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, 1964a).

- Exists in relation to, and is limited by the rights of others (Orem, 1966).

- Place where child may learn in freedom (Montessori, 1964a).

- 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).
<table>
<thead>
<tr>
<th>SCHOOLS</th>
<th>CLASSROOM</th>
<th>AREAS</th>
<th>SELF-CONTAINED</th>
<th>SEVERAL ROOMS</th>
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<tbody>
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<td>360</td>
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<tr>
<td>NEW WORLD</td>
<td>A) 22 x 36</td>
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</table>

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:  

Floor Plan No. 2:

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.
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 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):
<table>
<thead>
<tr>
<th>SCHOOLS</th>
<th>CLASSROOM</th>
<th>AREA SQ.FT</th>
<th>no. CHILD</th>
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<th>ADEQUATE 42 sqft/c</th>
<th>GENEROUS 50 sqft/c</th>
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<td>DOWNTOWN</td>
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<td>B) 17 x 24</td>
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<tr>
<td>HIGHLAND</td>
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<tr>
<td>NEW WORLD</td>
<td>A) 22 x 36</td>
<td>792</td>
<td>18</td>
<td>☐</td>
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<td></td>
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</tbody>
</table>

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 enclores 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

MONTESSORI 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):
<table>
<thead>
<tr>
<th>SCHOOLS</th>
<th>CLASSROOM</th>
<th>AREA</th>
<th>PRACTICAL LIFE</th>
<th>SENSORIAL</th>
<th>MATH</th>
<th>LANGUAGE</th>
<th>SCIENCE/GEOMETRY</th>
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<td>2) 10 X 20</td>
<td>200</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>NEW WORLD</td>
<td>A) 22 X 36</td>
<td>792</td>
<td>220</td>
<td>0</td>
<td>80</td>
<td>72</td>
<td>0</td>
</tr>
</tbody>
</table>

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 placed these materials together.

The next two floor plans (Floor Plan S and B) 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.
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 MATERIALS

MONTESSORI 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 and seating positions, such as: cushions, stuffed chairs, window seats, and raised and lowered platforms.

• Arrangements for these area 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

MONTESSORI 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):
<table>
<thead>
<tr>
<th>SCHOOLS</th>
<th>CLASSROOM</th>
<th>AREAS</th>
<th>SHAPE</th>
<th>AREA</th>
<th>no. CHILD</th>
<th>SQFT/CHILD</th>
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</thead>
<tbody>
<tr>
<td>LAKESHORE</td>
<td>A) 18 x 18</td>
<td>324</td>
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<tr>
<td></td>
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</tr>
<tr>
<td></td>
<td>13 x 22</td>
<td>286</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>B) 1) 240 SQFT</td>
<td>240</td>
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<td></td>
<td>24</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2) 15 x 19</td>
<td>285</td>
<td></td>
<td></td>
<td>88</td>
<td>1.6</td>
</tr>
<tr>
<td></td>
<td>3) 14 x 18</td>
<td>252</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DOWNTOWN</td>
<td>A) 22 x 30</td>
<td>660</td>
<td></td>
<td></td>
<td>60</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>B) 17 x 24</td>
<td>408</td>
<td></td>
<td></td>
<td>45</td>
<td>18</td>
</tr>
<tr>
<td>FAMILY</td>
<td>A) 36 x 28</td>
<td>1008</td>
<td></td>
<td></td>
<td>62</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>B) 28 x 44</td>
<td>1232</td>
<td></td>
<td></td>
<td>48</td>
<td>20</td>
</tr>
<tr>
<td>MONTESSORI</td>
<td>A) 38 x 38</td>
<td>1444</td>
<td></td>
<td></td>
<td>96</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>B) 38 x 38</td>
<td>1444</td>
<td></td>
<td></td>
<td>96</td>
<td>24</td>
</tr>
<tr>
<td>HIGHLAND</td>
<td>A) 1) 12 x 16</td>
<td>192</td>
<td></td>
<td></td>
<td></td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>2) 18 x 20</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3) 12 x 18</td>
<td>216</td>
<td></td>
<td></td>
<td></td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>B) 1) 16 x 20</td>
<td>320</td>
<td></td>
<td></td>
<td></td>
<td>72</td>
</tr>
<tr>
<td></td>
<td>2) 10 x 20</td>
<td>200</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NEW WORLD</td>
<td>A) 22 x 36</td>
<td>792</td>
<td></td>
<td></td>
<td>112</td>
<td>18</td>
</tr>
</tbody>
</table>

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.

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, 1964a), 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 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 doors, 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 activity 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 mentions 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 gymnasium, 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 “gymnasium” as Montessori refers to it, should accommodate 12-16 children dancing, playing group games, and viewing a special film (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,

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

<table>
<thead>
<tr>
<th>SCHOOLS</th>
<th>DAY CARE</th>
<th>DAY CARE ROOM</th>
<th>AREAS</th>
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</table>

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: