

The background of the cover is a close-up photograph of a light-colored wooden surface. In the upper left, a portion of a white circular object is visible. In the lower right, a wooden block with a circular hole is shown, resting on the wooden surface. The text is centered in the upper half of the image.

DESIGNING FOR THE
MONTESSORI METHOD
OF EDUCATION

Thesis Program by Jennifer Nagel

DESIGNING FOR THE MONTESSORI METHOD OF EDUCATION

A Design Thesis Submitted to the
Department of Architecture
North Dakota State University

By
Jennifer Nagel

In Partial Fulfillment of the Requirements
for the Degree of
Master of Architecture

North Dakota State University Libraries Addendum

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May 2021

TABLE OF CONTENTS

COVER PAGE	1
SIGNATURE PAGE	3
FIGURE AND TABLES	6
THESIS PROPOSAL	
THESIS ABSTRACT	8
THESIS NARRATIVE	10
Introduction	11
Project Typology	12
Project Emphasis	12
User/ Client	13
Major Program Elements	15
Project Goals	16
PRECEDENT ANALYSIS	
Rutchut School	18
My Montessori Garden Preschool	28
Kindergarten in Guastalla	36
Children’s House	42
Precedent Analysis Summary	49
PLAN FOR PROCEEDING	
Documentation of the Design Process	51
Design Methodology	53
Project Schedule	54
THESIS PROPOSAL	
RESULTS FROM UNIFYING IDEA	56
PROJECT JUSTIFICATION	59
HISTORICAL, SOCIAL, & CULTURAL	70
SITE ANALYSIS	76
DESIGN RESEARCH	95
DESIGN SOLUTION	120
APPENDIX	
REFERENCES	150
PREVIOUS STUDIO EXPERIENCE	155

TABLES AND FIGURES

Fig. 1- “Broken”	8
Fig. 2- Kraaken Images	10
Fig. 3- Matt Hoffman Image	14
Fig. 4- Thesis Site Map	16
Fig. 5- U.S. Map	17
Fig. 6- North Dakota Map	17
Fig. 7- Rutchut School Entrance	18
Fig. 8- Rutchut School Classroom	19
Fig. 9- Rutchut Outdoor Work Area	19
Fig. 10- Rutchut School Entrance	20
Fig. 11- Rutchut School East Elevation	20
Fig. 12- Rutchut School West Elevation	20
Fig. 13- Rutchut School Office Elevation	21
Fig. 14- East Classroom Elevation	21
Fig. 15- West Classroom Elevation	21
Fig. 16- Rutchut School Front Facade	22
Fig. 17- Rutchut School Shading Device	22
Fig. 18- Rutchut School Courtyard	23
Fig. 19- Rutchut School Project	24
Fig. 20- Rutchut School Green Space	25
Fig. 21- Rutchut School Site Plan	26
Fig. 22- Rutchut School Site Design	27
Fig. 23- Garden Staircase	28
Fig. 24- Montessori Garden Classroom	29
Fig. 25- Montessori Garden Aerial	29
Fig. 26- Montessori Garden Walkway	30
Fig. 27- Montessori Garden First Floor	30
Fig. 28- Montessori Garden Site	31
Fig. 29- Montessori Garden Layer	32
Fig. 30- Montessori Garden Structure	33

TABLES AND FIGURES

Fig. 31- Montessori Garden Heat Gain	34	Fig. 60- Kelly, Sikkema	75
Fig. 32- Montessori Garden Air Circulation	34	Fig. 61- Thesis Site Map	76
Fig. 33- Montessori Garden Section	34	Fig. 62- U.S. Map	77
Fig. 34- Montessori Garden Windows	35	Fig. 63- North Dakota Map	77
Fig. 35- Montessori Garden Outdoor	35	Fig. 64- Site Analysis	78
Fig. 36- Kindergarten in Guastalla Concept	36	Fig. 65- Zoning	81
Fig. 37- Kindergarten in Guastalla Classroom	37	Fig. 66- ND Tree Species	82
Fig. 38- Kindergarten in Guastalla Exterior	37	Fig. 67- Species Predominance	83
Fig. 39- Kindergarten in Guastalla Elements	38	Fig. 68- Tree Benefits	83
Fig. 40- Kindergarten in Guastalla Winter	38	Fig. 69- ND Soil Type	84
Fig. 41- Kindergarten in Guastalla Material	39	Fig. 70- East of Site	84
Fig. 42- Kindergarten in Guastalla Circulation	40	Fig. 71- Plants on Site	84
Fig. 43- Kindergarten in Guastalla Ext. Elevation	40	Fig. 72- SMCHS Views	86
Fig. 44- Kindergarten in Guastalla First Floor	41	Fig. 73- Site Images	87
Fig. 45- Kindergarten in Guastalla Site Plan	41	Fig. 74- Wallis, Marcus	88
Fig. 46- Children’s House	42	Fig. 75- Interaction Matrix	90
Fig. 47- Children’s House Entrance	43	Fig. 76- Interaction Net	91
Fig.48- Children’s House Entrance Facade	43	Fig. 77- Beau Norby	96
Fig. 49- Children’s House Window	44		
Fig. 50- Children’s House Roof	45		
Fig. 51- Children’s House Exterior	45		
Fig. 52- Children’s House Circulation	46		
Fig. 53- Children’s House Section	46		
Fig. 54- Children’s House Surrounding Area	47		
Fig. 55- Jackie Hope	49		
Fig.56- Ben White	50		
Fig. 57- Project Schedule	54		
Fig. 58- Project Schedule	55		
Fig. 59- Spiske, Markus	58		



ABSTRACT

How can architecture improve the health and well-being of students in the learning environment?

Can we as designers use the Montessori child-focused approach to learning and apply it to architecture for children's education?

How can design focus on child growth in all areas of their development, such as cognitive, emotional, social, and physical?

Components necessary for a program to be considered authentically Montessori include multiage groupings that foster peer learning, uninterrupted blocks of work time, and guided choice of work activity. In addition, a full complement of specially designed Montessori learning materials are meticulously arranged and available for use in an aesthetically pleasing environment. This thesis aims to encourage independence, freedom within limits, and a sense of order. The child, through individual choice, makes use of what the environment offers to develop themselves. This organization of information—facts and figures—prepares the child for the world of adolescence, when thought and emotion evolve into understanding more abstract, universal concepts such as equity, freedom, and justice.

Typology: Educational Facility

Site: Bismarck, North Dakota



THESIS NARRATIVE

“Only Architecture that considers human scale and interaction is successful architecture.”

-Jan Gehl

INTRODUCTION

Montessori Method is a child-focused approach for educating children. In Montessori classrooms, children work independently and in groups, often with specially designed learning materials. The furniture is scaled down to the proportions of a child rather than an adult which helps aid in their level of learning. It focuses on child growth in all areas of their development; cognitive, emotional, social, and physical. Montessori education is student-led and self-paced and allows children the freedom to develop their imagination and desire for learning. Instead of sitting at a desk looking at textbooks all day, children shuffle around the classroom to different activities that teach them a new skill.

My goal for the project is to create the ideal environment for Montessori education. I hope that my design will excite families who are thinking about switching from traditional schooling to the Montessori method. As well as educate people who are not familiar with Montessori.

Lastly, I want to look into how today’s new advances in technology can improve the Montessori method. By doing this, I hope other Montessori schools will use this as an example and implement it into their classrooms.

“Rather than simply filling children with facts, Montessori education strives to nurture each child’s natural desire for knowledge, understanding, and respect.”

-Melanie Thiesse

PROJECT TYPOLOGY

K-5 EDUCATIONAL FACILITY

To successfully examine the theoretical premise, I will create an elementary education facility that represents, implements and reflects the discovered research during the fall semester. Declaring this facility as an elementary school will help provide a clear scope of the research discovered. I will adapt the design around a singular tested methodology.

PROJECT EMPHASIS

Studies have shown the importance of the physical environment in supporting childhood development. The emphasis for my thesis is to research the benefits of the Montessori Method of Education and how it shapes the minds of today's youth. I will analyze the learning stages of children in all areas of their development, including: cognitive, emotional, social, and physical. After doing so, I will design a facility that nurtures a child's natural desire for knowledge, understanding, and respect. In order to accomplish this, I will delve into the effectiveness of learning in the given physical environment and the relationship between concepts such as: scale, movement, daylighting, materiality, spatial organization, connection to nature, use of technology, and social interaction. The goal of this thesis is to redesign the traditional elementary school into the ideal facility for the Montessori Method of Education.

USER/CLIENT DESCRIPTION

STUDENTS

Children ages 6months-5 years old will be the primary users of the facility. They will inhabit the building during typical business hours. Most children will live in a nearby community, but some may travel a distance due to a parent's job.

TEACHERS

Teachers will supervise and engage their students in activities to ensure they are providing an environment that fosters learning. Teachers will be the secondary users of the space.

OFFICE STAFF

Their primary role is to manage the day to day activities at the daycare facility. Some tasks include answering phone calls and scheduling meetings

PARENTS

The typical role of a parent is to ensure their children are dropped off and picked up at the designated time. Parents will typically only occupy the space during this time and during meetings and events.

MAINTENANCE

Custodians, gardeners, will occupy the site based on necessary needs. These occupants require a small portion of space to perform their duties.

VOLUNTEERS

The job of a volunteer usually requires listening to the children, offering comfort, resolving conflict and helping with day to day operational duties. The primary role is to maintain focus on the children to help maintain a safe, friendly, and supportive environment.



MAJOR PROJECT ELEMENTS

CLASSROOMS

Flexible indoor space that provides a space for children to learn.

GREEN ATRIUM

A common area used by all students.

NAPPING AREA

Comfortable, peaceful space where children are able to relax. The noise and natural daylighting will be reduced in this area.

PLAYGROUND

Outdoor play spaces are an extension of the classroom. Playing outside allows children to experience a constantly changing environment while being exposed to natural daylighting, open air, physical activity, and the natural elements.

GARDEN

Outdoor garden spaces provide great opportunities for children to learn basic tasks. Not only are gardens a great learning tool, but children are also able to grow healthy food here.

FACULTY SPACES

Teacher support space, administration space, storage.

GYMNASIUM

Physical activity is an important aspect of a child's growth.

GOALS OF THESIS PROJECT

The goal for my project is to create the ideal environment for Montessori education. I hope that my design will excite families who are thinking about switching from traditional schooling to Montessori method. As well as educate people who are not familiar with Montessori. I want to look into how today's new advances in technology can improve the Montessori Method. By doing this, I hope other Montessori Schools will use this as an example and implement it into their classrooms.

FOSTER the growth of functional independence, task persistence and self-regulation.

PROMOTE social development through a large variety of materials for the refinement of sensory perception.

ENCOURAGE imaginative exploration leading to confident, creative self-expression.

PROVIDE an understanding of the child's role in their community, in their culture and in the natural world.

PROFESSIONAL

Professionally, I hope to take the lessons learned from my thesis and apply the knowledge in a successful firm which specializes in educational facilities. As architects, we are given the opportunity to impact future generations by creating meaningful environments. The key role when designing an environment for education is to provide a facility that promotes and encourages creativity and innovation. I have always had an interest in this topic and hope that my passion for it will give me an advantage over other potential applicants. I am excited for the future and the opportunity to improve the daily life of others through my designs.

ACADEMIC

My academic goal of this thesis project is to receive a Masters of Architecture degree at North Dakota State University. Through the design process, I hope to apply the knowledge I have gained thus far, while understanding new concepts. I hope to take these new skills and apply them to my future endeavors. I hope in the future that the thesis project serves as a reference for current graduate students whom share the same passion in bettering educational facilities.

PERSONAL

The greatest goal for my thesis project is to produce a solution that I am proud of. I hope that my hard-work and the high standards I have set for myself help me achieve a project that exceeds my greatest expectations. Accomplishing this project makes my journey to become a licensed architect one step closer. This is not the end but merely the beginning of something new.



RATCHUT SCHOOL

ARCHITECTS: Design in Motion

TPOLOGY: Educational Facility

PROJECT YEAR: 2016

LOCATION: Tambon Hua Nong, Thailand

AREA: 1100 sqm.



Figure 8- Rutchut School Classroom



Figure 9- Rutchut School Outdoor Work Area

From the architect:

The project design reflects the ‘Montessori’ ideal learning environment, where a learning space should resemble a home more than a typical classroom. Therefore, the learning area is split into multiple small-sized “rooms”, where all the children could feel more like home when they come to school. The layout of these “rooms” has been designed to correlate with each of children’s activities.



Figure 10- Rutchut School Entrance Elevation



Figure 11- Rutchut School East Elevation

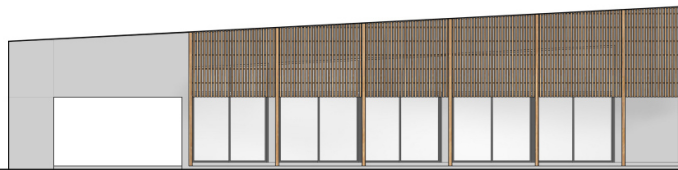


Figure 12- Rutchut School West Elevation

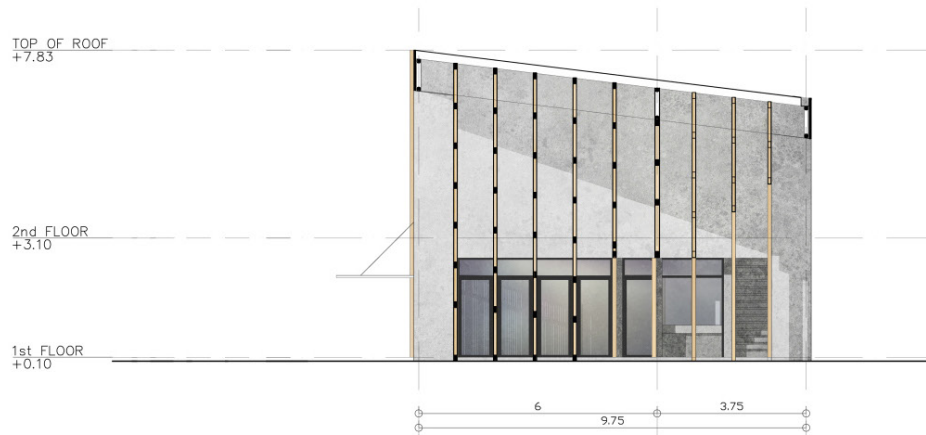


Figure 13- Rutchut School Office Elevation

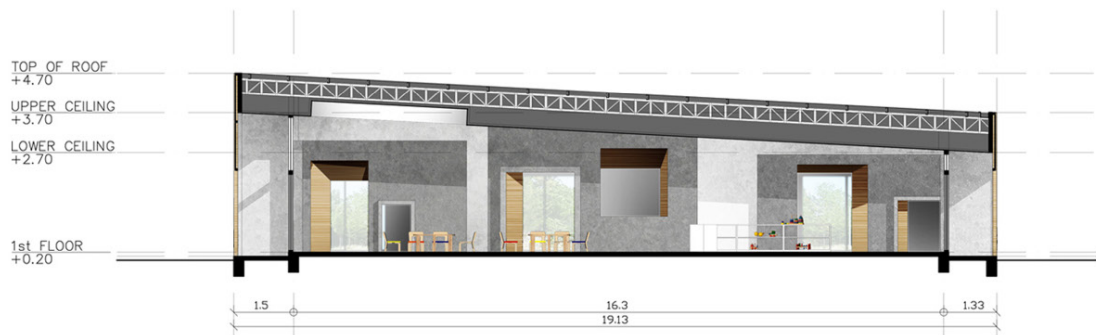


Figure 14- East Classroom Elevation

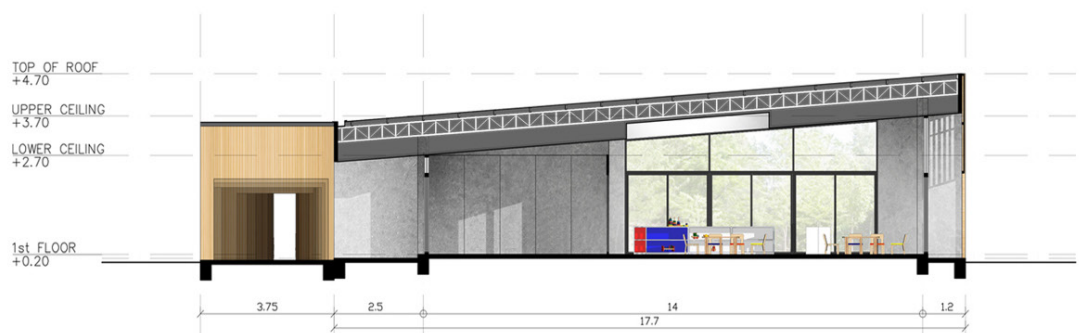


Figure 15- West Classroom Elevation



Figure 16- Rutchut School Front Facade



Figure 17- Rutchut School Shading Device

Research findings:

Like the following cases, Rutchut School proves that the best learning environment for children is nature. The building layout has been carefully planned to support children's self-learning and integrated both indoors and outdoors spaces, architecture, and landscape to provide different learning activities. This layout consists of different "nature" elements, each suitable for different stages of child's development. The selected natural elements that have been used to create an ideal learning environment for this project include caves, sand, mounds, and trees.



Figure 18- Rutchut School Courtyard

PROJECT ELEMENTS AND CONCEPTS

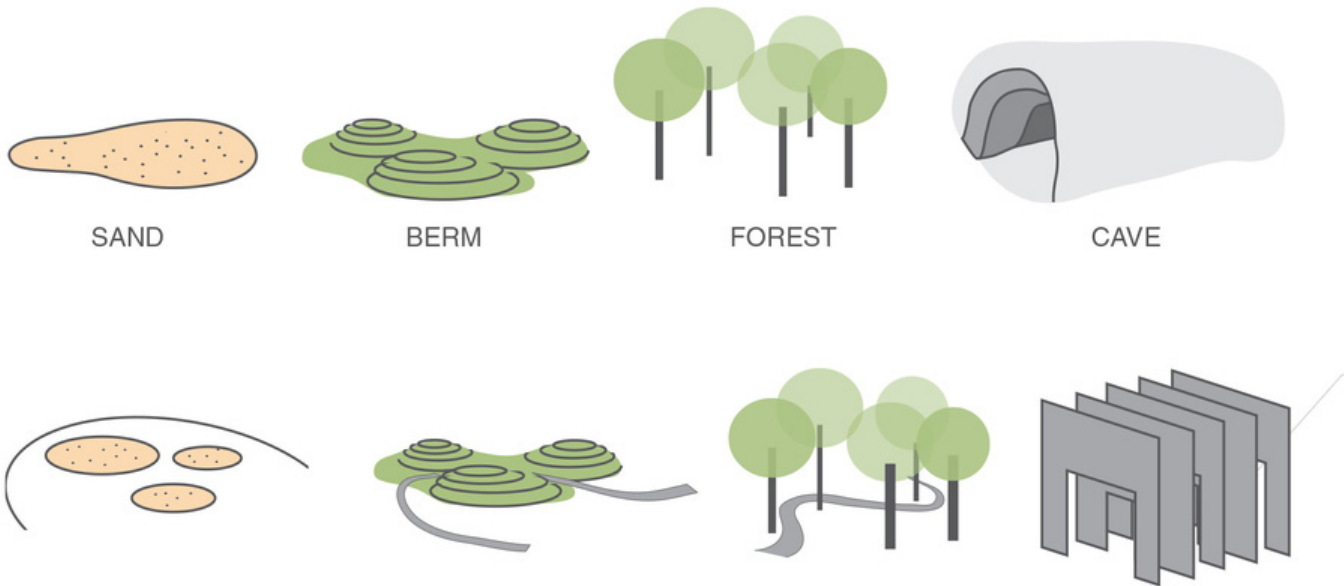


Figure 19- Rutchut School Project Elements

The “Cave”

This concept has been transformed into wooden layers at the entrance. The spaces in between cascaded layers allow the natural light to pass through making them dominant, interesting and creating a gently fresh atmosphere for the kids.

The Sand

Used in the playground around the Toddler Building to facilitate the development of the sense of touch in toddlers.

Freeform “Mound”

This is used in the landscape of the court and surrounding areas, where children could run around and utilize the space for an outdoor learning experience. This area also uses to connect all the buildings and learning spaces together.

Trees

“Trees” are planted to provide shades for outdoor learning spaces.



Figure 20- Rutchut School Green Space

This project also includes one building for parents, and two buildings for classrooms, where the buildings are interconnected with roofed corridors. All the buildings were painted in grey tones alternating with wooden slat to create a smooth, yet warm feeling to the eyes of the outsiders. The architecture is designed to be simple, which allow children to easily understand the layout of the project. Also, wooden slat helps filter out sunlight from outside, so that children are exposed to just enough sunlight that's optimal for their visions and learning.

Additionally, this wooden slat will limit children's view of the outside, which can help decreasing distractions from outside the classrooms and help children to focus better on their current tasks. The classroom buildings also consist of multiple smaller rooms that serve different activities. This planning was inspired by a child's home, where they circulate through each 'room'. Here they could play, learn and develop different skills and knowledge. Thus, a 'smaller room' is more suitable and more stimulating for children in learning than a big regular open room.

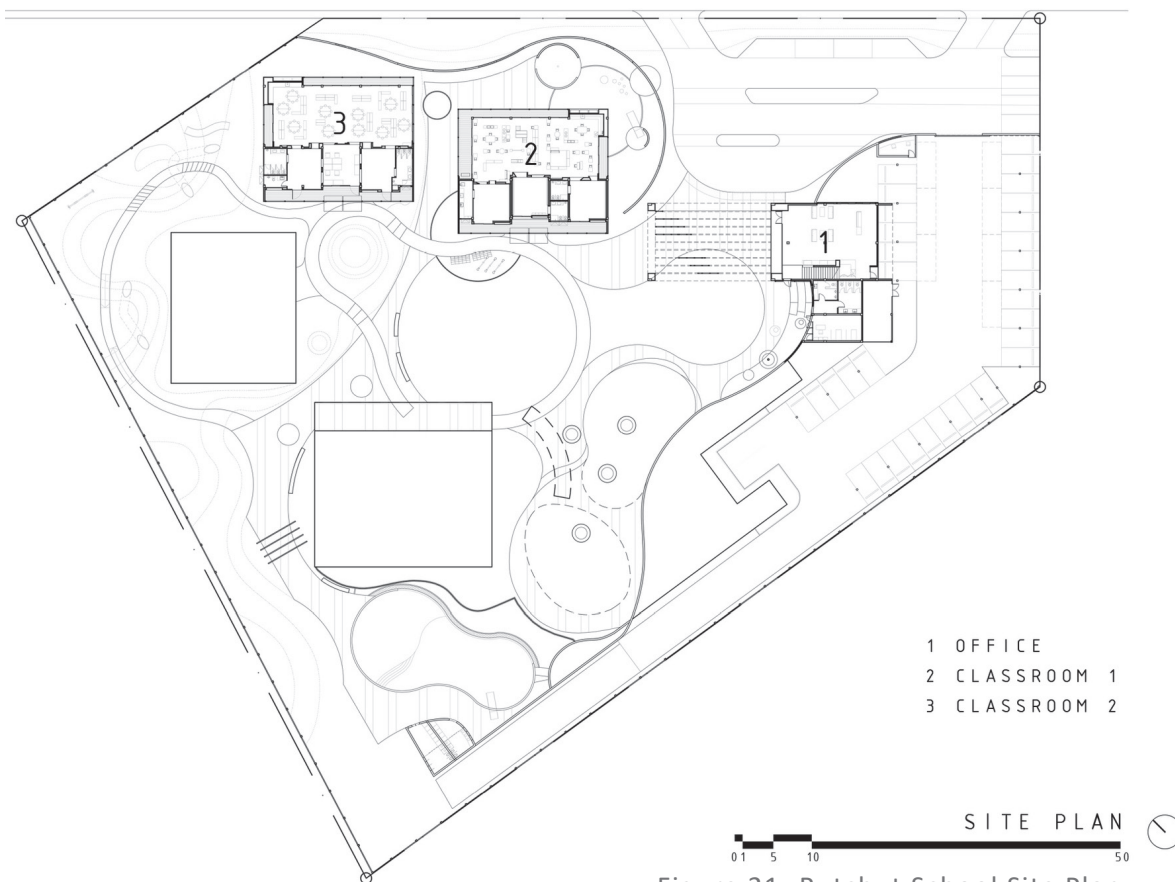


Figure 21- Rutchut School Site Plan



Figure 22- Rutchut School Site Design

CONCLUSION

Rutchut School has made a large contribution to my understanding of “Designing for Montessori Education”. This case study proves the impact of the school’s material, attention to detail, and the layout of spaces can have on the overall design. Along with this, Rutchut School has given me a great example of how architect’s can create learning opportunities both indoor and outdoor. The effort put into the site’s design makes this school stand out from other Montessori schools.



Figure 23- Garden Staircase

MY MONTESSORI GARDEN PRESCHOOL

ARCHITECTS: HGAA

TYOLOGY: Educational Facility

PROJECT YEAR: 2020

LOCATION: Vietnam

AREA: 600 sqm.



Figure 24- Montessori Garden Classroom



Figure 25- Montessori Garden Aerial



Figure 26- Montessori Garden Walkway Plan

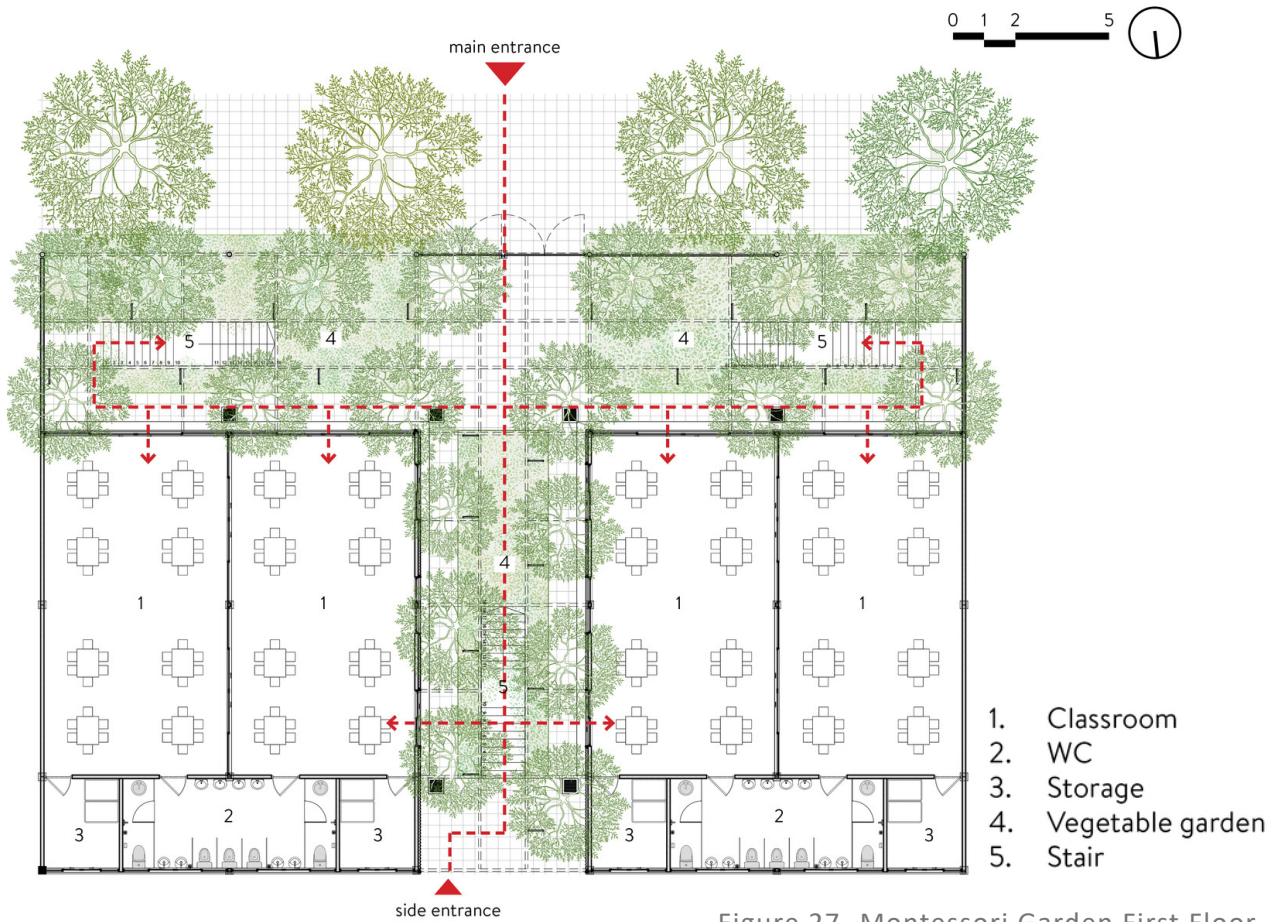


Figure 27- Montessori Garden First Floor

From the architect:

Montessori is an educational method originating in Europe in the early 20th century, and has been developing in Vietnam in recent years. This method respects the independence of children, creates an environment for them to explore and feel the world through their own senses. My Montessori Garden is a Montessori-oriented preschool. We, together with the investor, want to create a garden - a natural space for children, a classroom between the trees and flowers. The circulation of the building can be seen in the figure below.

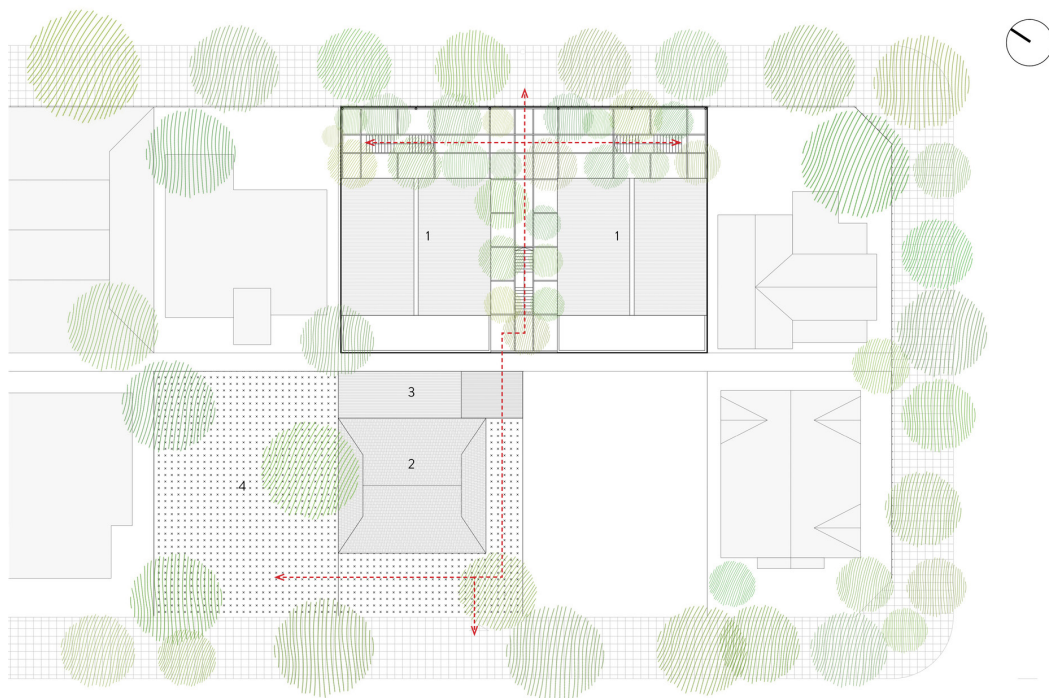


Figure 28- Montessori Garden Site Location

- 1. My Montessori Garden
- 2. Old Kindergarten
- 3. Kitchen
- 4. Yard

Research findings:

Montessori Garden Preschool is a great example of having nature at the heart of design. The school is built around a garden which has great impacts of the development of young children. The building itself is very simple, with the use of symmetry and balance. However, the large windows in each classroom bring in natural lighting and the feeling of “being outdoors”.

PROJECT ELEMENTS AND CONCEPTS

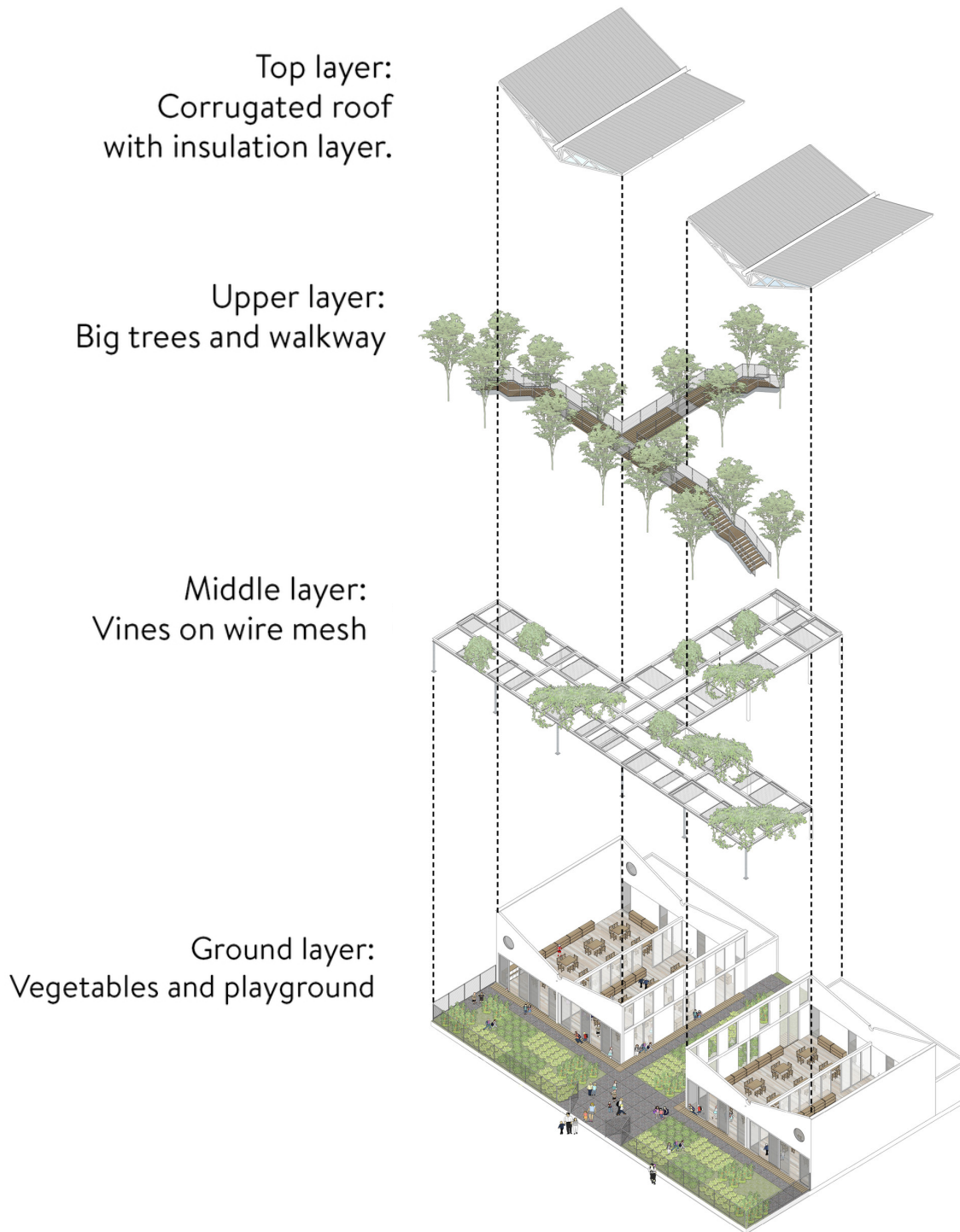


Figure 29- Montessori Garden Layer of Spaces

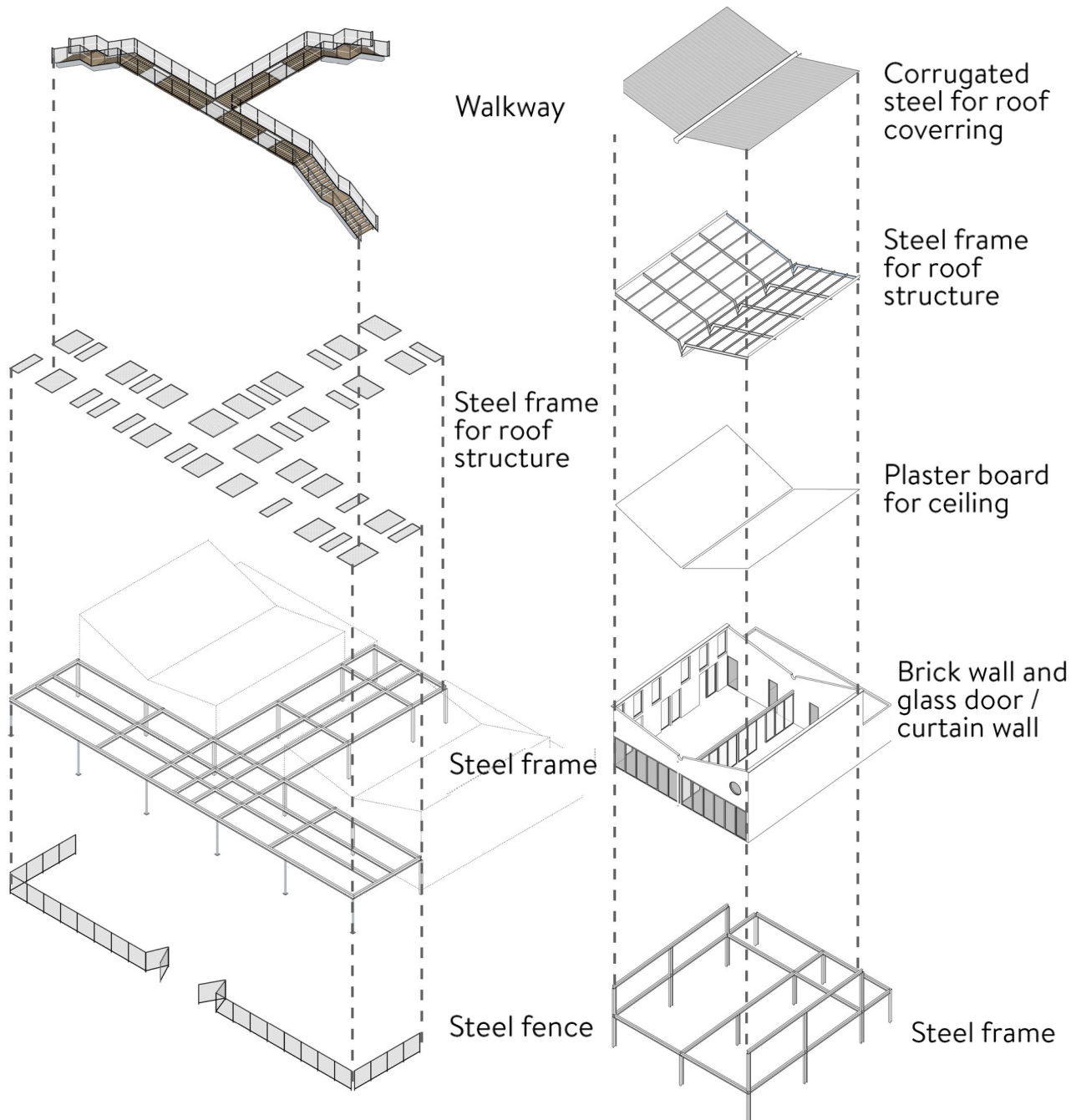


Figure 30- Montessori Garden Structure

In terms of micro-climate, the tree garden surrounding the classroom also creates a cool and quiet atmosphere for the classrooms, while creating views and green landscapes for all classes. In an effort to seek change from simple but bold architectural solutions - creating a classroom in the middle of a garden right in the heart of the city, we hope to contribute to improving the quality of educational spaces, inspire the next changes.

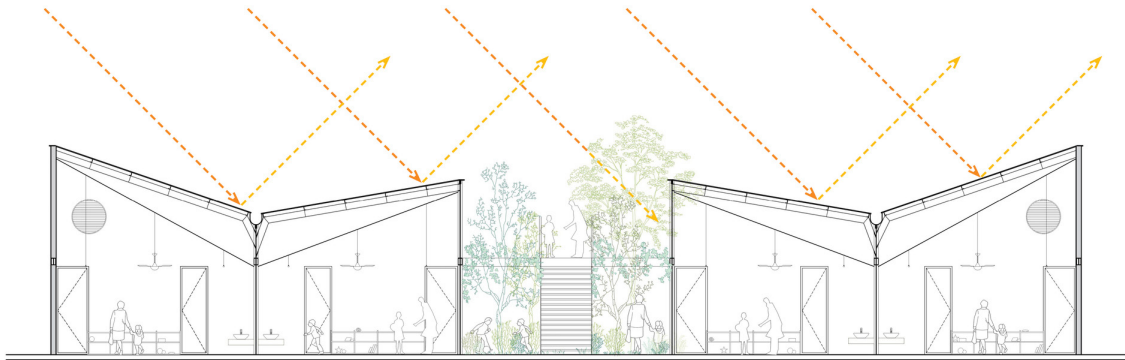


Figure 31- Montessori Garden Heat Gain 0 1 2 5

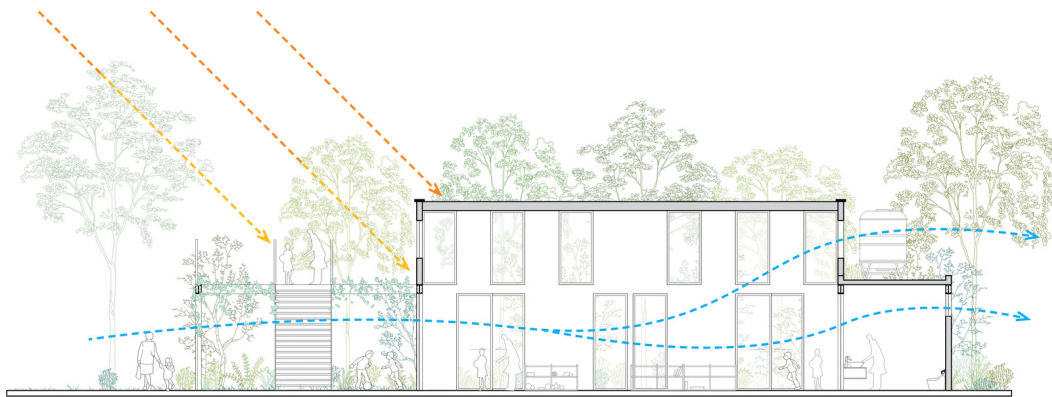


Figure 32- Montessori Garden Air Circulation 0 1 2 5



Figure 33- Montessori Garden Section 0 1 2 5



Figure 34- Montessori Garden Windows



Figure 35- Montessori Garden Outdoor

CONCLUSION

Once again, this case study has taught me the importance of the natural environment when designing for Montessori education. The whole idea behind the Montessori Garden Preschool is the positive impact of nature on a developing mind.

The design is similar to the other case studies because of the natural materials used within the classrooms. This is a huge characteristic of Montessori classrooms. On the other hand, this case study is unlike the others due to the fact that it is for ages 3-6 rather than 6-12. I plan to take ideas from Montessori Garden Preschool and apply it to my own design.





KINDERGARTEN IN GUASTALLA

ARCHITECTS: Mario Cucinella Architects

TYPOLOGY: Educational Facility

PROJECT YEAR: 2015

LOCATION: Guastalla, Italy

AREA: 1400 sqm.



Figure 37- Kindergarten in Guastalla Classroom



Figure 38- Kindergarten in Guastalla Exterior

PROJECT ELEMENTS AND CONCEPTS

Architectural elements of the new kindergarten by MCA – like the shape of the interior, their organization, the choice of materials, all the sensory perceptions related to the light, the colors, the sounds, the tactile suggestions – are designed taking into account of the pedagogical and educational related to the growth of the child.

The structure involves the use of natural materials with low environmental impact. In particular, the supporting structure is made up of wooden frame: a safe and ideal material to keep the thermal insulation of the building.

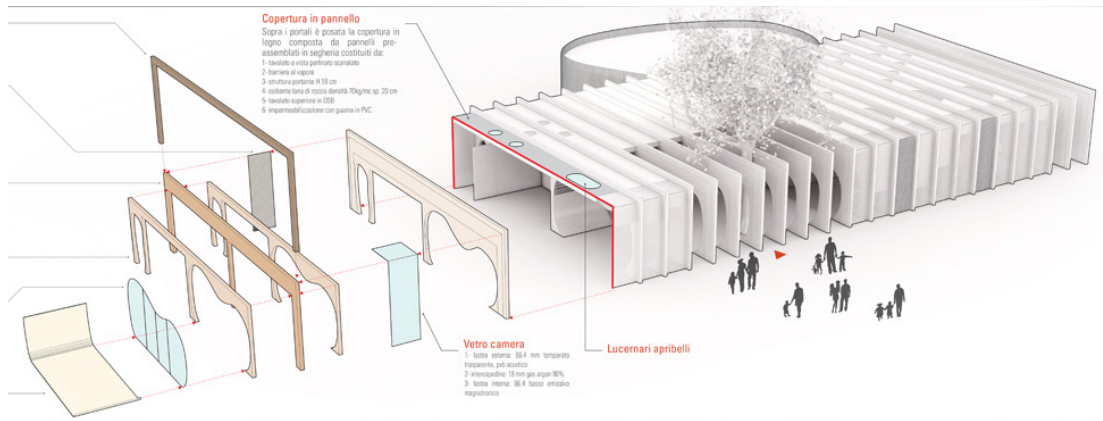


Figure 39- Kindergarten in Guastalla Elements



Figure 40- Kindergarten in Guastalla Winter



Figure 41- Kindergarten in Guastalla Material

The philosophy of the building is to create a space suitable for children and teachers which is welcoming and safe which provides children with the opportunity to explore the world. The overall design stimulates the interaction of the children with the surrounding environment

The glazing on the exterior of the building allows visual connection between the exterior, as well as create a sense of security for the children using the facility. Along with this, it allows natural light to illuminate the classrooms. The interior space is a mirror image of the exterior environment incorporating natural elements and neutral tones. The Kindergarten in Guastalla has many program elements. These include: classrooms, laboratories, play areas, niches, kitchen, unloading and service area, and green spaces.

Research findings:

Connection spaces between classrooms stimulate curiosity and exploration. Though the building is a simplistic linear space it provides paths of different experiences. The widening and shortening of the spaces, play and interaction spaces and large transparent windows allow a glimpse of the outdoor areas. Mindfulness of space, materials, light, colors and sounds articulate an extraordinary design which considered the importance of providing children with enriching spaces to help foster the growth of the children.

The floor plan accommodates easy movement through the day care center by positioning the main corridor along the north-west side of the building. The building uses repetition through spatial organization that have similar functions. Circulation through the space can be seen in green on the figure below.

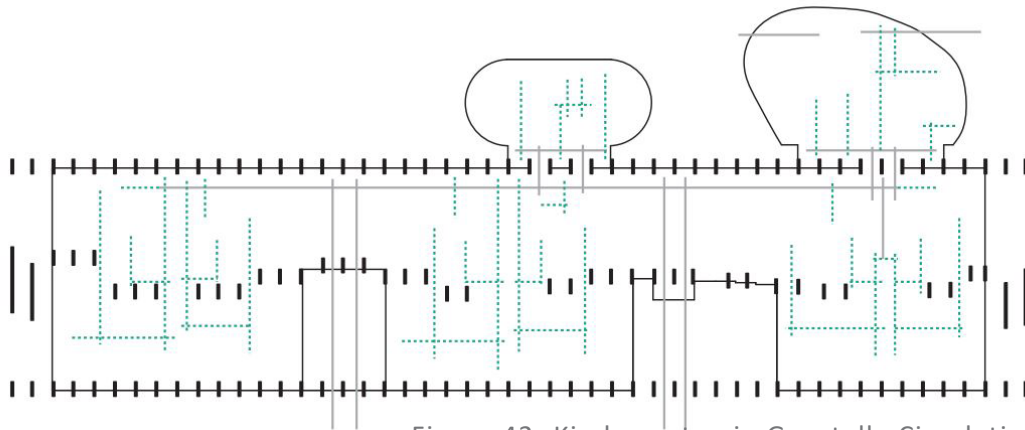


Figure 42- Kindergarten in Guastalla Circulation

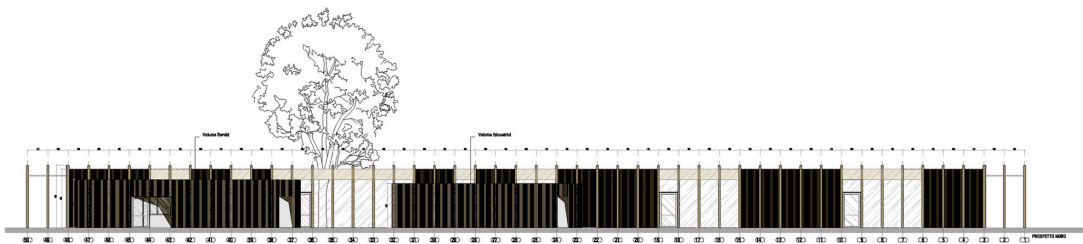


Figure 43- Kindergarten in Guastalla Ext. Elevation

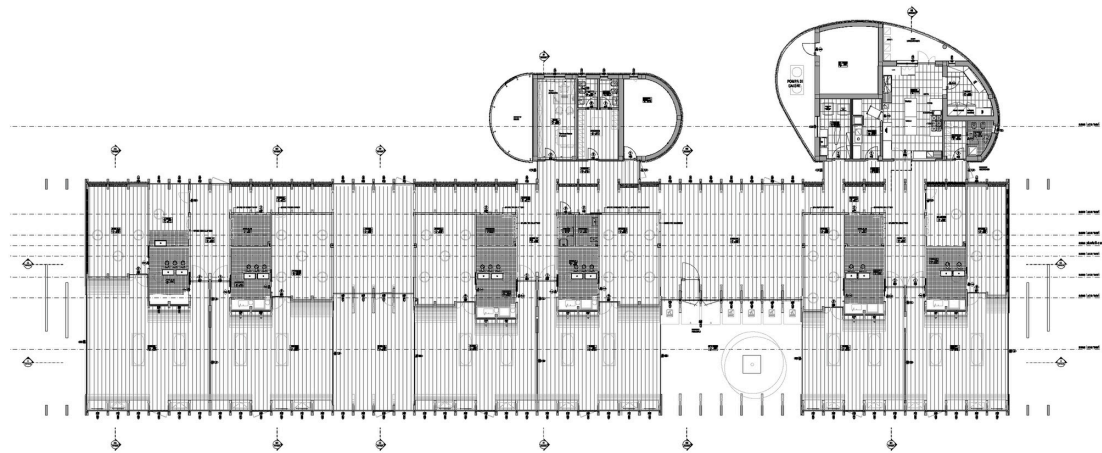


Figure 44- Kindergarten in Guastalla First Floor

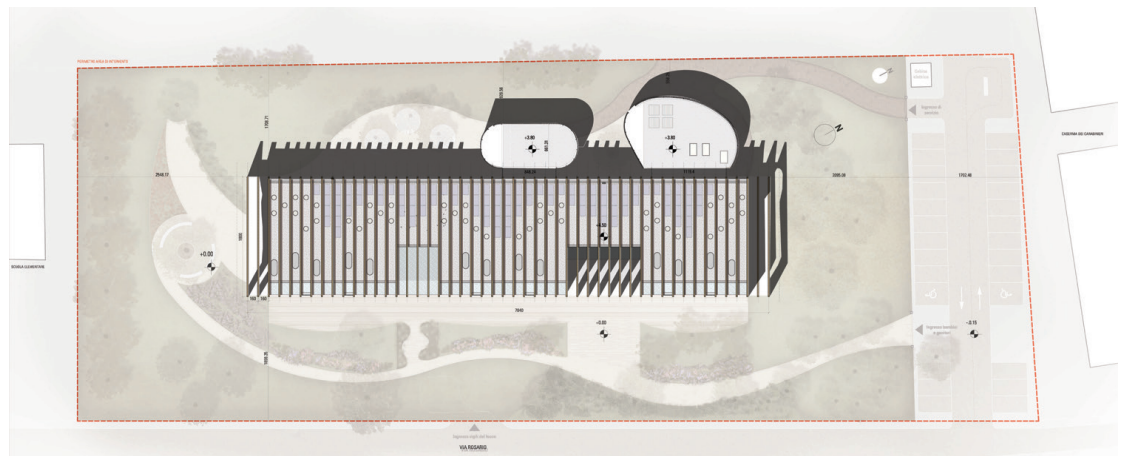


Figure 45- Kindergarten in Guastalla Site Plan

CONCLUSION

The Kindergarten in Guastalla is a great example of a sophisticated and effective use of natural materials. The wooden frames provide movement to a mostly symmetrical design. The use of wood has been a repeating element among my chosen case studies, however the Kindergarten in Guastalla uses wood in an organic fashion. I plan to use this as inspiration for my own design.



