the variety of different types, such as soft furniture, (for example: "bean bags", pillows, arm chairs, etc.). They also lack the variety of spaces and positions the child could take and use the furniture, especially areas where the child can retire privately to work.

Privacy:

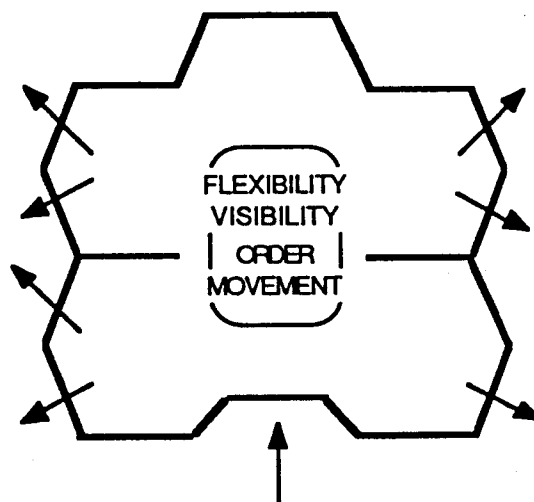
According to Recommendations for Child Care Centers (1979), provision of a private area is crucial to the development of self-concept and personal identity. For Montessori the prepared environment must permit the child to retire to a private area, or to socialize. As Orem and Coburn (1978) mention, no other child may enter another child's space unless he's invited to do so. From the six observed schools, only one school, Highland Community School, provides for a private area by transforming a closet into a loft, where one child could comfortably be seated in this area.

One can provide places with cozy, private spaces for one or two children, where the child can observe other children. Some of these places can overlook an activity area such as the large

activity space, so if the child sees other children walking on "The Line" (refer to Cultural and Artistic Materials, under 11. Order and the Didactic Materials), the child can observe and decide if they will like to join.

DESIGN GUIDELINES:

- Layout of activity spaces should be based on the modified open-plan facility.
- Emphasis must be placed on visibility between activity areas in order to permit observation by the teacher, and between the children.
- Partial enclosures between activity spaces will provide for freedom and privacy for the child.
- Partial separation by enclosures of circulation from activity spaces.
- Modified open plan facility, where the children can observe what is going on from any part of the school.



- *Provide a minimum of 50 square feet per child for primary activity spaces.*

- *Provide a variety of spaces for the child to retire to.*

- *Provide "soft" furniture, such as: pillows, soft chair, carpeted platform areas, etc.*

- *Provide private areas where child can retire to, or from where they can observe other children, and provide them with the freedom to choose the activity they want to participate in.*

II. ORDER AND THE DIDACTIC MATERIALS

MONTESORI PHILOSOPHY:

Order is an important component of the prepared environment but is not only reflected in keeping things in their proper places, but also in the order of life, evidenced by the relationship of things, places, and time (Orem, 1971).

The use and placement of the didactic materials are probably the best example of order in the prepared environment, for not only are they arranged in the same location in all Montessori classrooms, but they are also presented to the child in a particular order, (the child is not allowed to use any material unless the child has been adequately presented to it by the teacher). It is then through the use of the didactic materials, that the child's senses are stimulated and exercised in a controlled and orderly manner (Edelson & Orem, 1970).

The didactic materials are divided into four areas: 1) practical life, 2) sensorial, 3) academic materials, which include math, science, geography, language, and reading, and 4) cultural and artistic materials. These four areas are described later, so that the reader understands the relationship between the design criteria and the specific didactic material's usage and purpose.

It must be emphasized that the didactic materials within each division must be arranged in the order presented to the child, but

the arrangement of these four areas within the classroom were not specified by Montessori and have been left up to the teachers' choice.

Moore et. al. (1979) reinforces the importance of order in early child care environments by stating: "The classroom's arrangement should contribute to the children's concepts of order and space. A perceptually clear and distinct room environment, achieved through uncluttered equipment and furniture arranged in an orderly fashion, helps the child to focus his attention on the curriculum instead of distracting him with irrelevant stimuli. Daily contact with uncluttered, structurally simple environment helps teach time and space organization." (sect. 904, p.1).

The next part of this component will be presented a little differently. The next part is called "Findings/Inventories" which deals with the general findings of the use and arrangement of the didactic materials within the six observed schools. Following this section, the four didactic materials are further divided into 1) general description of the didactic material, 2) particular findings from the inventories that relate to each area in particular, and 3) design criteria that supports this didactic material. Lastly, the reader will find the "General Design Guidelines" which presents the design ideas that applies to the four areas of the didactic materials.

FINDINGS/INVENTORIES:

Three out of the six schools observed do not consider themselves to be "pure Montessorians" (refer to Table 1: *Building Type and Philosophy*), meaning that 1) they allow the use of other materials, such as computers, television, etc., and 2) are not as strict in the actual teaching of the didactic material.

Nevertheless, all six schools agreed in the importance of the order in which the materials are presented, stating that they are best presented in the order conceived by Maria Montessori, and not in a random manner.

It was found through the interviews that the basic layout of the room only changes once or twice per year, since it is important for the child to find the didactic materials in the same location every day. They all agreed, though, that the furniture is moved every day by the children, which reflects the other component of the prepared environment: freedom.

Three design criteria that the teachers consider when arranging the four areas of the didactic materials are: 1) visual connections between the four areas, 2) variety of spaces and obstacles within the room so children can coordinate and control their movements, and 3) the placement of the practical life and sensorial materials near the "front" of the room, since its most frequent users are the younger children.

The next table (Table 4: *Location of the Didactic Materials*) presents how the different areas are divided in each school, and

within each classroom. In the first two columns the classroom's dimensions and area are given. Under each didactic material the area (square feet) allocated (if any) for each didactic material is listed for that particular classroom. The shaded circle along that particular row shows another didactic material that was included in the same area. The blank circles show the didactic materials that are not within that area. The small, black dots reflect those classrooms that did not have a special area allocated for the different didactic materials, but were arranged along the periphery of the room. The small squares beside the areas reflect those classrooms whose practical life and sensorial were not placed together.

Table 4: Location of the Didactic Materials (Please refer to page no. 49):

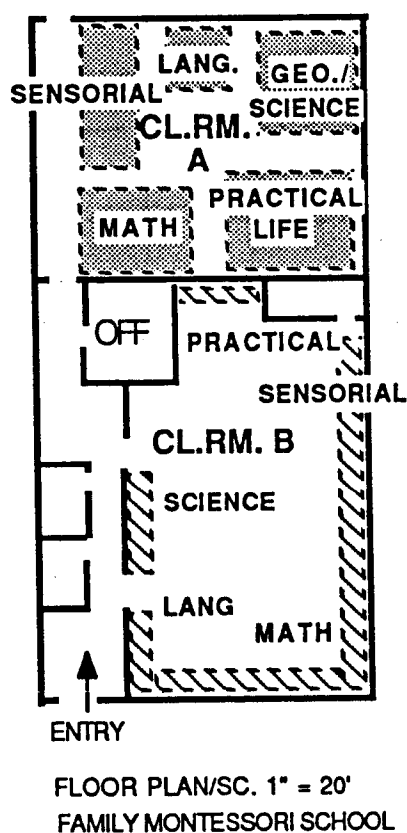
SCHOOLS	CLASSROOM AREA	AREA	PRACTICAL LIFE	SENSORIAL	MATH	LANGUAGE	SCIEN/GEO
LAKESHORE	A) 18 X 18	324	●	324	○	○	○
	17 X 16	272	○	○	272	●	○
	13 X 22	286	○	○	○	○	286
	B) 1) 240 S.FT.	240	○	120	○	○	72
	2) 15 X 19	285	○	○	285	●	●
	3) 14 X 18	252	252	○	○	○	○
DOWNTOWN	A) 22 X 30	660	●	●	●	●	●
	B) 17 X 24	408	●	●	●	●	●
FAMILY	A) 36 X 28	1008	320 ■	108	96	36	●
	B) 28 X 44	1232	●	●	●	●	●
MONTESSORI	A) 38 X 38	1444	360 ■	120	364	312	●
	B) 38 X 38	1444	96	168	336	168	168
HIGHLAND	A) 1) 12 x 16	192	192	●	○	○	○
	2) 18 x 20	360	○	○	360	●	●
	3) 12 x 18	216	○	○	○	○	○
	B) 1) 16 x 20	320	320	●	○	○	○
	2) 10 x 20	200	○	○	200	●	●
NEW WORLD	A) 22 x 36	792	220	80	72	○	○

One major finding in the location of these areas is the placement of the practical life and sensorial materials. Since these are the first materials taught to the children when they enter the Montessori classroom, they are most often used by the younger children. According to the teachers, they prefer the location of these two areas to be closer to the "front" of the room, or where the teacher can observe them better. As can be referred from Table 4, only two schools did not place these materials together.

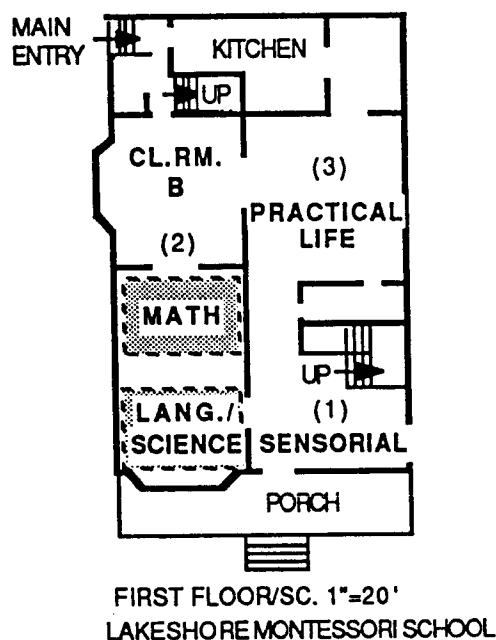
The next two floor plans (Floor Plan 5 and 6) demonstrate the three different types of area allocation for the didactic

materials. Montessori Family School contains two examples: 1) the classroom divided into different areas by the use of shelving, racks, tables, or plants, and 2) the periphery location of these materials, where there are no measurable allocated areas for the didactic materials. The third example is found in Lakeshore Montessori School, where almost each area allocated for the didactic materials was found in one of the rooms of the renovated house.

Floor Plan No. 5:



Floor Plan No. 6:



An important consideration for order is the design of circulation paths. Confusing circulation prevents the child from

using and seeing the Didactic Materials adequately, and creates confusion and disorganization, two non-Montessorian attributes. Many of the schools lack an adequate circulation pattern, sometimes having a set of the didactic material placed along a circulation path.

A. DAILY LIVING EXERCISES/PRACTICAL LIFE

MONTESSORI PHILOSOPHY:

These are the first materials the child is first introduced to in the prepared environment. These exercises involve the physical care of the person and of the environment. The materials involve simple and precise tasks (sweeping, cleaning, polishing, washing, etc.) which the young child has already observed adults perform in the home. Because experiences should have their roots in the child's immediate environment and culture there are no suggested list of materials. Their purpose is to aid the inner construction of discipline, organization, independence, and self-esteem through concentration on a precise activity. According to Montessorians, after these inner needs are met, the child is then introduced to the sensorial materials (Lillard, 1972).

FINDINGS:

As previously mentioned, the main consideration in the placement of the practical life exercises is that since they are often used by the youngest children they should be placed closer to the "front" of the room where the teacher can observe them better.

Six out of the eleven classrooms placed the practical life and the sensorial area close together, but not particularly in the front part of the room. The average area allocated for the practical life exercises was of 260 square feet.

Since the practical life exercises involve the use of water for scrubbing, and cleaning, the area should have low sinks for the child to use. Of the six schools, only three contain a small sink for the children to use. The rest of the schools have buckets of water and pans so the children can perform their cleaning and scrubbing tasks. These three schools also have a non-carpeted floor for this area.

These area was also used for snack time and for art, where the easel is placed near a water source, and on the non-carpeted area. In the schools where no adequate flooring was available, the floor was covered with a plastic material to protect the floor from the falling paint, or water.

DESIGN GUIDELINES:

- Place the practical life area close to the "front" of the room, or near the observation area of the teachers.

- Allocate a minimum of 50 square feet per child for this activity area (Moore et. al, 1979).

- Use flooring that is easy to clean, and non-slippery.

Avoid the use of carpet along this area.

- Shelving should not be higher than 2'-11", since this area is used by the younger children.