CHILDREN'S HOUSE

ARCHITECTS: MU Architects

TPOLOGY: Daycare

PROJECT YEAR: 2014

LOCATION: Briis-Sous-Forges, France

AREA: 640 sqm.



Figure 47- Children's House Entrance



Figure 48- Children's House Entrance Facade

From the architect:

For a good number of years, the children of Briis-sous-Forges have had the chance to have their school placed in the middle of the forest. From a very young age, they learn to observe the changes brought on by the seasons, to smell the humus of the undergrowth, to benefit from the open sky in the clearings, or to notice the slow dance of the tree shadows around their classrooms.

The building is visible through the trees from the nearby road and has a predominantly low profile, with a two-story turret rising from one end. Its plan incorporates three branches that extend outwards towards the forest, forming three separate sheltered playgrounds for the different age groups “The imposing presence of the forest on the site has always been a leading point to our design,” says Grégoire Dubreux, Associate Architect at MU Architecture. Children’s House is a primary school which provides after-school care and summer school care for young children. The tree inspired school is located in Briis-Sous-Forges, France which is the heart of the forest.

Figure 49- Children’s House Window





Figure 50- Children's House Roof

Figure 51- Children's House Exterior

Some of the Children's House program elements include:

- preschool
- art room
- administration offices
- tea room
- toy room
- changing room
- maternal activity room
- break room
- storage space



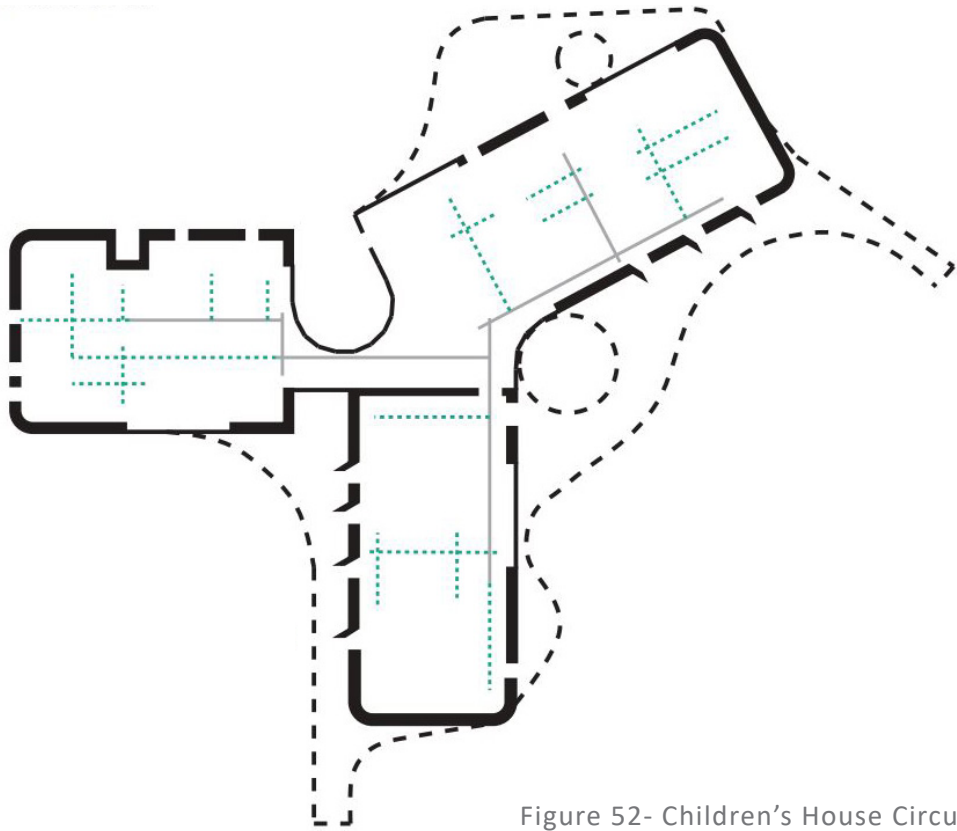


Figure 52- Children's House Circulation

Research findings:

The building footprint contains one central node with three individual wings expanding outwards. The majority of the primary circulation routes are located near glass facades which allow children direct sight to the exterior. The circulation of the Children's House can be seen in the figure above. As for the figure shown below, the section plan of Children's House documents the structure of the building.

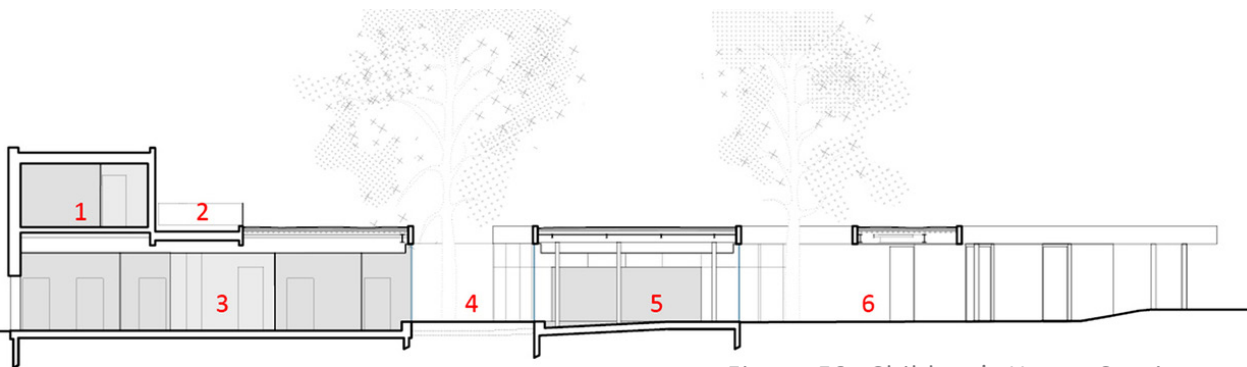


Figure 53- Children's House Section



Figure 54- Children's House Surrounding Area

CONCLUSION

The greatest take-away from the Children's House Montessori Preschool is the influence nature has on the overall design and layout of the facility. The form of the building creates a sensory experience by integrating trees seamlessly into the structure of the building. The unique shape mimics the energy and wonder in which children possess. Like the other three case studies, this one is a great example of using the surrounding area for opportunities of exploration and imagination. By fostering a child's natural desire to learn from the world, the Montessori method of teaching is able to live up to the high standards set a hundred plus years ago by Maria Montessori herself.

Something I noticed that makes Children's House by MU Architects stand out is the bright paint colors chosen for the interior of the school. This is not something normally found in a Montessori classroom. In fact, the classrooms are usually a neutral color with natural materials. The only color within the classrooms come from the learning activities the children work with. This design technique enhances the attention of the child and keeps him/her focused on their task.

PRECEDENT ANALYSIS SUMMARY

Early childhood education was the focus of all four of my case studies: Rutchut School, Montessori Garden, Kindergarten in Guastalla, and Children’s House. A consistent theme throughout each case study was each project’s response to integrating nature into the built environment and the importance of environmentally sensitive design. Spatially all four case studies show the importance of the physical environment and its benefits to childhood development. Montessori buildings avoid distracting design elements that could be detrimental to the development of children. Scale and material choice is another great factor in each study. Some unifying principles seen amongst the precedent studies include; easy access to the play yard from the classrooms, adequate lighting, building scale and spatial arrangement. The biggest takeaway was that every design decision impacts the learning environment, no matter how minor the decision may seem.

Optimal education requires optimal surroundings, and for more than a century Montessori environments have set the standard for school design that supports deep learning, peaceful and purposeful social development, and vibrant communities of practice. Grounded in core principles of order, respect, and freedom within limits, Montessori environments are intentionally designed to foster concentration, collaboration and community.



Figure 55- Jackie Hope **49.**



PLAN FOR PROCEEDING

DESCRIPTION

Before the designing phase of the Montessori educational facility can begin, I plan to visit the location of my project's site in Bismarck, North Dakota. By doing so, I will grasp a better understanding of the area, which will allow me to determine if the site has any specific needs moving forward.

Through a great amount of research, it is important to learn what the surrounding land is used for, and how many people live in the area. This knowledge would help determine the proposed square footage of the site and allow the project to suit the neighborhood to the best of its ability. The end goal is to have a successful project that benefits the community.

After this, I will look into several case studies in order to get inspiration for my own project. For example, by studying similar projects, I will be able to decipher the spatial requirements that are critical for the program. Once the requirements are evident, I will categorize them by their security clearances to reinforce the private and public components of the design.

Lastly, I will document the site through computer software such as Revit, Rhino, and Adobe Products. This technology will be capable of using this research data and transform it into mass models. After creating the masses, I can situate the program in a way that best utilizes the project's site.

METHODOLOGY

UNIFYING IDEA:

Designing for the Montessori Method of Education

To find a solution to the topic, I will analyze precedent studies, quantitative data, the test new ideas and tools in order to form the research conclusion.

PRECEDENT RESEARCH:

To form the program, I will study how the research was proposed as a viable option. I will also examine the purpose and context that formed the Montessori method. The research will include how a Montessori education facility is managed in order to produce the most beneficial design solution to the topic.

QUANITATIVE DATA:

Quantifying the data necessary for research conclusion will be found through GIS mapping, modeling, and demographic research. I will use the findings in order to document the community on a city and neighborhood scale.

GIS mapping will allow me to identify the locations where important landmarks and traffic routes are found. Through the use of models, I will be able to measure the efficiency of the proposed solutions. This will result in designing the best facility possible.

QUALITATIVE DATA:

Qualitative data and quantitative data will be produced simultaneously to determine whether or not the proposed solution will be successful. Along with this, if it will be beneficial to the community, as well as meet the needs of the users. Both forms of data will be used together to form a concise design solution for the Montessori method of teaching.

PROJECT SCHEDULE



Figure 57- Project Schedule

1. PROPOSAL

The thesis proposal began with brainstorming ideas during the summer of 2020 and will conclude with the submission of this document.

2. PROGRAM

The programming portion began in October 2020 with determining the typology and site of the project.

Key Dates:

1. Thesis Proposal due 10/13

2. Thesis Program due 12/17

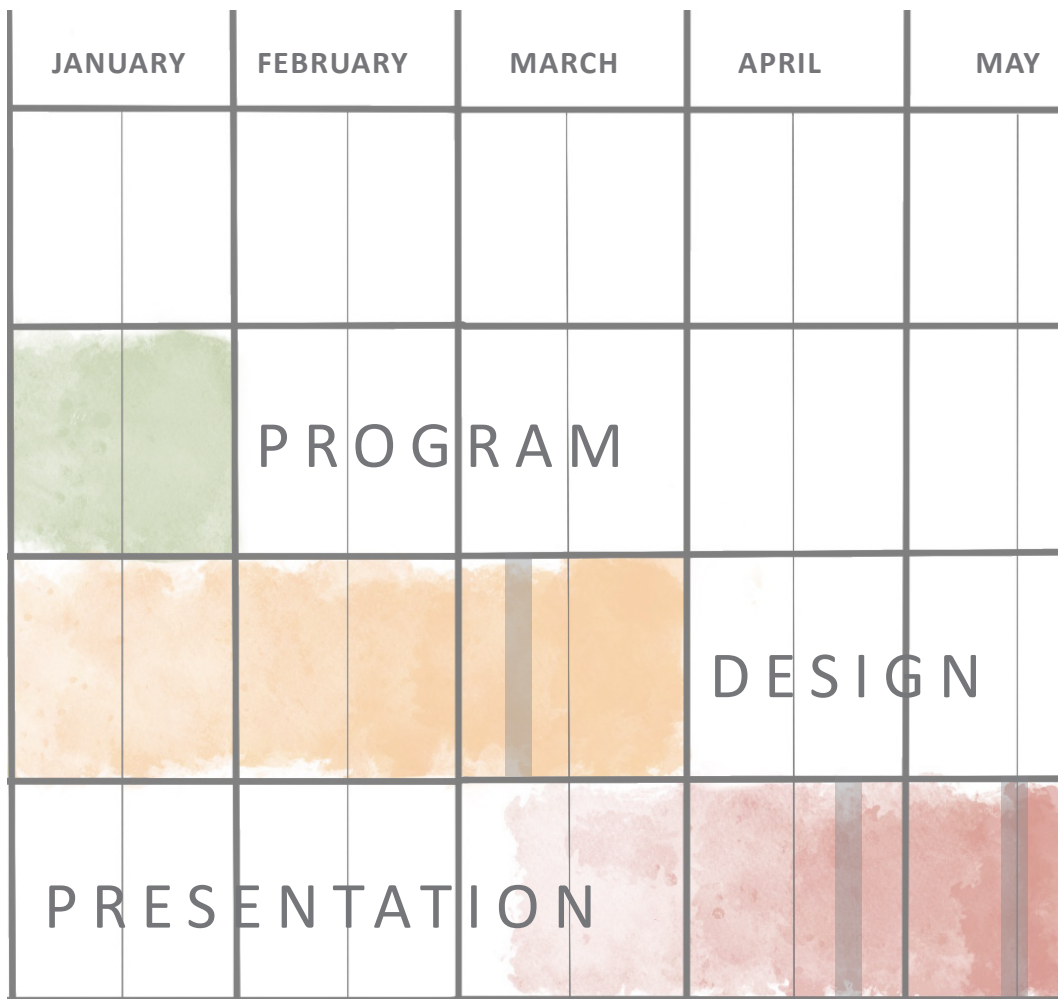


Figure 58- Project Schedule

3. DESIGN

After I have done extensive research and feel as though I have a great understanding of the topic, I will begin the thesis design phase. This will occur around early-to-mid December 2020.

4. PRESENTATION

After spending several months designing, it will be time to present my thesis project. This is set for the beginning of May 2021. Following this, my final thesis book will be due.

Key Dates:

3. Midsemester Review 3/8 4. Exhibit due 4/23 5. Book due 5/14

RESULTS FROM UNIFYING IDEA

PHILOSOPHICAL

Through the gathering of information and the gathering of qualitative data and drawing conclusions based on case studies, the main criteria for the Montessori Method of Education has been identified. Using this process, The Montessori Method will be translated into architecture and implemented into a Early Education facility, as well as other Montessori schools in the future. These findings will make Montessori education spaces more effective and create more learning opportunities. They will also encourage students to interact not only with the Montessori tools, but also the environment and one another.

THEORETICAL

The theoretical findings aquired through my research identifies what makes a school authentically considered as “Montessori”. This includes multiage groupings that foster peer learning, uninterrupted blocks of work time, and guided choice of work activity. In addition, a full complement of specially designed Montessori learning materials are meticulously arranged and available for use in an aesthetically pleasing environment. Montessori facilities should be designed to encourage independence, freedom within limits, and a sense of order. The child, through individual choice, makes use of what the environment offers. This organization of information—facts and figures—prepares the child for the world of adolescence, when thought and emotion evolve into understanding more abstract, universal concepts such as equity, freedom, and justice.

STRATEGIES

To determine how to design for the Montessori Method of Education in architecture, correlational research was implemented. “The impact of the built environment within these facilities can drastically impact many aspects of development. The aim of early childhood facilities should be to provide children with a safe, caring environment with optimal opportunities for social, emotional, physical, and cognitive development.” (California Department of Education, 2016). . The development of children is shaped by the interactions with the physical built environment and with the interactions with peers. “Children shape their environment and the environment shapes them” (Striniste and Moore, 1989). My research has found that regardless of what the final design solution looks like, the environment needs to provide an atmosphere that is appropriate for a child’s development. It is crucial that my design sparks a sense of curiosity, joy, and meaning for everyone who occupies the space.

Moving forward, my strategies to effectively design a Montessori school will be to incorporate the following requirements. The following list was developed by gathering common occurrences in Montessori facilities.

- Scale & perspective
- Provide easy access to green space or outdoor play areas, connection with nature and transparency
- Warm and welcoming environments
- Use of colors, textures and materials appropriately
- Optimal spatial arrangements for classroom
- Control noise levels by reducing reverberation, harmonious acoustic environment
- Adequate natural and artificial lighting
- Environment which encourages movement, comfort, competence and sense of control

Furthermore, precedent studies will also be a strategy used in this project as an example of the process previous designers have used to design for the Montessori Method of Education. They will also be used as an example of program elements, spatial relationships, as well as the learning opportunities created through the built environment.



PROJECT JUSTIFICATION

The years that young children spend in early educational facilities are the most critical years of their developmental process. Along with the physical growth, children are also developing their cognitive, social, and emotional aspects as well. These are crucial when planting a strong foundation for their future and who they will grow up to be.