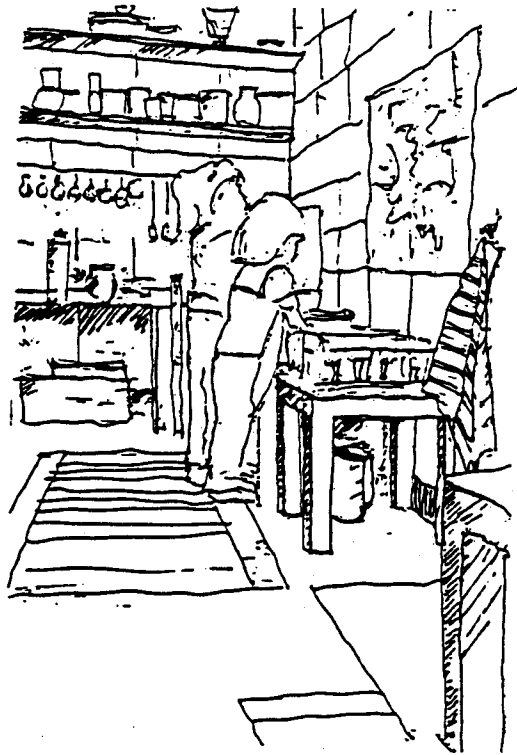
- Provide shelves and racks for towels, and cleaning cloths.

- Provide one to two tables and chairs for eating.

- Provide shelves for the art materials.

- Since accessibility to water is important, provide low sinks and counter tops for the child to use.

- Provide natural light or adequate lighting level for painting.



*Two girls washing dishes in the Practical Life area
(Montessori School).*

B. SENSORIAL MATERIALS

MONTESORRI PHILOSOPHY:

The aim of these materials is to educate and refine the child's discrimination of dimensions, shapes, smells, temperature, weights, textures, and patterns. They assist the child's intelligence development , by organizing and categorizing the child's sense perceptions into an inner mental order (Lillard, 1972).

FINDINGS:

Sensorial is the other material that is most often used by the younger children, so it should be located near the front of the room. The average area allocated for this area is of 119 square feet.

Most of the didactic materials in this area involve the use of large blocks, such as the "Pink Tower", and the "Brown stair". Moore et. al. (1979) recommends for block play areas: 5.6-6.25 square feet per child. It was also found that some of these Sensorial Materials require wider shelves in order to display them correctly.

In order for the child to carry the sensorial material from one area to another, without taking it apart, the children in Montessori New World School use individual, low tables that measure approximately 12" x 24", and 10-12" above the floor, and have their origin in India. These small tables enable 1) the child to sit on the floor but to have higher surface to work upon, 2) the child is able to stand up and see the materials from above, and 3) they are easily carried by the child to any part of the room. They closely resemble breakfast trays used at home.

DESIGN GUIDELINES:

- Area should be carpeted so children can work on the floor.
- Individual tables should be provided so the children can work alone or together by joining the tables.
- Since the younger children are the frequent users of this area shelving should not be higher than 2'11" high.
- Allocate 5.6 - 6.25 square feet per child (Moore, et. al., 1979).

C. ACADEMIC MATERIALSMONTESSORI PHILOSOPHY:

These materials teach language, writing, reading, mathematics, geography, and science. They build upon the inner knowledge the child has acquired through the use of the sensorial materials and guide the child to more abstract subjects. Their aim is to satisfy the child's innate desire for learning (Lillard, 1972).

FINDINGS:

Probably the most defined and largest area of the academic materials is the math area (refer to Table 4), since its materials need more space to use and are more delicate to work with (that is, smaller pieces).

From Table 4: Location of the Didactic Materials, we can see that only four classrooms out of the eleven provide for a separate defined math area with its own shelves, seats, etc.; the average for these areas is: 217 square feet. Three classrooms had math in the same area as language and science (including geography); the average is 274 square feet. Only two schools had the language and science (including geography) areas in the same area: 174 square feet. In general, the academic areas were the least defined in the classrooms.

The areas of language, reading, geography, and science require a more quiet atmosphere, and more defined areas for the child to work in. These areas should be able to accommodate a variety of seating positions for the child to work in.

DESIGN GUIDELINES:

- Math area should have more floor space than the other areas so that the child can easily spread out on the floor.
- Individual tables and group tables should be available for the children to use.

- Since these areas are used by the older children, higher shelves can be used: limit of 3'- 3" (Moore et. al., 1979).
- Language, reading, science, and geography areas should have comfortable and intimate spaces for individual activities in a variety of seating positions, such as: cushions, stuffed chairs, window seats, and raised and lowered platforms.
- Arrangements for these areas include: 1) quiet corners defined with storage units, 2) sunken pit/raised areas, and 3) quiet alcoves, defined by wall storage units.
- Moore et. al. (1979) recommends for reading areas: 4.4-6.25 square feet per child.
- Quiet areas can be insulated with carpets, draperies, partial acoustic panels.
- Local task-oriented lighting should be provided.
- Provide shelving and racks for the placement of the didactic materials.

D. CULTURAL AND ARTISTIC MATERIALS

MONTESORI PHILOSOPHY:

These materials deal with self-expression and the communication of ideas. Many of these materials are rooted in the child's culture and environment and will therefore be determined by the individual teacher. Activities such as "Walking on the Line" prepare the motor organs for rhythmical exercises. In this Montessori exercise, the children use a line drawn, or












taped to the floor as a guide, while they move very slowly, march, or run in rhythm to the music. This exercise develops their sense of balance and control of movements for dance, as well as being a preparation for music. According to a "pure" Montessorian, "The Line" builds community spirit, but it is not a required activity, only if the child wants to.

FINDINGS:

Cultural and artistic materials are not located in a separate area. The most important element is the "The Line", which was found in every Montessori classroom, usually located in the middle of the room.

From the interviews, it was found that the ideal shape for "The Line" is the oval, but only two classrooms have an oval-shaped area, the rest have a rectangle taped on the floor (Table 5: Analysis of the Line). The oval shape was favored so the children can see each other at all times. The areas for "The Line" range from 40 sq. ft. to 112 sq. ft., the average being 77 sq. ft. It was interesting to find that the more "pure" Montessorians (Montessori School of Milwaukee, Highland Community School, and Montessori New World School) have more area allocated for "The Line".