Instead of sticking to the “traditional” learning methods, as designers, we have the responsibility of creating the best environments for the given client. In this case, children are my clients. I firmly believe it is important to realize they are the future and they deserve exceptional learning facilities. Only when we understand their individual needs, will we be able to design an exceptional school that caters to each child. For instance, designing spaces which are developmentally appropriate while ensuring that the environment is providing inspiration and meaning. “Plainly, the environment must be a living one, directed by a higher intelligence, arranged by an adult who is prepared for his mission.” -Maria Montessori

This project will be my solution to the unifying idea of “Designing for the Montessori Method of Education”. By designing the ideal facility that will follow the strict guidelines set by Maria Montessori herself, I will be able to inspire the design of future Montessori schools, as well as influence the “traditional” school design. When assessing many existing school facilities, it became evident that both architects and educationalists are failing to develop certain fundamental issues which are key to the development of our youth.

I chose to do my project on the Montessori Method because it is important to me for many different reasons. As designers we have a responsibility and ethical duty to not only create space, but also to create space which supports the activities and individuals within the environment. Through my educational experience at North Dakota State University we have always been taught that environmental design should enhance and support the lives of the users. However, I believe our region often constructs schools that are cookie-cutter designs and use little consideration of how these environments actually impact the students. Although Montessori design is often overlooked in the architectural field, I believe as society begins to understand the benefits and lasting effects of quality educational facilities, there will be a rise in Montessori schools around America. It is my goal to shine light on the importance of architectural design in the development of early childhood. It is my mission to help others understand how to meet the needs of our youth. As Maria Montessori once said, “everything within the environment should be constructed to correspond with the physical, mental, social and spiritual aspects of a child”

LITERATURE REVIEW

Theories of Childhood: An Introduction to Dewey, Montessori, Erikson, Piaget, and Vygotsky

Written by Carol Garhart Mooney

SUMMARY:

“This best-selling resource provides clear, straightforward introductions to the foundational theories of John Dewey, Maria Montessori, Erik Erikson, Jean Piaget, and Lev Vygotsky. Each chapter highlights a theorist’s work and includes insight on how the theory impacts teaching young children today. Discussion questions and suggested readings are included to help you gain an understanding of what it means to apply each theory to your work with children.”

“Theories of Childhood, Second Edition”:

- Builds the bridge between theory and best practices in early childhood education;
- Supports your genuine enjoyment with children by helping you understand more about the ways they grow and learn;
- Includes new understandings of Vygotsky’s work; and
- Applies the five theories to the realities of the twenty-first century.

ABOUT THE AUTHOR:

Carol Garhart Mooney has written extensively on a wide variety of child development topics. In addition to *Theories of Childhood, Second Edition*, she is also the author of *Theories of Attachment: An Introduction to Bowlby, Ainsworth, Gerber, Brazelton, Kennell, and Klaus*, *Swinging Pendulums: Cautionary Tales for Early Childhood Education*, and *Use Your Words: How Teacher Talk Helps Children Learn*, all published by Redleaf Press.

She holds a master’s degree in early childhood education from the University of New Hampshire. She is a former preschool, kindergarten, and elementary school teacher and has served as a childcare services manager for Belknap-Merrimack Head Start. For twenty-five years, she has been an instructor of early childhood education and sociology of the family for the University System of New Hampshire.

EDITORIAL REVIEWS:

“I was quite pleased to see the second edition of *Theories of Childhood* come across my desk. We have used the text for a number of years in our introductory child development course. It provides a strong theoretical foundation for our students through its simple, direct approach. This includes not only the clear presentation of developmental theories in an understandable way, but also implications for and examples of how a particular approach impacts our work with children and families. I have had great feedback from students over the years and from a variety of faculty who have used it!”

-Eileen Micke-Johnson
Department Chair, Early Childhood & Elementary Education
Rogue Community College, Medford, OR.

“I chose to incorporate *Theories of Childhood* in my Early Childhood Theory and Practice class. I find that this book covers the main theorists in simple, easy-to-read ways, yet still detailed enough to introduce the students to each theorist. What helped me choose this particular book was that it wasn’t designed in a typical ‘textbook’ format. I like the quotes included at the beginning of each section and that each theorist has a biography, and that each theory is detailed, current, and to the point. If I will read a book from cover to cover and enjoy it, I will use it with my students.”

-Mrs. Elizabeth Engelhardt
Department of Teacher Education
University of Dayton, Dayton, Ohio

ARGUMENT:

A question I wanted to find a solution to was, “What are the main factors that have influenced Maria Montessori’s method of Learning?”. As stated, this resource briefly covers the foundational theories of John Dewey, Maria Montessori, Erik Erikson, Jean Piaget, and Lev Vygotsky, but for this review, I will focus on Chapter 2: Maria Montessori.

CHAPTER 2: MARIA MONTESSORI

The chapter begins with a quote by Maria Montessori saying, “The greatest sign of success for a teacher is to be able to say, “The children are now working as if I did not exist”. It then goes into the Biography of Maria Montessori. Learning about her life, proves how much she has accomplished and how many lives she has touched. Learning about her educational background also helps us understand how she was able to create the Montessori Method.

MONTESSORI’S THEORIES

Many of Montessori’s ideas are so basic to the ways we think about early childhood today that we take them for granted. Her research into young children and what they need to learn has affected the fundamental ways early educators think about children. In the United States, some early childhood programs called themselves Montessori programs.

Because there are Montessori schools and Montessori materials, educators and others sometimes forget to separate Dr. Montessori’s legacy of ideas about children and learning from specific Montessori programs. There is a wide range of diversity among these programs dash some of them hold very firmly to Montessori principles, and some of them would never meet Montessori’s own standards.

Montessori’s theories about children have influenced the way all early childhood programs are structured today. Her theories are important to early childhood teachers no matter what types of programs they work in.

CHILD-CENTERED ENVIRONMENTS

“Most American cities early childhood programs have child sized furnishings, equipment, and utensils. What else can teachers learn from Montessori’s understanding of good environments for children? Montessori thought that early childhood teachers should

- provide real tools that work, sharp such as sharp knives, good scissors, and woodworking and cleaning tools.
- Keep materials and equipment accessible to the children and organized so they can find and put away what they need; and
- create beauty and order in the classroom.

Arranging classrooms with low, open shelves means children can see what is available and get what they want without assistance from the teacher. They should not have to interrupt their work to get the attention of the busy teacher or ask permission to use the materials they need.

Montessori made it clear that it is a serious teaching responsibility to become "the keeper with custodian of the environment" ([1949] 1967, 277). She believed that the teacher should prepare a clean, organized, an orderly environment for the children. If every material has a place that is clearly marked in a child friendly way, with photographs or drawings as well as the printed name of the material that belongs there, children have the power to get but they need and also to put it away when they are done.

According to Montessori , knowing how to arrange an interesting, beautiful environment for children is as much a part of teaching as knowing how to select fine children's books for the library. "Our apparatus for educating the senses offers the child a key to guide his exploration of the world" ([1949] 1967, 183).

COMPETENCE AND RESPONSIBILITY

Montessori believed that children want and need to care for themselves in their surroundings. She believed that adults spent too much time serving children. She cautioned teachers to remember that children who are not allowed to do something for themselves do not learn how to do it. Fostering independence is part of Montessori's legacy. Open-ended scheduling, with large blocks of time for free work and play, is part of Montessori's legacy as well. Montessori claimed that the sense of competence children gain from involvement in such real-life work is extremely beneficial and enhances the child self-esteem in a way that artificial or contrived activities ever could.

OBSERVATION

Since Montessori trained as a doctor, she brought the skills of a scientist to the classroom. She believed that the way to get to know children is to watch them. Careful observation, to Montessori, is the key to determining what the children are interested in or need to learn. She believed every child could learn. She was convinced that if children are not learning, adults are not listening carefully enough or watching closely enough.

MONTESSORI IN THE TWENTY-FIRST CENTURY

Montessori's legacy is as important today as it was when she first shared her brilliant understanding of the needs of young children.

LITERATURE REVIEW

The Montessori Method

Written by Maria Montessori

SUMMARY:

By placing the child at the center, Maria Montessori revolutionized elementary education. In Montessori schools, children are given freedom to develop their own skills at their own pace--and, as a result, they flourish beyond their traditionally-schooled peers. "The Montessori Method" is Dr. Montessori's most complete account of the history, philosophy, and practice of her teaching method. It is an essential work for teachers, parents, and all those interested in unleashing human potential for the betterment of our world. This special Centennial Edition celebrates the 100th anniversary of the opening of the first Montessori "Children's House."

ABOUT THE AUTHOR:

Maria Montessori (1870-1952) was an Italian physician, anthropologist, educator, and philosopher. She first developed her breakthrough teaching methods while working with the mentally challenged and impoverished children of Rome. Her child-centered educational philosophy proved beneficial for students of all abilities and backgrounds. Today, the Montessori Method is practiced all over the world, and continues to grow in popularity.

EDITORIAL REVIEWS:

"Here, Maria Montessori introduces a scientific approach to pedagogy. The Montessori schools which she established and developed are intended for children three to seven years of age. The children are allowed as much freedom as possible and are provided with "didactic materials" which are various artifacts which they can use to educate themselves. They are supervised by a single directress whose primary task is to observe the children and direct their efforts by explaining to them how various didactic materials are used (it's very simple, but nothing is obvious to a young child). This book offers some valuable concrete advice, but its primary use to me was as an introduction to the approach of scientific pedagogy." -Vladimir Kornea

The basic premises as I understand them are that:

- (1) children have a natural desire to learn and
- (2) one can learn how to live in freedom only by being free.

These premises are fully supported and fleshed out in the book. The Montessori method achieved startling results, with four-year-old children (on average) learning to be masters of themselves, disciplined, benevolent, self-confident, and capable of reading and writing. Every educator should be familiar with Maria Montessori's work." - Vladimir Kornea

ARGUMENT:

A question I wanted to find a solution to was, "What are the main factors that have influenced Maria Montessori's method of Learning?" and "How can I apply these methods into my own design?"

MONTESSORI'S THEORIES

Of the many books I've been reading to prepare for my thesis of designing from the Montessori method of education, one of the texts that has impacted me most deeply, is *The Montessori Method* by Maria Montessori. In it, Maria Montessori explains the importance of children's individuality. She also goes into detail on how to make sure a child is able to thrive in learning environments. Other factors include their unique emotional, physical, psychological, and intellectual needs.

The Montessori Method has prepared me for my thesis and has given me useful tools to help better my future. Given different children's unique needs, and the unique circumstances of their caregivers, some of these lessons may not be applicable to all educational facilities, but the overall message can still inspire new ways of thinking and engaging with children.

DISCIPLINE MUST COME THROUGH LIBERTY

In her book, Montessori explained that a discipline person is someone who is a “master of himself, and can, therefore, regulate his own conduct when it shall be necessary to follow some rule of life.” She urged caregivers and educators to encourage children to move instead of sit still, to create and explore rather than stay in one place. Through habit and practice, she explained, children learn to “perform easily and correctly the simple acts of social or community life.”

Sometimes, we hinder children from learning new things or having transformative experiences when we limit their ability to explore. By encouraging a sense of freedom and liberty, but responding accordingly when they behave in a way that is inappropriate, you avoid teaching your child to associate “good” behavior with sitting still and “bad” behavior with action and movement. By letting them learn about discipline through freedom and liberty, you’re helping your child associate adventure with learning.

TEACH CHILDREN ABOUT THE CULTIVATION OF LIVING THINGS

Give children an opportunity to learn about different processes while also obtaining a new respect for nature. To do this, they must be given the opportunity to plant a seed and watch that seed transform through every stage of development.

In her book, Montessori described the following scenario to illustrate how her students engaged with nature:

“While the smaller children run freely up and down the paths, or rest in the shade of the trees, the possessors of the earth (children from four years of age up), are sowing, or hoeing, watering or examining, the surface of the soil watching for the sprouting of plants.”

At every stage of development, children can learn to appreciate nature in some way. Not only can this lead to practical applications like gardening for food, it can also give children a way to connect with the world around them and feel inspired.

OBSERVE MORE THAN YOU TEACH

Why is it important to observe more than we teach? Important biological processes are occurring behind the scenes and we need to allow for them to occur in an organic fashion.

When children have the tools and skills necessary to teach things to themselves, all that's required for educators is to watch them and ensure their safety. Independent play and self-guided lessons allow children to learn from trial and error. They can also enjoy concentrating on the activity as well as uninterrupted moments of education.

MISTAKES ARE NORMAL PARTS OF LEARNING

"If we teach our children that mistakes have a purpose, they won't automatically associate them with something "bad." Mistakes are a natural part of development and learning, and it's important for children to embrace that fact.

When I was a child, I would get scolded for making mistakes. Things had to be perfect, and if I didn't strive for perfection then I was a failure — that's what was instilled in me as early as kindergarten.

When children understand what a mistake really is, they can learn what not to do and work towards mastering a skill or activity without the added stress of feeling like they did something wrong or bad.

Montessori wrote about the "educational value in [the] idea of preparing oneself before trying, and of perfecting oneself before going on. To go forward correcting his own mistakes, boldly attempting things which he does imperfectly, and of which he is as yet unworthy dulls the sensitiveness of the child's spirit toward his own error."

Children shouldn't fear mistakes. Instead, they should see them as normal parts of learning." (Cruz, Taylor).

LITERATURE CONCLUSION

“The moment you step on campus, it’s clear this is a special place; every detail communicates our commitment to intergenerational, life-long learning and profound respect for every member of the community.”

SITE

The school is designed as a village, with a variety of communal spaces, such as libraries, gardens, cafes, and amphitheaters, preferably set within a natural environment.

BUILDING

A simple, uncluttered aesthetic guides the design, which features natural light and warm materials, close connections between indoor and outdoor environments, and common use spaces for communal learning and reflection

CLASSROOM

All spaces accommodate free movement, small group and individual lessons, and courteous interaction among adults and children, encouraging independent investigation and learning both inside and out.

COMMUNITY

Strong bonds between students, adults, as well as the neighborhood that surround the school are essential for establishing respect, trust, and a template for healthy development.

ORDER

Meticulous attention to every detail of the learning environment.

INDEPENDENCE

Student-centered learning is enabled by a highly enriched and structured classroom context. Adults support independence by maintaining a thoroughly prepared environment.

HISTORICAL, SOCIAL, AND CULTURAL CONTEXT

The American Montessori Society has great information about the history of the Montessori Method. I have taken this information directly off the organization's website in order to accurately depict the timeline of events.

THE BIRTH OF A MOVEMENT

"In 1906, Dr. Maria Montessori, an Italian educator, physician, and scientist, who had just judged an international competition on the subjects of scientific pedagogy and experimental psychology, was invited to create a childcare center in San Lorenzo, a poor, inner-city district of Rome. There, she would be working with some of the area's most disadvantaged, and previously unschooled, children.

She opened the doors on January 6, 1907, calling the center the Casa dei Bambini—Italian for "Children's House." Dr. Montessori was determined to make the Casa a quality educational environment for these youngsters, whom many had thought were unable to learn—and she did.

While the children were unruly at first, they soon showed great interest in working with puzzles, learning to prepare meals and clean their environment, and engaging in hands-on learning experiences. Dr. Montessori observed that before long, the children exhibited calm, peaceful behavior, periods of deep concentration, and a sense of order in caring for their environment. She saw that the children absorbed knowledge from their surroundings, essentially teaching themselves." (American Montessori Society).

MONTESSORI GAINS MOMENTUM

"The success of Dr. Montessori's schools sparked interest around the world. Dignitaries traveled to Rome from countries far and wide to witness, firsthand, the "miracle children" who exhibited concentration, attention, and spontaneous self-discipline.

The innovative Montessori Method also began to attract the attention of prominent educators eager to learn it. Some were taught by Dr. Montessori herself. Her courses drew students from as far as Chile and Australia, and within a few years there were Montessori schools on 5 continents." (American Montessori Society).

“In 1909, Dr. Montessori published her first book, *Il Metodo della Pedagogia Scientifica applicato all’educazione infantile nelle Case dei Bambini*. Within 3 years it had been translated into 10 languages. Its first 5,000 copies in English, succinctly titled *The Montessori Method*, sold out in 4 days.

By 1910, Montessori schools could be found throughout Western Europe and were being established around the world. In 1911, the first Montessori school opened in the United States.

By 1914, 187 English-language articles and books had been written about Montessori education. One article, in the highly popular *McClure’s Magazine*, described Dr. Montessori as “an educational wonder-worker.”

Dr. Montessori began to turn her attention to the education of elementary-aged children in 1916. In the international training course that year, Dr. Montessori focused nearly half of her lectures on newly created elementary materials. A year later, she published *L’autoeducazione nelle Scuole Elementari*, describing her thoughts on the education of children ages 7 – 11. (The English title of the book is *The Advanced Montessori Method*.)” (American Montessori Society).

NEW FRONTIERS

“Dr. Montessori’s early research focused on educating young children, but in the 1920s she turned her attention to adolescence. She observed that at this stage of development, students need activities that help them to understand themselves, to find their place in the world, and to blossom into global citizens.

She proposed residential schools where young adolescents—whom she called *Erdkinder*, or “children of the earth”—could work and live in a trusting community, engaging in real-world activities such as farming or marketing their own handmade goods. By experiencing human interdependence, she believed, students would learn how society is organized and develop the skills needed to meet the world’s challenges in a positive way.

In time, Dr. Montessori also wove peace education into her curriculum, a result of having lived through 2 horrific world wars. Education for peace and social justice remains an integral part of Montessori education.

Dr. Montessori traveled widely, giving courses and lectures and encouraging the launch of new schools. In 1929, together with her son, Mario, she established the *Association Montessori Internationale*, to ensure that her philosophy and approach to education would be carried on as she intended.” (American Montessori Society).

The American Montessori Society has great information about the history of the Montessori Method. I have taken this information directly off the organization's website in order to accurately depict the timeline of events.