Table 5: Analysis of the Line (Please refer to page no. 60):

SCHOOLS	CLASSROOM	AREAS	SHAPE	AREA	no. CHILD	SQFT/CHILD
LAKESHORE	A) 18 X 18	324		40	24	1.6
	17 X 16	272				
	13 X 22	286				
	B) 1) 240 SQFT	240			24	
	2) 15 X 19	285		88		1.6
	3) 14 X 18	252				
DOWNTOWN	A) 22 X 30	660		60	18	3.3
	B) 17 X 24	408		45	18	2.5
FAMILY	A) 36 X 28	1008		62	20	3.1
	B) 28 X 44	1232		48	20	2.4
MONTESSORI	A) 38 X 38	1444		96	24	4
	B) 38 X 38	1444		96	24	4
HIGHLAND	A) 1) 12 x 16	192			22	
	2) 18 x 20	360				
	3) 12 x 18	216		80		3.6
	B) 1) 16 x 20	320		72	22	3.3
	2) 10 x 20	200				
NEW WORLD	A) 22 x 36	792		112	18	6.2

Regarding the amount of square feet per child the range is from 1.6 to 6.2 square feet per child. The average of these square footages is 3.2 square feet per child. Since these observations were not done over long periods of time, the use of "The Line" for each classroom was not observed. It is then not possible to specify an exact square footage based on the observations. According to the *Anthropometric Data in Architectural Graphic Standards* (1981), the dimensions of a 5 year old child seated, is 11" x 10". It is then possible to suggest

2 1/2-3 square feet per child. the extra inches provide for sitting cross-legged, and for space between the children.

From the interviews, "The Line" was used to group children, or for group lessons. Two out of the three "pure" Montessorians mentioned that "The Line" was not to be used to call the children for group meetings. For them, it does not have to be a rectangle or an oval, it can be a path that circles the room, and used as a moving exercise for the development of fine and gross motor skills. They mentioned that there should be a separate area for group time. The other schools used "The Line" for singing, group lessons, and coordination.

Montessori School has taken a completely different approach to the design of "The Line": they use different colored carpet tiles to designate an area of 96 sq. ft. They feel this works very nicely, because it prevents "The Line" from fading or leaving marks on the floor, two main concerns of the other schools, but they admitted that it limited the freedom to move "The Line" from place to place.

Two other issues mentioned were: 1) bare floors might get too cold to sit upon, so rugs have to be used, and 2) sometimes two circles, or two squares are drawn, one within the other, so slower, smaller children can use the inner one.

DESIGN GUIDELINES:

- Locate the cultural and artistic materials in the center of the classroom, for increased visibility.

- Allocate at least 2 1/2 -3 square feet per child.
- If carpeting is not available, different colored strips of tile could be inlaid in the floor.
- If "The Line" is a path around the room, it should be part of the circulation areas, not of the activity areas, so as to decrease interruptions.
- Allocate a separate area for group time if "The Line" is a path around the room.
- In order to indicate the large activity space for "The Line" use floor level changes, different ceiling levels, and flexible partitioning.

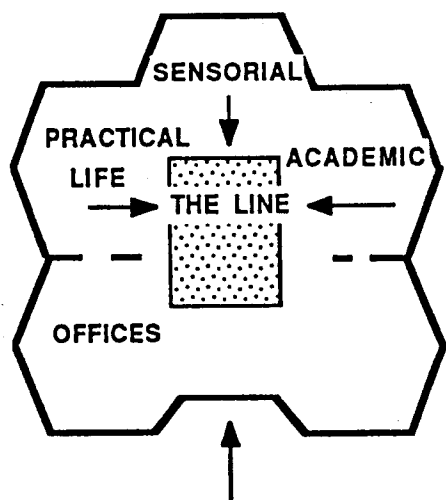
GENERAL DESIGN GUIDELINES FOR THE DIDACTIC MATERIALS:

Based on the advantages of the modified open space described in the "I. Freedom" section, it is then possible to suggest the arrangement of the Didactic Materials in separate activity areas, similar to small rooms that open up into a bigger, common area where cultural and artistic materials ("The Line") will be located. These small activity areas will be connected together, but will delineate activities that can be carried on in the specific didactic material's area, guiding the child from one activity to another.

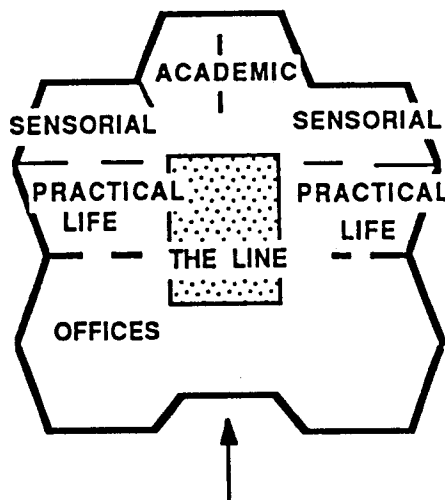
These two floor plans (Floor Plan 7 and 8) demonstrate the applicability of the modified open space in the Montessori context. The schematic diagram on the left shows three of the areas surrounding the cultural and artistic area ("the Line"). The

positive point of this floor plan is that all areas are visible from all other areas, the irregular shape provides "interesting" spaces, practical life is located near the front of the school and the office, gives order to the environment (the child can see where the other areas are), children can observe the different activities without interrupting the working children, and all of the rooms are able to get direct sunlight and view to the outside. The floor plan on the right shows how this floor plan can be further divided to accommodate another classroom.

Floor Plan No. 7



Floor Plan No. 8



In Recommendations for Child Care Centers (1979), Moore et. al. gives a wide variety of recommendations for the design of these activity areas. The more applicable issues for the design of Montessori schools have been extracted, and applied to the Montessori philosophy.

- Square activity spaces should be avoided because they increase the use of the perimeter of the room for organizing interest areas, leaving an empty space in the center where unoccupied children seem to congregate (Sect. 904, p.1).

- Activity spaces should be planned in an irregular shape ("L"-shaped), so the perimeter can be used to form activity corners (Sect. 903, p. 3).

- Activity spaces should be planned for 2-5 children each, plus one adult, since children are most concentrated on activities when they are not in large groups (Sect. 908, p. 1). This will help to sustain the "child's creative self-activity" (Standing, 1962).

- Activity spaces can be defined by floor level changes, different ceiling heights, niches, and fixed and movable partitions systems (full and one half height, with openings, etc.) to make spaces easily divisible into smaller or larger group areas as required (Sect. 905, p. 7).

- Low ceilings should be used in the less active areas such as sensorial and academic areas.

- Acoustic separation should be provided for the sensorial and academic materials, since they involve more passive form of activities (Sect. 911, p. 1).

- Visual connections between activity spaces lets the child observe different activities that are going on (Sect. 911, p. 1).

- Child balconies 4-5' high can create space above and below, by increasing amount of space without increasing the area of the room. They are low enough for adult to access from the side (Sect. 901, 11).