MONTESSORI COMES TO AMERICA

"In the United States, the Montessori Movement caught on quickly. The first Montessori school opened in 1911, in the home of a prominent banker in Scarborough, New York. Others followed in rapid succession. Unlike Maria Montessori's first Casa dei Bambini, which was for children from poor, disadvantaged families, these catered to children from wealthy, cultured families striving to give their children the best education possible. Prominent figures, including Thomas Edison and Alexander Graham Bell, gave their support.

In 1913, Maria Montessori traveled to the U.S. on a 3-week lecture tour, where she was met with crowds of curious and interested supporters. A reception was arranged for her in Washington, DC. Four hundred people attended, including Margaret Wilson, the daughter of President Woodrow Wilson, and many foreign ministers and dignitaries.

She lectured to a crowd of 1,000 at New York City's Carnegie Hall, where she showed "moving pictures" taken at her school in Rome; in response to demand, a second lecture was arranged.

Montessori reported that she found the schools in America faithful to her methods, and considered the trip an overwhelming success.

Dr. Montessori returned to the U.S. in 1915 to demonstrate her method at the Panama–Pacific International Exposition in San Francisco, and to give an international training course for prospective Montessori teachers.

At the exposition, a Montessori "Glass Classroom" was constructed—that is, a classroom with panoramic glass windows on 3 walls. This unique design enabled spectators to observe, with amazement, the class of young students who worked with intense focus and concentration, seemingly oblivious to the crowd surrounding them.

That same year, 1915, Dr. Montessori was an invited speaker at the prestigious annual conference of the National Education Association in Oakland, California. More than 15,000 educational leaders attended." (American Montessori Society).

The success of the Glass Classroom and Dr. Montessori's long California visit fueled American interest in Montessori education and its visionary founder, helping to propel Montessori education across the country. American newspapers and educational leaders embraced its founder for both her pedagogy and her personality. By 1916, more than 100 Montessori schools were operating in the U.S." (American Montessori Society).

A MOVEMENT DERAILED

"The Montessori Movement in the U.S. burned out as quickly as it had spread. Language barriers, World War I travel limitations, anti-immigrant sentiment, and the disdain of a few influential educators all contributed to the decline.

William Kilpatrick, a highly regarded figure in the progressive education movement, and a former student of John Dewey, was one such detractor. He critiqued the Montessori Method in his book, *The Montessori System Examined*. A popular scholar in the early 20th century, Kilpatrick criticized Dr. Montessori's credentials, perspectives, and overall philosophy. He dismissed her beliefs of the role of the teacher, ideal classroom size, and classroom materials. And, he rejected her interpretation of the doctrine of development, as well as the amount of freedom the children have in a Montessori school. Kilpatrick's negative assessment of Montessori quickly became widely known and accepted throughout the U.S.

By the 1920s, Montessori education in the U.S. had almost completely faded away, except for the occasional school or practitioner." (American Montessori Society).

THE RESURGENCE

"By the 1950s, the cultural climate was changing in the U.S., including a growing discontent with traditional American education. Among those seeking alternatives was a young, aspiring teacher from New York City, Nancy McCormick Rambusch.

Having "happened upon" the writings of Maria Montessori, Rambusch was struck by the freshness of her ideas. In 1953, she traveled to Paris to attend a Montessori Congress and learn more. There, she met Mario Montessori, Maria's son, who encouraged her to bring Montessori back to the U.S. One thing led to another, and out of Rambusch's subsequent Montessori schooling and vigorous efforts to promote the Method in the U.S., Montessori education once again took off. Parallel to this, in 1960, and also as a result of Rambusch's efforts, the American Montessori Society was born." (American Montessori Society).

The American Montessori Society has great information about the history of the Montessori Method. I have taken this information directly off the organization's website in order to accurately depict the timeline of events.

MONTESSORI TODAY

“From its humble beginnings more than 100 years ago as a single schoolroom for a group of underprivileged children in Rome, Italy, Montessori education has taken a firm foothold on the education landscape. In the U.S. alone, approximately 5,000 Montessori schools now serve over one million children, from infancy through adolescence. Thousands more Montessori schools exist worldwide.

The American Montessori Society is thriving, as is the Association Montessori Internationale and its member societies worldwide. Other Montessori groups also offer opportunities for networking, collaboration, and professional growth.

Currently, China, in particular, is seeing unprecedented demand, and education groups are working as diligently as they can to train the teachers and build the schools needed to meet it. We at AMS are helping, particularly to ensure the quality of select programs, and are poised to provide more support in coming years.

In the U.S., there has been a proliferation of programming specific to communities' needs; for example, public and charter schools that offer tuition-free Montessori education, schools that offer extended hours of operation, and programs that operate year-round.

There are also Montessori classrooms that are bilingual, immersive-language, and/or faith-based; and programs specifically for children with learning exceptionalities, such as those associated with dyslexia and language-processing disorders.

Recognizing the many values of intergenerational relationships, and the alignment of Montessori philosophy with adult-care needs, some Montessori schools now include programs that bring together students and the elderly for meaningful interactions. Others create cross-cultural relationships with Montessori schools in distant countries, opening the doors for students to form global connections and strengthen their understanding of peoples worldwide. Many Montessori schools, if not most, incorporate community-based service learning programs in their curriculum.” (American Montessori Society).

Well-known personalities have been educated in Montessori schools. Among them are NBA MVP, Stephen Curry; Google founders, Larry Page and Sergey Brin; and the late chef, author, and television personality, Julia Child. These individuals have cited their Montessori education experience as contributing to their success, heightening public awareness of Montessori as an approach that helps individuals from all manner of fields reach their full potential.

Day One Academies, an initiative launched in 2018 to provide \$1 billion in funding for full-scholarship Montessori-inspired preschools for low-income families, have drawn new attention to the Method. The man behind the initiative? Amazon CEO Jeff Bezos, a Montessori alum himself.

The evidence is clear: Montessori is not only here to stay, it is growing at a rate that would have gladdened the heart of its founder, Dr. Maria Montessori—a woman who dared to reimagine how we learn, and recognized the dignity and capacity of all human beings.

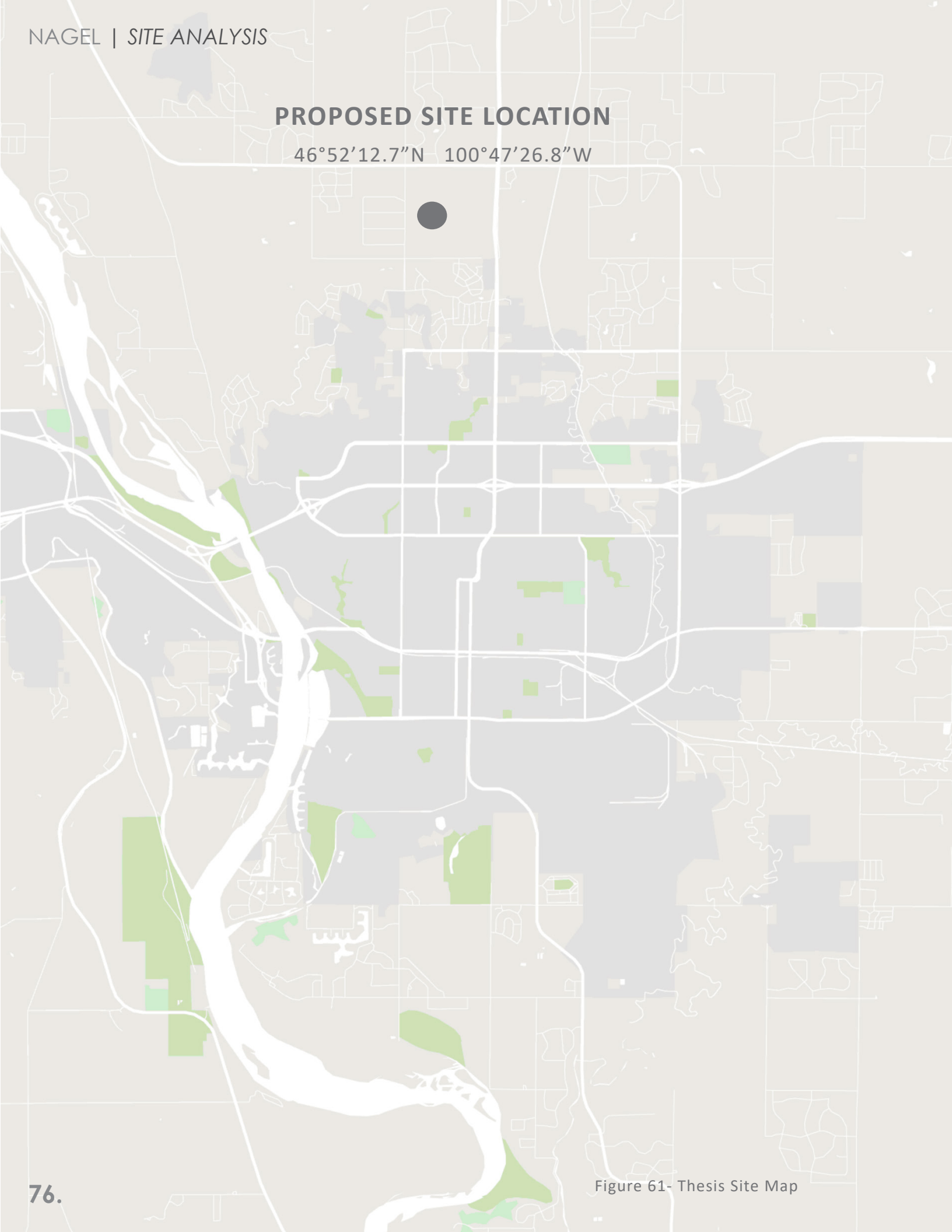
And her legacy continues in the great work of AMS’s Montessori-credentialed educators and affiliated teacher education programs. We are united with a common purpose: to make the world a better place through grace and courtesy instilled in our children, who will serve as our future leaders. Join the largest Montessori Movement and organization in the world! (American Montessori Society).



Figure 60- Kelly, Sikkema

PROPOSED SITE LOCATION

46°52'12.7"N 100°47'26.8"W



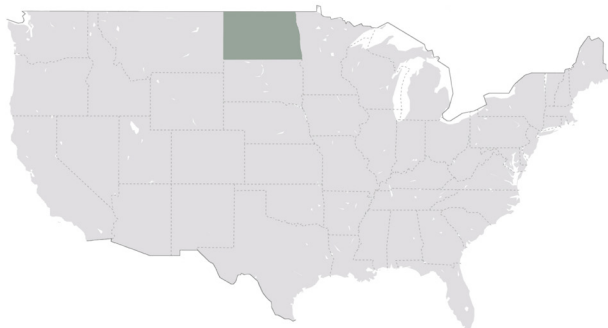
THE SITE

OVERVIEW

The site I chose for my thesis project is located in the Capitol city of Bismarck, North Dakota. It is the second largest city in North Dakota and is rapidly growing each year. A great majority of the city's new development can be found on the northern side, which is where my proposed site is situated. The surrounding streets of the site are 3rd St. NW and 57th Ave NW. It is a great location because it is a few blocks west of State St., which is one of the city's major streets. This will make it convenient for families when transporting their children off at school.

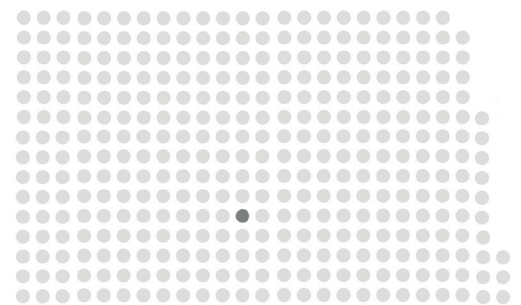
One of the greatest deciding factors when choosing my site was to find an area that would benefit from a new Montessori School. There is currently a need for a Montessori School in the city of Bismarck, making it the ideal community for my project.

POPULATION 74,162	MEDIAN AGE 37	HOUSEHOLDS 27,263
MEDIAN INCOME \$57,660	MALE 49.58%	FEMALE 50.42%



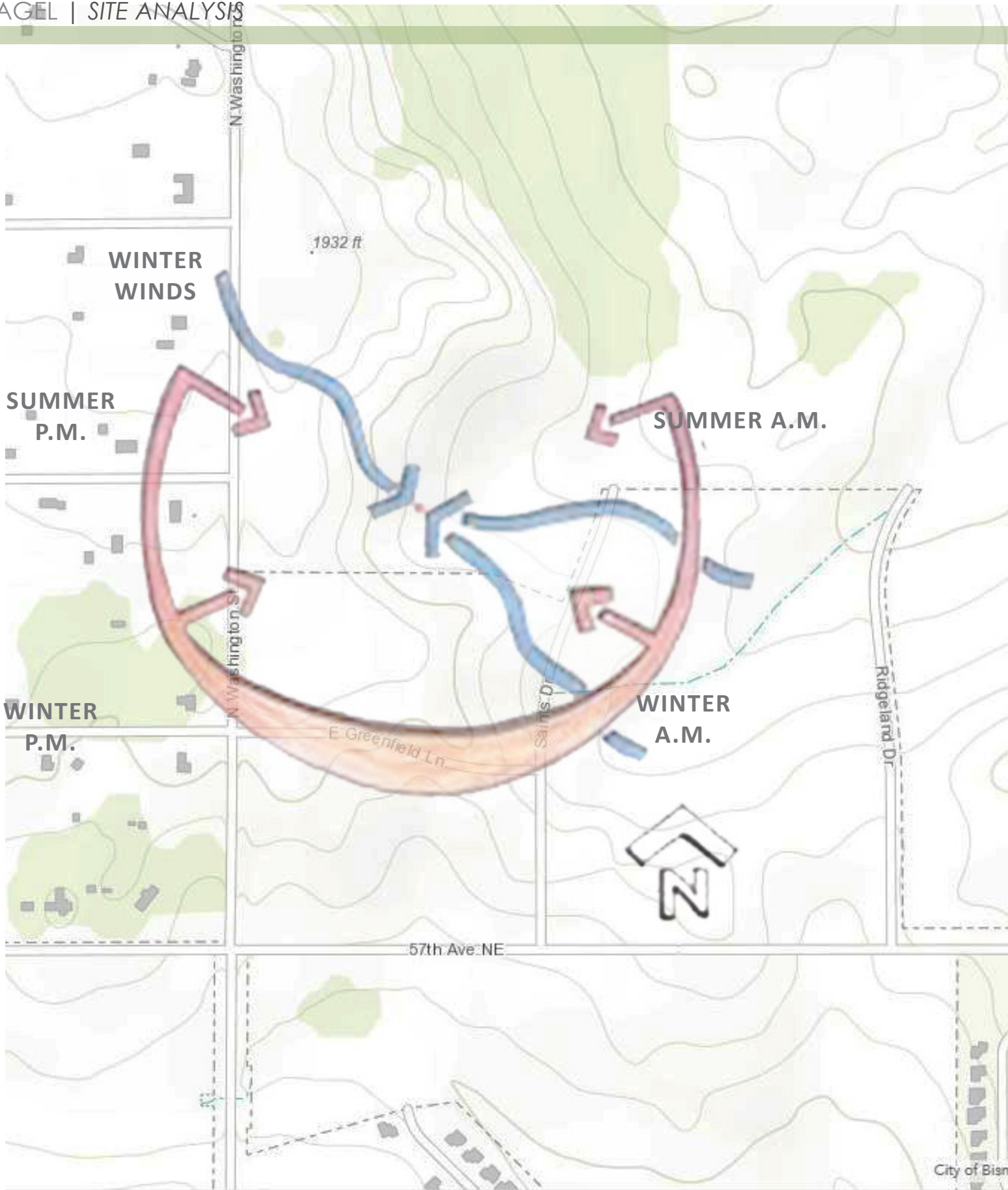
**Midwest Region,
United States**

Figure 62- U.S. Map



**Bismarck,
North Dakota**

Figure 63- North Dakota Map



SITE ANALYSIS

HISTORIC INFORMATION

Initially established as the western terminus of the Northern Pacific's Railroad in 1873, the city was named after German chancellor Otto von Bismarck. Gold was discovered shortly thereafter, increasing the growing city's population. Located in the rolling hills and valley along the Missouri River, Bismarck today is referred to as the "Jewel of North Dakota." It is ranked the least stressful city in America (Sperling 2004) and in 1997 received All American City designation (National Civic League 1997).

Bismarck is 574.4 m (1653 ft.) above sea level at latitude 46° 04' and longitude 100° 45'. It is located along the Missouri River where natural flooding used to occur annually and associated soils are predominantly a deep Mandan silt loam.

Thirty-year average minimum and maximum temperatures range from 10.1°F to 70.3°F (-12.2°C to 21.3°C), respectively, with extremes from -0.6°F to 84.5°F (-18.1°C to 29.2°C). The city receives 15.4 inches (391.2 mm) of precipitation annually with winds averaging 10.2 mph (17.3 km/hr).



CIRCULATION

VEHICULAR TRAFFIC

The existing roads in the area are shown in the image below. The greatest amount of vehicular traffic will come from parents dropping their children off at school, as well as busses. With St. Mary's High School situated just Southeast of the site, there will be additional traffic created by staff and students. I will design an additional road connecting Ridgeland Dr. to Saints Dr. for a more convenient route.

PEDESTRIAN TRAFFIC

The site is located in an up-and-coming residential development. There are few existing sidewalk paths around the site. I intend to design many additional paths around my project for students to enjoy nature walks when the weather permits.