- Circulation can surround the activity spaces, motivating and inviting children to look around to see what's available (Sect. 904, p. 3).
- Activity areas should not be grouped too closely together, children may disrupt one another as they move about.
- Adequate display of the materials is of utmost importance in the Montessori classroom, since the prepared environment means that all the materials are visually and physically accessible for the child to use, so the child does not have to ask for help from the teacher.
- In section 1106, p. 2, of Recommendations for Child Care Centers (1979), Moore et. al. recommends 24 cubic feet per child for all open and closed shelving, and shelf heights of 2'-11" (2-3 years old), 3'-1" (3-4 years old), 3'-3" (4-5 year olds), and for mixed ages, 3'-0".

III. BEAUTY AND ATMOSPHERE

MONTESSORI PHILOSOPHY:

Montessori and her disciples describe the prepared environment with attributes that define beauty and atmosphere , such as:

- Must be calm, peaceful, tranquil, and harmonious

(Standing, 1957).

- Must have discipline, love, and security (Orem, 1971).

- Must be non-competitive and predictable (Orem, 1971).

- Must not be rigidly structured and disciplined, nor disorganized or undisciplined (Lillard, 1972).

- Beauty is inspirational and refreshes the spirit

(Montessori, 1964, a).

FINDINGS:

Even though Montessori and her disciples describe in abstract terms the prepared environment, they have not specified how to achieve beauty, non-competitiveness, security, love, etc. in the prepared environment. There are no scales to measure beauty, warmth, or love in an environment; we can be in the most beautiful house in the world, but it can lack the homey environment of another house. Nevertheless, there are some attributes, that we, as architects, designers, teachers, can

have some control over, such as how secure we feel in a building, how homey, or institutional a place looks. We must not overlook the fact that the teacher is the dynamic link between the didactic materials and the child (Montessori, 1967), and who ultimately is the person that provides love and security in the prepared environment.

Ideally, the Montessori school should be a house: "A Children's House", but due to lack of money, or availability of places many of these schools have to make the best of what they have. Some felt they could have a better and more beautiful environment, and some just desired to have a little more control in their classrooms. For example those that rent the building could not paint the walls as they liked.

There are two schools that are located in renovated houses, and what is especially appealing to the directors was the non-institutional feeling of the house. The only negative aspect of these two houses is that the main entry to the house is not used, since the "parlor area" is used as classrooms, so a side door is used, taking one past the kitchen (refer to the Floor Plan 1 and 2).

An important factor that affects the atmosphere of an environment is the use of artificial or natural lighting, which can affect activity levels and fatigue in children. Montessori states that the windows should admit light freely (Montessori, 1964, a), and that they should be low enough so that the child can see out. The only two schools that had low windows were the two

renovated houses; the rest had windows that were too high up for the child to be able to see the ground level.

DESIGN GUIDELINES:

Recommendations for Child Care Centers (1979), mentions that the approach to the building from the public spaces is a critical factor in the child's and parents' feelings toward the new environment. Some suggestions are:

- The new building to be designed should be home-like in appearance, preferably consistent with the architecture of the surrounding community, if residential (Sect. 918, p.3).
- Use wood to make the Children's House look warmer and friendlier, rather than concrete and steel which may make the building look cold and institutional (Sect. 918, p.3).
- Clear paths and an easy to find entry will help decrease any anxiety feelings that parent and child may feel as they approach the building (Sect. 804, p.1).
- Make paths easy to find with signs, landscaping, gateways, and level changes (Sect. 804, p.1).
- Front yard of the building should approximate the neighborhood's scale, and should lead directly into a front porch (Sect. 803, p. 2).
- A porch, overhang, or deck area provides an outdoor waiting space for parent and child (Sect. 803, p. 2).
- Plants and landscaping should appear residential, not institutional (Sect. 803, p. 2).

- Entry door should be child-scaled and homelike with the use of wooden doors with small panes of glass rather than heavy aluminum dooors, etc.

- Entry should have homey elements such as carpets, low light levels, plants, warm colors, etc. (Sect. 1103, p. 3).

- Lockers, bathrooms, sinks, furniture, light switches, and doorknobs should be at a familiar scale, in order to increase the child's freedom to manipulate it and, therefore, become more independent (Sect. 912, p. 2).

- Low, grilled patterned windows give the building a homier atmosphere, and may help decrease a child's anxious feelings if the child is able to observe activities through the windows as the child approaches the building (Sect. 804, p. 1).

- Windows permit the child to be in contact with nature when the weather is not favorable for outside activities.

- Skylights also let light in and give the "Children's House" a sunny, warm atmosphere, especially during winter time.

- Light can be used to define spaces, highlight acvtivity areas, and soften the environment (Sect. 915, p.4).

- Other factors that may contribute to a homier atmosphere are: warm colors, plants, comfortable furniture, pillows, window seats, and animals in study area (Sect. 916, p. 3).

IV. COMMUNITY LIFE & PARENTS

MONTESSORI PHILOSOPHY:

Since the first "Casa dei Bambini", in the San Lorenzo Project, Maria Montessori requested that mothers visit at least once a week to confer with the teacher; "giving an account of her child, and accepting any helpful advice, which the teacher may be able to give" (Montessori, 1964, b). This practice still continues today, but in a limited way, meeting 2 to 3 times per year.

According to Orem (1971), Montessori schools generally conduct an active parent-education program so that parents comprehend the goals of the Montessori Method. Parents are encouraged to participate in private conferences with the teacher and in parent-group meetings, and to observe the program in action, (some institutions open classes for observation).

One aspect of community life within the classroom is socialization which is defined as being incidental, where the child may act individually or interact with others. Moore et. al. (1979), mentions that in order to increase mixing of ages among the children, many opportunities must be provided for children of different ages to observe the activities of other age groups. This age-mixing increases motivation and socialization among the children. Consequently, the younger children are inspired by observing and asking for help from the older children, and older

children can always work in the simpler and less challenging environment (such as Practical Life exercises and the sensorial materials) if they feel they need to (Rambusch, 1962).

One of the basic concepts in the Montessorian philosophy is that there are no teacher's possessions, such as chairs or desks of adult dimensions in the prepared environment; this assures the children that this is their own environment specifically designed for them. This is important because if children feel a sense of ownership and responsibility toward the classroom environment, they will maintain the daily order and care of it, consequently increasing community life.

FINDINGS:

Two out of the six Montessori schools interviewed are owned by the parents, both regard themselves as "pure" Montessorians. One of these schools did not call itself Montessorian, but a "community" school whose goal is to "reach out to the community" and that by "giving the parents power" (for example, letting them direct meetings, etc), it increases their input. It is worth noting that all three "pure" Montessori schools have greater parent involvement (with auctions, social gatherings, etc), than the other three schools.