ZONING

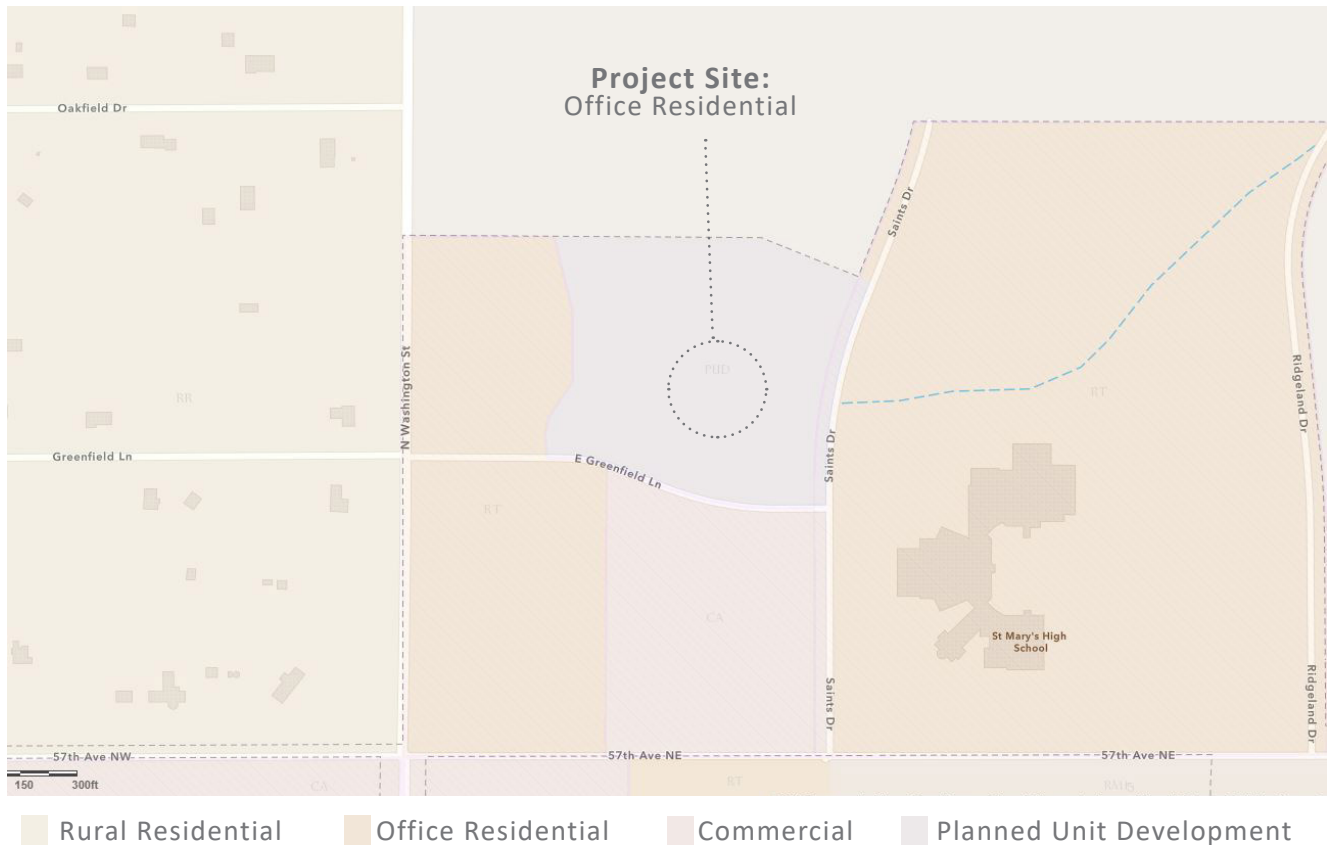


Figure 65- Zoning

VEGETATION

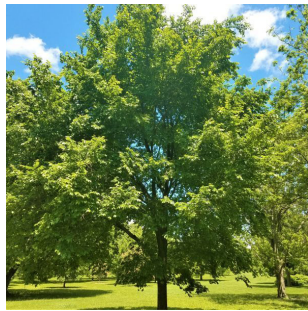
Citywide, the resource represented 93 different tree species, a notable number considering climate restrictions. However, because the majority were newer introductions to the city and few in number, overall diversity was low.

Abundant species having the best performance overall were Green ash, American elm, Chokecherry, and Hackberry. Popular evergreens for our area include: Arborvitae, Cedar, Juniper, Pine, Spruce, Yew

DECIDUOUS SPECIES



Green Ash



American Elm



Hackberry



Chokecherry

CONIFEROUS SPECIES



Fir



Spruce



Juniper



Pine

Figure 66- ND Tree Species

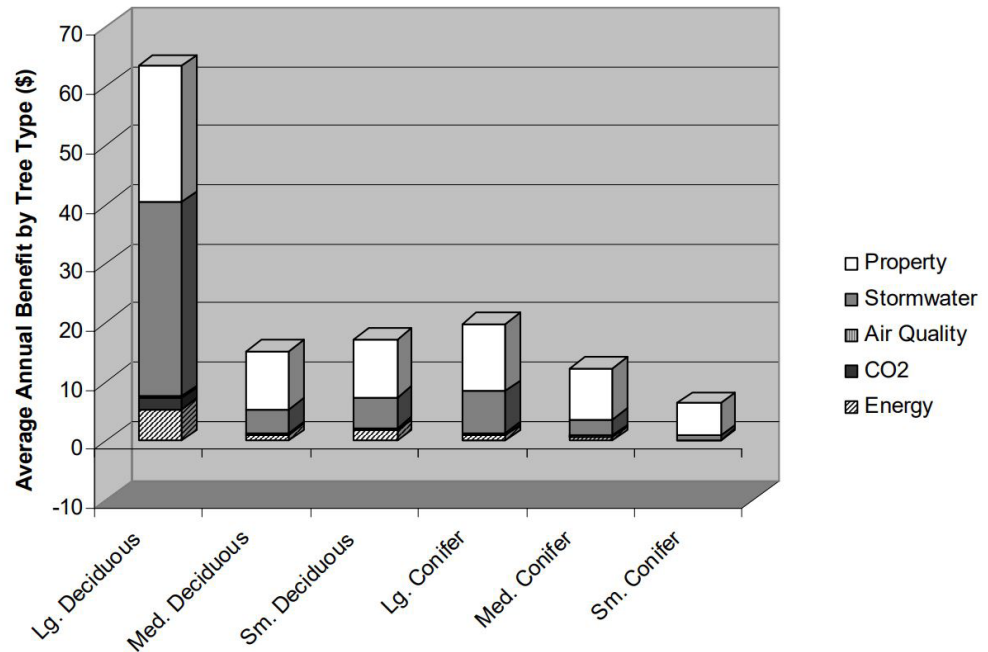
SPECIES PREDOMINANCE

Species	# of trees	% of Total Trees	Leaf Area (ft ²)	% of Total Leaf Area	Basal Area (ft ²)	% of Total Basal Area	IV
Green ash	5,644	31.7	11,697,020	27.9	2,978	18.1	25.9
American elm	3,506	19.7	19,804,960	47.3	9,135	55.7	40.9
American linden	1,342	7.5	1,141,286	2.7	137	0.8	3.7
Common chokecherry	744	4.2	394,175	0.9	185	1.1	2.1
Black ash	637	3.6	360,365	0.9	66	0.4	1.6
Littleleaf linden	539	3.0	448,294	1.1	137	0.8	1.6
Amur maple	506	2.8	181,791	0.4	65	0.4	1.2
Hackberry	476	2.7	617,467	1.5	131	0.8	1.6
Crabapple	384	2.2	151,023	0.4	60	0.4	1.0
Manchurian ash	324	1.8	147,887	0.4	19	0.1	0.8
Siberian elm	219	1.2	1,472,907	3.5	635	3.9	2.9
Bur oak	212	1.2	51,944	0.1	11	0.1	0.5
White/silver poplar	208	1.2	1,504,711	3.6	1,106	6.7	3.8
Norway maple	205	1.2	145,014	0.3	13	0.1	0.5
Boxelder maple	198	1.1	1,187,620	2.8	447	2.7	2.2
Totals	15,144	85.0	39,306,460	93.9	15,125	92.2	90.4

Species predominance (listed in order by percent of total trees) and importance values calculated as the mean of tree numbers, leaf and basal area proportions.

Figure 67- Species Predominance

BENEFITS



Average annual street benefits per tree by tree types.

Figure 68- Tree Benefits

SOIL FOUND ON THE SITE

The Mandan series consists of very deep, well drained, moderately permeable soils that formed in silty sediments.

These soils are on terraces and uplands and have slopes ranging from 0 to 25 percent. Mean annual temperature is 42 degrees F, and mean annual precipitation is 16 inches.



Deep Mandan Silt Loam
Figure 69- ND Soil Type

VEGETATION FOUND ON THE SITE



Figure 70- East of Site



Figure 71- Plants on Site

The existing site has very little vegetation. There are natural grasses and weeds scattered around the site. There are however, freshly planted Pine trees to the East. My intentions for my project is to have a great amount of new vegetation in order to provide students with the most learning opportunities possible.

MONTESSORI GARDEN

“Under the heading ‘Care of Environment’ we would include... many outdoor tasks such as digging, planting, weeding, watering, sweeping up leaves , and so forth.”

—E. M. Standing, Maria Montessori, Her Life and Work

CREATING A MONTESSORI GARDEN CLASSROOM

“Montessori Gardening for kids is about bringing kids into the garden which provides them with a rich learning experience that they’ll remember for years to come. Gardening gets children outside and deeply involved in nature’s works. And, what could be more hands-on and based in reality than sowing and reaping living plants?” (Montessori Kids Universe). The following information was taken from a Montessori-Certified website. (montessori-on-a-budget.com)

PLANTS AND TREES

“Children will naturally want to pick flowers and leaves. However, make it a rule that children need to learn the name of the plant/flower/tree, first!

Teach also the plants/herbs that are edible, non-edible, and poisonous. To do this, write the name of the plant/tree and hang it or place it on a stick in the ground. If the plant is edible (like a cherry tree or mint) the name should be written in black. If not edible, write the name in red. You can use round plastic lids from food containers and write the name on the inside; or glue on cut-out letters. Attach to the plant with string.” (Montessori Services).

MAINTAINING AND HARVESTING

“Children can care for the garden after they learn how to weed and water properly. At some schools these chores are assigned on a rotating basis, or several children can work together. If planned carefully, there might be foods to harvest in the early spring (lettuce, parsley, strawberries) and then later in the summer or early fall (corn, tomatoes, pumpkins). Flowers might be picked as well. Organize practical life activities around your harvest.” (Montessori Services).

SURROUNDING AREA

ST. MARY'S HIGH SCHOOL

The new SMCHS campus opened in August 2019. It is located just Southeast of my project's proposed site. The site is adjacent to a newly built high school because the Montessori Method of Education correlates to Private schooling. Many times, students attending a Montessori facility will move to a private high school after Eighth grade.



South Wing of SMCHS



Saint's Dr. facing North



North Wing of SMCHS



SMCHS Main Entrance on Ridgeland Dr.

Figure 72- SMCHS Views

Southwest View of Site



Northwest View of Site



South View of Site



Figure 73- Site Images



PERFORMANCE CRITERIA

Executive Summary

BEHAVIORAL PERFORMANCE

Behavioral Performance correlates directly with Montessori Education and will be a major influence on the outcome of my project's final design. Identifying the factors that influence academic performance is an essential part of educational research. The usage patterns will be crucial to consider, to ensure the best environment and lay-out for my Montessori School and the overall performance of the students. Part of the traditional Montessori design is to separate the workspaces into different areas of the classroom based on the subject being taught. Another important factor I will take into consideration is what rooms need to be accessed depending on the user, for example, easy access to the play yard from the classrooms. Adequate lighting, building scale and spatial arrangement will influence to the project's behavioral performance.

PSYCHOLOGICAL IMPACT

Montessori environments are intentionally designed to foster concentration, collaboration and community. In order to find the best solution to my design, I will use findings from precedent studies that have proven to foster the growth of functional independence, task persistence and self-regulation. Along with this, my design will promote social development through a large variety of materials, for the refinement of sensory perception. This will encourage imaginative exploration leading to confident, creative self-expression. Lastly, my project will provide an understanding of the child's role in their community, in their culture and in the natural world.

CODE COMPLIANCE

For my project, I will follow the ADA guidelines for the state of North Dakota. ADA aims to make educational institutions more accessible for those using the facility. The goal and purpose of this is to ensure that those who suffer various specified disabilities are allowed equal accommodated access to education.

SPACE INTERACTION MATRIX

The matrix below shows the relationship between the many different relationships within the child learning center. It is clear there is a high priority on children and exploration space. From this matrix, we can conclude that classroom spaces should be located near each other as well as an adjacent common area and outdoor space.

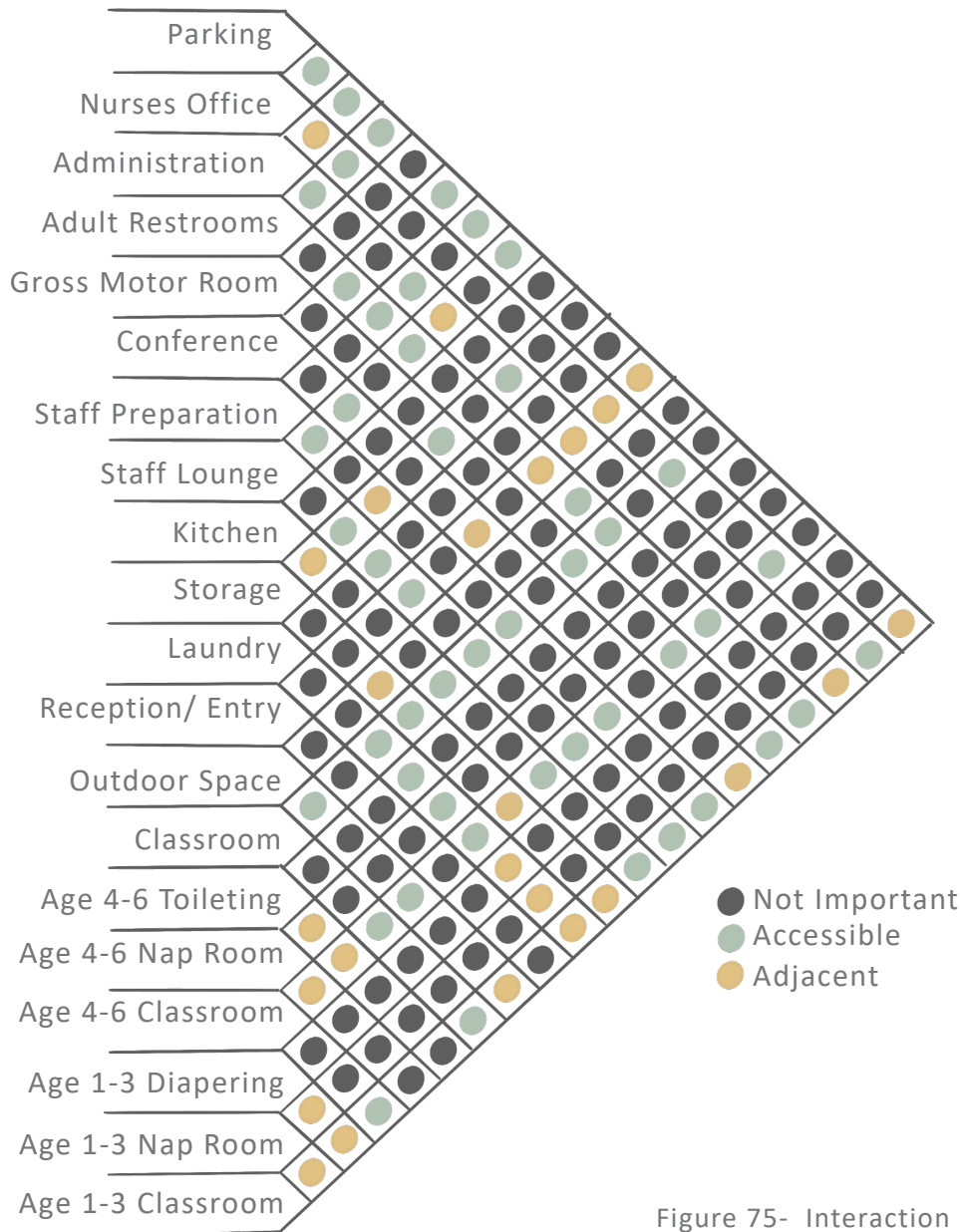


Figure 75- Interaction Matrix

SPACE INTERACTION NET

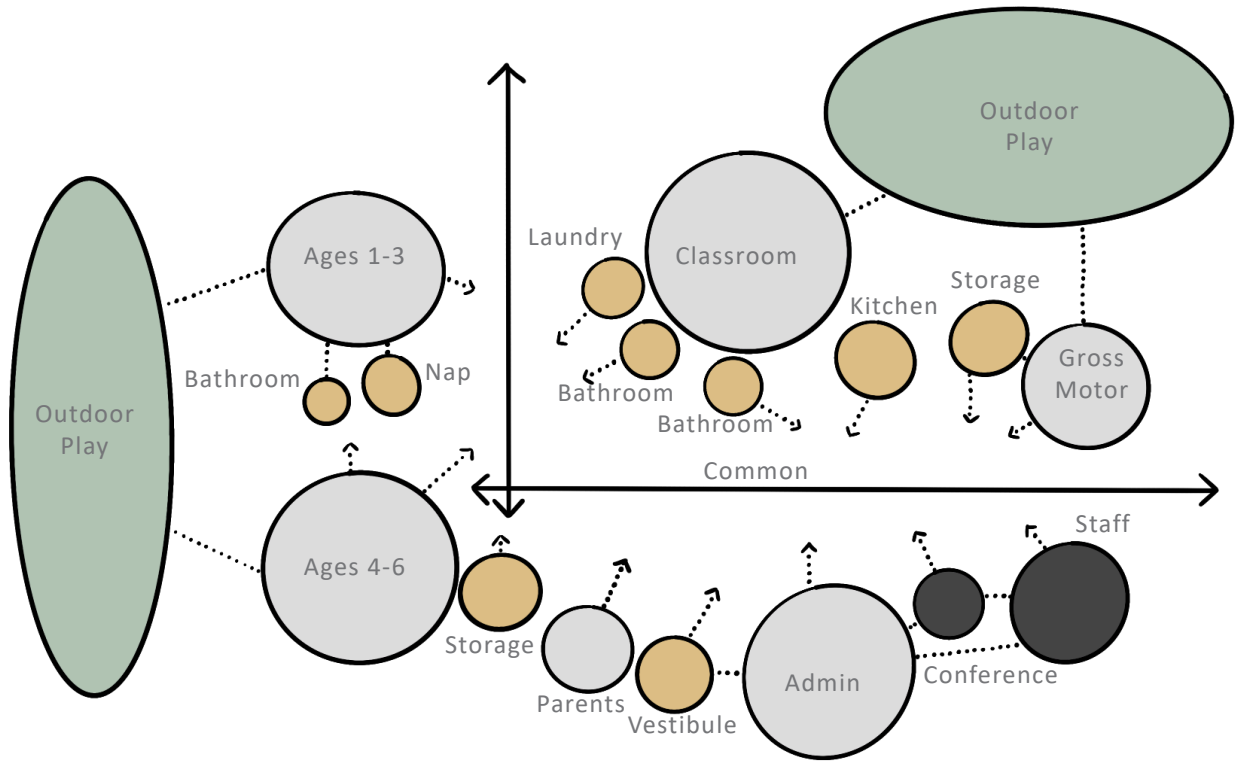


Figure 76- Interaction Net

- Classroom
- Outdoor
- Support Spaces
- Admin/ Office

The interaction net above illustrates the interrelationships between the programmatic requirements for an early education center. Currently the illustration represents a same-age cluster of students.