All of the schools have parent-teacher conferences 1 - 2 times per year. When asked if they desired a separate parent-teacher conference room, all were against it. They prefer to talk to the

parents in the same classroom their child works in, so as to show them the materials their child is using.

Regarding the presence of adult furniture in the prepared environment of the Montessori schools, only one school had an adult's rocking chair, and a soft chair in each of its two classrooms. The reason for this is not known.

DESIGN GUIDELINES:

- All activity spaces must provide seating and working areas for all ages, regardless if the area is used mostly by older, or younger children.

- Other shared facilities, like the cultural and artistic materials ("the Line") and outdoor spaces can be designed to enhance mixed-age interaction, by using movable furniture, carpeted boxes, etc. that the children can build and manipulate, increasing cooperation with other children.

- The type and amount of space can influence how much the children interact with each other. Open plan facilities may increase the amount of receiving and giving help that takes place between teacher and student, and between students.

- Some square footages to take into consideration in order to increase or decrease social involvement are: 1) Below 35 square feet per child: aggressiveness occurs. 2) Medium densities of 35-50 square feet per child sustain more social involvement. 3) Spaces with 50 or more square feet per child, random behavior occurs (Moore, et. al. 1979).

- *Architecture may help increase parent participation by providing appropriate entry conditions to encourage parents to enter and linger (Sect. 1005, p.1).*

V. NATURE

MONTESSORI PHILOSOPHY:

The "Botanical World" or "life garden" (Orem, 1971), is another important aspect of the Montessori Method. In general, it is a garden completely enclosed with a fence in direct communication with the classroom, so that the children are free to go and come throughout the day (Kocher, 1973).

The garden serves several purposes: 1) Allows children to discover from contact and observation the cycles of life (Orem, 1971). 2) The child learns responsibility as they care for their plants (Montessori, 1964, b). 3) Teaches the child patience and "confident expectation", which is a form of faith and philosophy of life (Montessori, 1964, b).

FINDINGS:

It has been found that quality outdoor spaces are a necessary component of developmentally-oriented child care, since it broadens their sensory experiences and their understanding of the natural and physical phenomena (Moore et al., 1979). All of the directors agreed on the need for an outdoor garden area, where the child could freely interact with the exterior environment. Presently, none of the schools had a garden, but fulfilled this need with plants in the classroom. Only Montessori School has a

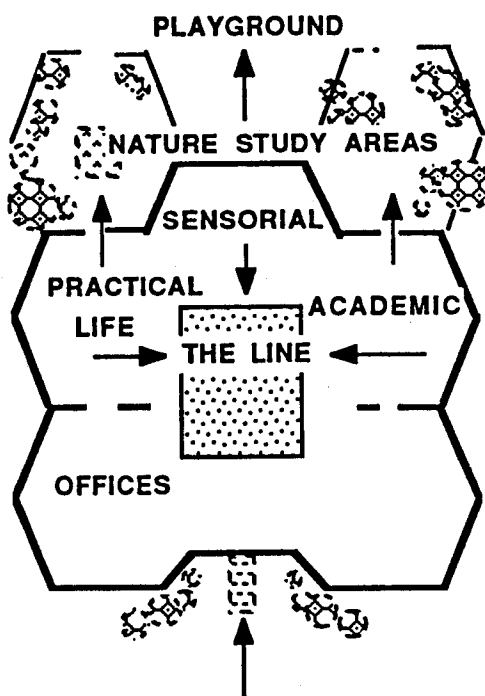
classroom with a set of double doors that lead directly to the playground, but the doors were not used for security reasons.

Several issues were raised regarding the child's "freedom" to visit the outdoors as they pleased: liability reasons, lack of staff to be able to supervise the playground, and the harsh weather Milwaukee experiences during winter. All agreed that this outdoor garden should be a separate nature study area, apart from the playground, and that it had to be both physically and visually accessible from all the classrooms. This nature study area is to be used for more sedentary and quiet activities, such as gardening, reading, observation, etc.

DESIGN GUIDELINES:

- Place the nature study areas near the classrooms, so that children can both visually and actively enjoy these areas (Floor Plan 9).

Floor Plan No. 9



- Garden should be enclosed with walls or fences; not too high so as not to block the sun's rays.
- Some extensions of the building can also become greenhouses so they can be used all year long.
- Provide a cultivated area for the child's use and exploration, and a wild section (Montessori, 1964, b).
- Divide cultivated area into portions reserving one for each child.
- Provide in each "little educative gardens" a different agricultural product in order to demonstrate the proper method for planting, feeding, and crop gathering (Montessori, 1964, b).
- Paths should be wide enough for circulation (Kocher, 1973).

- *Shade trees should be provided for shelter, climbing (Orem, 1971; Kocher, 1973), and for resting (Montessori, 1964, b).*
- *If there are no trees, man-made shelters can be used to play or sleep under them, or to bring their tables out to work or dine.*
- *Use overhangs and natural shading features so that children do not have to look into the sun.*
- *Avoid large areas of glass so as to reduce unwanted reflections.*
- *Provide smaller windows which still allow contact with nature and still provides a homey environment (Moore, et. al. 1979).*
- *Provide for "broad terraces" (Montessori, 1964, a) (at least 10'-0", that relate directly to the appropriate indoor areas. These covered transition space will provide year round outdoor play space, increase usable activity space, and permit new activities not usually done indoors (Moore, et. al. 1979).*
- *Provide for weather resistant furniture, and some hard surfaces such as concrete or asphalt to place them.*
- *Other items to consider: bird feeders, garden shed (Kocher, 1973), water source, pen for small animals, etc.*

VI. RELATED ISSUES

These last two issues are presently important factors in the Montessori classroom. The first issue is the playground or gym which Montessori addresses in her book The Montessori Method, and the second is the need for child care time from early morning to late afternoon, referred to as "Day Care" by the Montessori teachers. These two issues influence the prepared environment but they are not considered components of the prepared environment.

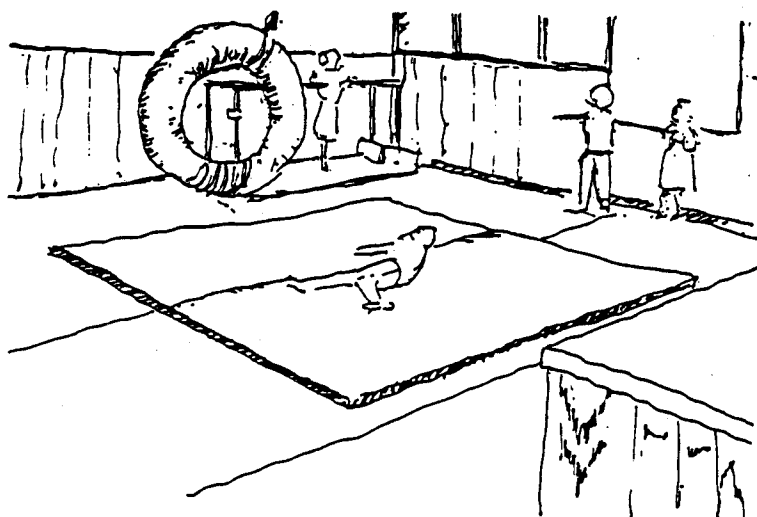
A. PLAYGROUND/GYM:

MONTESSORI PHILOSOPHY:

In the Montessori Method, Montessori writes extensively about the need for an adequate gymnasium or playground, that will offer a field for the most varied exercises, such as walking, throwing objects, going up and down stairs, kneeling, rising, jumping, etc. (Montessori, 1964, b). Not only does she mention the need for this gross motor exercises, but she specifically details how to build the different apparatus (refer to Appendix B). Orem (1971) states that there must be an apparatus for every kind of motor activity.

FINDINGS:

Only Montessori School has a small indoor gym in the basement measuring 22' x 24' (see diagram below). The children can visit the room whenever they want if there is a teacher supervising them. The gym contains mats, parallel bars, and a hanging rope, and is used for gym class, and rainy days.



Gym Room in Montessori School

Regarding the playgrounds it is sad to admit that almost all of them are not close to meeting the requirements of an "adequate" playground: they lack either trees, other shading devices, soft ground, seating areas, etc. All of them had a climbing structure, and of course, a hard surface.

Highland Community School has a very interesting playground: the children take down every night the "movable" parts of the

climbing structure into a storage room. The reasons: to prevent theft, and avoid suits of injuries "after hours". But it has a greater benefit: it involves the children in a community project and increases the adaptability of the environment by the children.

Regarding the specific information Montessori writes about the gymnasia, one of the teachers mentioned that these needs can be met with the usage of present day climbing apparatus.

DESIGN GUIDELINES:

The gym area can also be called a "multi-purpose-motor activities space", specifically designed to encourage and adapt to a variety of large muscle activities. The "gymnasia" as Montessori refers to it, should accomodate 12-16 children dancing, playing group games, and viewing a special fim (allocate 12.5-15 sq.ft. per child) (Moore, et. al. 1979).

Some considerations are: 1) Floor, ceiling, and walls should absorb noise, 2) Floor surfaces should fit activities expected, and 3) Sub-divide the space with different ceiling heights, floor levels, columns, and movable partitions (Moore, et. al., 1979).

The discussion of playgrounds requires more than a simple summary, and it is beyond the scope of this thesis. Given that according to the Montessori teachers these gross motor activities can be provided with the use of everyday playground equipment, the reader is referred to other books for playground design such as: Abstracts on Child Play Areas and Child Support Facilities, by A. B. Hill, C. G. Lane, U. Cohen, G. T. Moore, and Tim McGinty

(Center for Architecture and Urban Planning, 1978), and Environmental Planning for Children's Play, by A. Bengtsson, (New York: Praeger, 1970).

B. DAY CARE

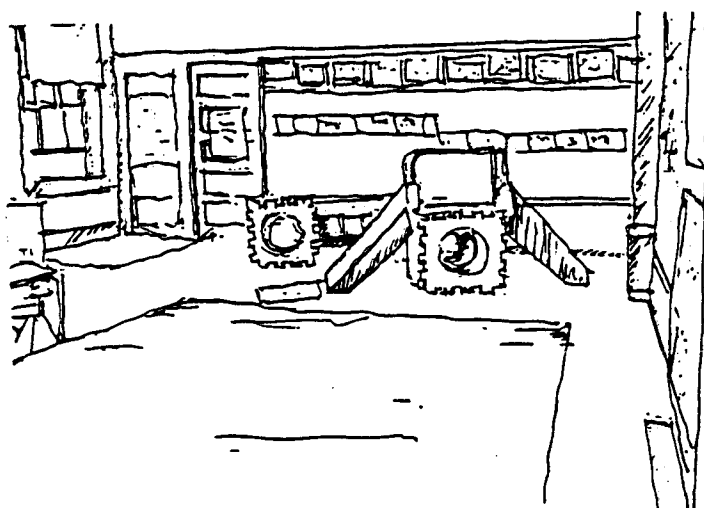
MONTESSORI PHILOSOPHY & FINDINGS:

Even though Montessori does not talk about day care, it is a growing need for today's families. Day care refers to meeting the immediate needs of the child, overall well-being, safety, and health; it is similar to babysitting. Four out of the six schools observed provide for day care, some starting at 6:30 a.m., and ending at 5: 50-6: 00 p.m. Day care is provided for children whose parents cannot pick them up sooner. Then why is not the Montessori classroom offered all day? Since Montessori time is not a play time environment but an educational one, the children get tired, and need a change of "atmosphere". Most schools generally start their Montessori school around 9: 00 a.m., and continue it till 3: 00 p.m., interrupting for lunch and nap time.

As can be referred from Table 6: Day Care, two out of the four schools that provide for day care, only two schools have a different room for day care. These rooms were found to have more interesting spaces and loft areas than the regular Montessori classroom.

Table 6: Day Care

SCHOOLS	DAY CARE	DAY CARE ROOM	AREAS
LAKESHORE	●	○	
DOWNTOWN	●	●	704
FAMILY	●	○	
MONTESSORI	●	●	1056
HIGHLAND	○	○	
NEW WORLD	○	○	



Day Care Room in Downtown Montessori School

According to the teachers, there is a need for a separate day care room for a number of reasons: 1) Children are not allowed to use the Didactic Materials when in day care. 2) Day care contains toys and materials not appropriate for the Montessori classroom. 3) It is difficult to have the children put their toys away, and then change to the Montessori materials with the respect and the right attitude to use them.

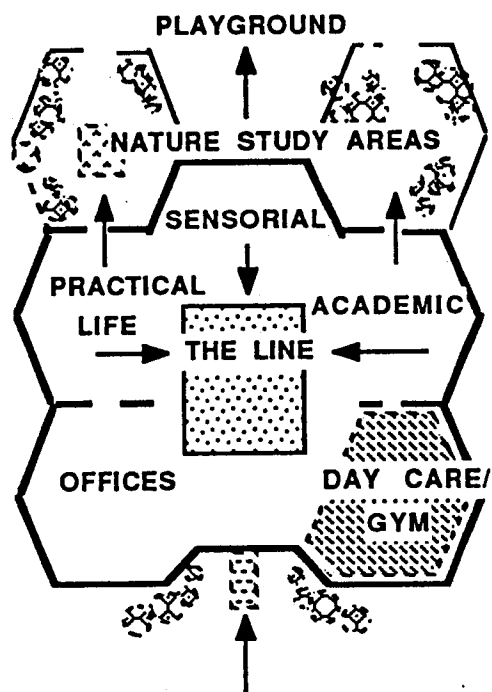
DESIGN GUIDELINES:

Recommendations for Child Care Centers (1979), mentions a criteria that is appropriate for this separate day care room.

- *A central gathering area should be used as a resource room to be used by several child groupings, where toys and equipment can be stored and viewed in an organized way.*

Allocate 2.5-4 sq.ft.per child for this area (Sect.1008, p. 2).

The next diagram (Floor Plan 10) demonstrates the placement of the Day Care room in relation to the other areas. Since the Day Care room would not be used during Montessori school time, this area could double as the gym. Adequate consideration must be given to storage areas for those materials only used for day care time, such as toys, etc., so the children won't be distracted when using the area as a gym during Montessori school time.

Floor Plan 10:

CONCLUSION

The aim of the Montessori Method is the development of the child's potential as a preparation for life. Learning is a dynamic process in which the whole personality of the child is actively engaged. In order to educate the whole child, the child must have the freedom to develop physically, intellectually, and spiritually in a prepared environment.

The prepared environment is described by Montessori with the smallest of details, such as color of the table tops, and with vague and abstract terms, such as freedom, order, etc. It has been this writer's intent to provide in this document an analysis of the prepared environment and design guidelines that may help create and sustain this prepared environment. Hopefully, designers and teachers alike can use these guidelines for the design of Montessori schools, and for the understanding of the Montessori philosophy that supports it.

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APPENDIX A

2. What modifications has the Montessori philosophy/school undergone to accept new technology (T.V., computers, etc.) If you accept this new technology, where are they located and are the children free to use them at any time, or is there a restricted time usage?

PREPARED ENVIRONMENT:

1. How many-sets of the Didactic Materials are in the room? How are the Didactic Materials laid out in the room or rooms? Any thing in particular you might like or dislike about the present D.M. arrangement/location? Do you wish to have these materials in the same/different rooms?

2. "The Line" : What are its purposes? Any particular shape Montessori wants it to be, or do you place it where you want? Dimensions?

TEACHER'S LOUNGE/PARENTS:

1. Does the school have a particular room/space the teacher can retire to? If no, is there a need for one?

2. Are parents actively involved? How?

3. Do you have a parent-teacher conference room? Is there a need for one? Why/ Why not? _____

GARDEN/PLAYGROUND:

1. In the Montessori Method, Montessori describes in much detail the "gymnasia". How do you accomodate for these requirements?

2. Montessori describes extensively the "Botanical Garden". Do you have one? How do you accomodate for this? Will you like one?

3. Montessori talks about the freedom of the child to visit the garden/playground? Are you able to do this? Do you wish for this? Why/why not? _____

INVENTORIES:

Location: _____

No. of children _____ Ages: _____ Teacher _____

Day care time: _____ Montessoti time: _____

Observe each major space: Draw floor plan or area.

For each facility/play area observed, draw and annotate significant patterns of activity, participants, environmental features involved, and location/dimensions of the Didactic Materials.

Assessment of the organization of the physical environment:

Degree of visual connection between spaces:
connection_____lack of connection

Degree of closure of spaces:
closure_____lack of closure

Degree of spatial separation of one space of another:
separation_____lack of separation

Degree of connection between indoor and outdoor activity spaces
connection_____lack of connection

Degree of softness of the activity centers:
softness_____lack of softness

Variety of seating and working positions in the activity areas:
variety_____lack of variety

Degree of appropriateness of the amount of storage, work surfaces in the activity areas that pertain to the activity.
appropriateness_____lack of appropriate

<i>Presence of natural light</i>	<i>Y</i>	<i>N</i>
<i>Low windows</i>	<i>Y</i>	<i>N</i>
<i>Presence of teacher's desk/chair</i>	<i>Y</i>	<i>N</i>

APPENDIX B

APPENDIX B

MUSCULAR EDUCATION (from The Montessori Method, pp. 140-144)

A. Little Fence:

Purpose:

- Move the limbs without throwing upon them the weight of the body.
- Will enable them to fulfill the need which they feel of throwing themselves on the floor and kicking their legs in the air.

Construction:

- Parallel bars supported by upright poles firmly fixed on a heavy base.

B: Trampolino:

Purpose:

- Development of the lower limbs.
- Strengthens the articulation of the knee.

Construction:

- Swing with wide seat that supports front limbs. The swing is hung from strong cords and is left swinging. In front of it there is a small wall reinforced by a strong smooth board against which the children press their feet against the board each time that the child swings toward the wall.

- Board against the child swings may be erected at some distance from the wall; low enough so that the child can see above it.

C. The Pendulum:

Purpose:

- for the arms and spinal column.
- Exercise in which the eye gauges the distance of bodies in motion.

Construction:

- Rubber balls hung on a cord.

-Children seated in their little armchairs strike the balls, sending it from one to another.

D. The Cord:

Purpose:

-Children walk along the line, helping them to order and direct their movements in a given direction.

Construction:

-Line drawn with chalk on the earth.

E. Little Round Stair:

Purpose:

-Habituates children to climb and descend stairs without holding onto the railing.

-Teaches them to move up and down with poised and self-controlled movements.

Construction:

-Little spiral, wooden stair, which is enclosed on one side by a railing on which the children can rest their hands, and the other side is open and circular.

-Steps must be very low and very shallow.

F. Broad-Jump Apparatus:

Purpose:

-Practice the high jump.

Construction:

- Low wooden platform painted with various lines, in order to measure the distance jumped.

-Small flight of stairs may be used in connection with the plane, making it possible to practice and measure the high-jump.

G. Rope-Ladders:

Purpose:

-Helps to perfect a variety of movements: kneeling, rising, bending forward and backward, etc.

-Helps to acquire equilibrium and the coordination of muscular movements.

-Increases chest expansion/Reinforces the hand.