The three main spaces in the early education center. This includes the common area which allows people to meet, interact informally and have shared experiences. The second and third main areas include the learning communities and outdoor spaces. These spaces allow for learning, exploration, creativity and discovery

SIZE REQUIREMENTS

CLASS SIZE

Montessori Teachers are prepared in their early learning education to teach a large class size. In fact, it is considered preferable to the instructors to have more students in the class, to allow for each age group to have a solid number of peers.

In her development of the pedagogy for early childhood, Maria Montessori addressed the benefit of having more activity happening in the class in order for children to have more exposure to use of the materials.

“We consider that in its best condition, the class should have between 28-35 children, but there may be even more in number.” – Maria Montessori

“When classes are fairly big, differences of character show themselves more clearly and wider experiences can be gained. With small classes this is less easy.” (Maria Montessori, The Absorbent Mind)

Unlike some schools, which strive for very small classes, Montessori values the lessons of community when the size of the class is somewhat larger. The classroom dynamic helps children see that their presence and activity matters in the group and there are many opportunities to interact. This is the source of the genuine and abundant language development.

AMI SCHOOL RECOGNITION:

Group Size 1 Teacher 1 Assistant-	10-12 infants/toddlers
	24-35 primary (3-6 years)
	24-35 elementary (6-12 years)

AMS SCHOOL ACCREDITATION:

Group Size 1 Teacher 1 Assistant-	8 infants
	16 toddlers (18-36 months)
	30 early childhood (2.6-6 years)
	30 elementary (6-12 years)

Montessori classes thrive when the number of children in the class is substantial. Limiting the size of the class is detrimental for the teaching dynamic in the classroom. The schools that are implementing genuine Montessori practices with credentialed teachers are capable of maintaining full class capacity.

The accreditation of Montessori schools includes all the elements of quality that are required for the waivers addressing the limit of 20 children per class in the WAC: 170-295-2100:

SPACE ALLOCATION

STAFF QUALIFICATIONS: Montessori credential is tailored to the expectations of a larger class.

PROGRAM STRUCTURE: The open classroom model of children pursuing freely chosen work lends itself to greater focus and learning as well as greater social interest in sharing the experience.

SQUARE FOOTAGE: The measurements provided by the Health department are reliable for the classroom spaces.

LOWER STAFF TO CHILD RATIOS: The adaptations Montessori schools have made to support the basic classroom team of 2 teachers includes additional staff that can do the work of supporting the class routines. This allows for a lower ratio and supports the reflective and intentional work of teachers.

ADDITIONALLY: The maximum capacity of a class is not consistently full. The design of the day for Montessori children often implies smaller group sizes in the afternoon while older children have extended day



DESIGN RESEARCH

HOW DOES A CHILD PERCEIVE THE ENVIRONMENT?

The following information was taken directly from https://www.archdaily.com/942969/neuroarchitecture-applied-in-childrens-design?ad_medium=gallery

Maria Montessori's studies of how children's brains work have been heavily praised by neuroscience. We will address this concept in laymen's terms, but essentially what Montessori discovered was that the child's mind during early childhood can be divided into two phases: the unconscious absorbent mind (from 0 to 3 years old) and the conscious absorbent mind (from 3 to 6 years). This theory establishes that, from birth, the child absorbs all the stimuli from the environment in which they find themselves in the same way that a sponge does. This is why it is so important to design suitable spaces for them.

"If we prepare an environment at home that is appropriate to the dimensions of the child, to his strengths, to his psychic faculties, and if we let them live in freedom, we will have taken an immense step towards the solution of the educational problem in general, because we will have given the child his environment' - Maria Montessori in 'The Child in the Family', 1929, p. 65."

But how does such a small child absorb these stimuli? Through their senses! A child who has grown up in a suitable environment for them since birth will produce more positive brain responses. And children growing up in environments that positively stimulate their brains take on a few characteristics: they learn faster and feel more motivated and focused.

We have selected some factors that can be applied to any environment inhabited by children, but which will be most efficient when incorporated into bedrooms, playrooms, and classrooms. Below, we discuss in detail four of these factors: sight, smell, hearing, and touch.

ENVIRONMENT PERCEPTION

SIGHT

In consideration of the child's vision, it is important to address account the colors and lighting of their surroundings. Light and pastel tones inspire a calmer and more peaceful atmosphere, whereas warm, strong colors might encourage children to have more energy than usual.

If possible, it is preferable to incorporate natural light, but it is also important to include enough artificial lighting to keep the child active and focused. Some studies show that learning improves up to 20% in better-lit classrooms. Check out more tips for lighting kids' indoor spaces here.

Spatial organization, an important pillar of neuroarchitecture, helps a lot in improving the visual aspect of an environment. It is important to plan ways to keep children's toys and supplies as organized as possible.

TOUCH

For children (especially younger children), being able to touch objects is extremely important. Feeling the textures and temperatures of different objects is actually enriching for children's development. To this end, it is recommended to design an environment with textures accessible to the touch.

HEARING

Regarding the sensory development of children's hearing, it is essential to address two parameters that seem to contradict, but which are actually complementary in children's environments: music and silence. There are several studies proving the benefits of classical music in fetal development and also during early childhood. On the other hand, silence is essential to guarantee greater concentration in children. The ideal is to find a balance between sound and its absence.

SMELL

Much is said about olfactory memory being the strongest type of memory in human brains. Therefore, it is important to consider the smells of an environment that, in the future, might become part of the olfactory memory of children. A good strategy to improve smell may be to include indoor plants. In addition to improving relaxation and providing daily contact with more living things, the olfactory possibilities of a home garden, for example, are endless.

EARLY CHILDHOOD

SUMMARY

The following information was taken directly from <http://montessorischoolofalexandria.com/early-childhood/>

The instructional materials and equipment provide the core of the child's learning program. The materials are scientifically designed aids, placed on low shelves, within easy reach. The child is encouraged to use the materials according to his interests.

Emphasis on practical life and sensorial exercises is an integral activity, designed to take advantage of the young child's unique talent to develop his own capabilities. The child learns to respect the feelings and ideas of others, sharing in work and play.

Special materials enable children to learn to care for themselves. Lessons in courtesy give them confidence to deal with everyday situations. Through its enriched curriculum – language, mathematics, science, history, geography, music, and art – the school provides “a preparation for life.

The environment presented in the Montessori elementary program helps build a strong mind, as well as good character, responsibility, and respect toward others, while instilling in the child the joy and freedom of learning. The learning process stimulates the child's mind and creates order within it. This is achieved by letting the child master exercises concretely and then build toward the abstract concept of ideas and exercises.

The teacher's role is to acknowledge the child's interest and develop it. For this purpose, the teacher is the link between the child and the material. Through repetitive use of the material, the child achieves perfection in its use and therefore reaches the goals for which it was designed. Thus, the child acquires independence, self-control, accuracy, mental order, enrichment of imagination, and love for work.

AGES 3-6 CLASSROOM



CLASSES FOCUS ON:

- Age span of 3 to 6 years
- Children progress at their own pace
- Freely develop an inquisitive mind
- Montessori materials used

BACKGROUND INFORMATION

Practical Life is often by a sink, this makes sense as far as clean up goes. If there isn't a separate art area, there are usually some art activities integrated into Practical Life.

The very first Montessori math materials are in the Sensorial area of the classroom; they include the Pink Tower, Brown Stair, Red Rods, and Cylinder Blocks. At first glance, these materials may not seem to be mathematical in nature. A closer look reveals that each of the materials is based on the number 10: ten cubes, ten rods, ten cylinders.

This emphasis on base 10 is one of the less-apparent features of these materials. The obvious points of interest for the Sensorial materials are coordination, fine and gross motor skills, following directions, sequencing, and grading by size. The fact that Montessori decided to incorporate the decimal system into these materials is a brilliant way to introduce the idea of quantity early on.

In 3-6, history falls under the general "cultural" label. Activities include the study of time (clock and calendar), celebration of the child's own birthday (including the creation of a timeline of the child's life), observation of the seasons, and introductory work about the earth, planets, and volcanoes.

There is a distinct emphasis on sequence and the passage of time. Grounding the child firmly in the understanding of days, months, and years gives them a head start on the study of historical events.

AGE 3-6 REQUIREMENTS

GENERAL EQUIPMENT

- Child-sized table and chair
- Rug (flat, off-white) and table mat (cloth placemat)
- Pencils and paper
- Plants, animals (pets), and artwork
- Age-appropriate books of all kinds
- Shelves for holding materials

PRACTICAL LIFE

- Pouring
- Spooning
- Tweezing
- Tonging work
- Cleaning equipment (child-sized broom, sponge, scrub brush, etc.)

SENSORIAL

- Pink Tower
- Red Rods
- Brown Stair
- Color Tablets

MATH:

- Spindle Boxes
- Sandpaper Numerals
- Cards & Counters
- Golden Bead Set

LANGUAGE

- Matching Cards
- Sandpaper Letters
- Movable Alphabet
- Pink Series Work (objects, cards, pictures)

CULTURAL

- Globe and world map puzzle
- Nomenclature Cards (plants, animals)
- Land and Water Forms (cards, clay, and water)

AGE 6 - 12 REQUIREMENTS

- CLASSES FOCUS ON:
- Age span of 6 to 12 years
 - Builds strong character
 - Instills the joy of learning
 - Develops abstract concepts naturally
 - Becomes a responsible member of society

GENERAL EQUIPMENT

- Sturdy table or open floor where work can be done
- Shelves for holding the work
- Work rug and a table mat (placemat) Clipboard, writing paper, and sharpened pencils
- Plants or artwork for the school area A pet for the child(ren) to take care of

PRACTICAL LIFE

- Need for development through emotions, creativity, and feelings.
- Arts and crafts contribute greatly to this increased search for sensitivity.

MATH:

- Strip Boards and Equations – Addition, Subtraction, Multiplication, and Division
- Large and Small Decimal Number Cards
- Math Symbols: $<$, $>$, $+$, $-$, \times , \div
- Decanomial Box of Bead Bars
- Checkerboard
- Small Bead Frame

LANGUAGE

- Pink, Blue, & Green Series
- Word Study Card Sets
- Movable Alphabet
- Grammar & Punctuation Materials
- Age-appropriate books of all kinds

GEOMETRY:

- Geometry Nomenclature Cards 6-9 (Geometry Folders)
- Geometric Solids
- Constructive Triangle boxes
- Geometry Cabinet
- Geometric Stick Box

BOTANY & ZOOLOGY:

- Living/Non-Living Cards
- Zoology Nomenclature Cards – all vertebrates and invertebrates
- Botany Nomenclature Cards – plant, flower, root, seed, fruit, leaf, stem
- Botany Impressionistic Charts & Experiments
- Characteristics of Vertebrates Cards
- “Types of...” Cards for all Botany & Zoology categories
- Plant Kingdom Charts and Nomenclature Cards
- Animal Kingdom Charts and Nomenclature Cards

HISTORY & GEOGRAPHY:

- Land & Water Form Work (drawings, photos, advanced)
- Globe & large world map
- Maps and Card Materials for all the continents
- Parts of the Earth, Mountain, River, Volcano, and Flag
- Geography Impressionistic Charts 6-9
- Fundamental Needs Chart & Cards

ART & MUSIC:

- Cards for study of art and artists
- Cards for study of types of instruments and musical symbols
- Musical instruments (and lessons for an instrument)
- Art supplies of all kinds

ESSENTIALS FOR RESEARCH:

- Access to a library
- Access to a computer (with a child-safe program installed and adult supervision)
- Books for research

THE MONTESSORI PHILOSOPHY

In 1907, Dr. Maria Montessori developed a child-centered educational approach based on her scientific observations of children from birth to adulthood.

Montessori educators believe all children have a natural hunger for knowledge and are capable of initiating their own learning in the right, supportive environment.

The approach values the development of the whole child—

- PHYSICAL
- SOCIAL
- EMOTIONAL
- COGNITIVE

THE HALLMARKS OF MONTESSORI

- Multi-age groupings that foster peer learning.
- Uninterrupted blocks of work time
- Guided work activity choices
- Meticulously arranged, specially designed learning materials
- An aesthetically pleasing learning environment

PROJECT GOALS

The goal for my project is to create the ideal environment for Montessori education and look into how today's new advances in technology can improve the method.

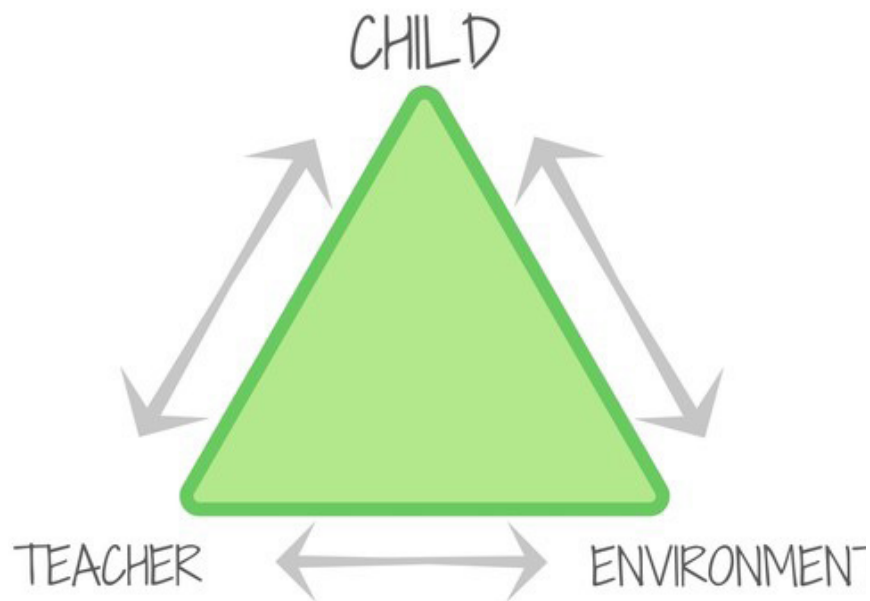


THESIS ABSTRACT

How can architecture improve the health and well-being of students in the learning environment?

Can we as designers use the Montessori child-focused approach to learning and apply it to architecture for children's education?

How can design focus on child growth in all areas of their development, such as cognitive, emotional, social, and physical?



DESIGN CONSIDERATIONS

EDUCATION/ DEVELOPMENT

- Incorporate a large variety of sensory engaging opportunities
- Focus on the cognitive, social, emotional, and physical aspects of a child's development

EASE OF ACCESS

- Free movement
- Independent investigation
- Close connection between indoor and outdoor

SCALE + PERSPECTIVE

- Design to the proportions of a child

USE OF TECHNOLOGY

- Interactive learning stations

COMMUNITY

- Create opportunities for community involvement
- The school is designed as a village, with a variety of communal spaces

DAYLIGHTING + MATERIALS

- A simple, uncluttered aesthetic guides the design, which features natural light and warm materials, close connections between indoor and outdoor environments, and common use spaces for communal learning and reflection

INDEPENDENCE

- Support independence by maintaining a thoroughly prepared environment.

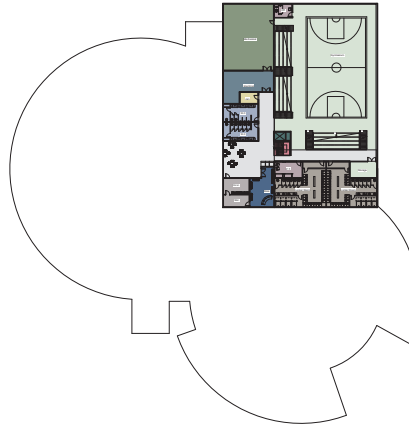
PROJECT DETAILS

ARRANGEMENT ON THE SITE

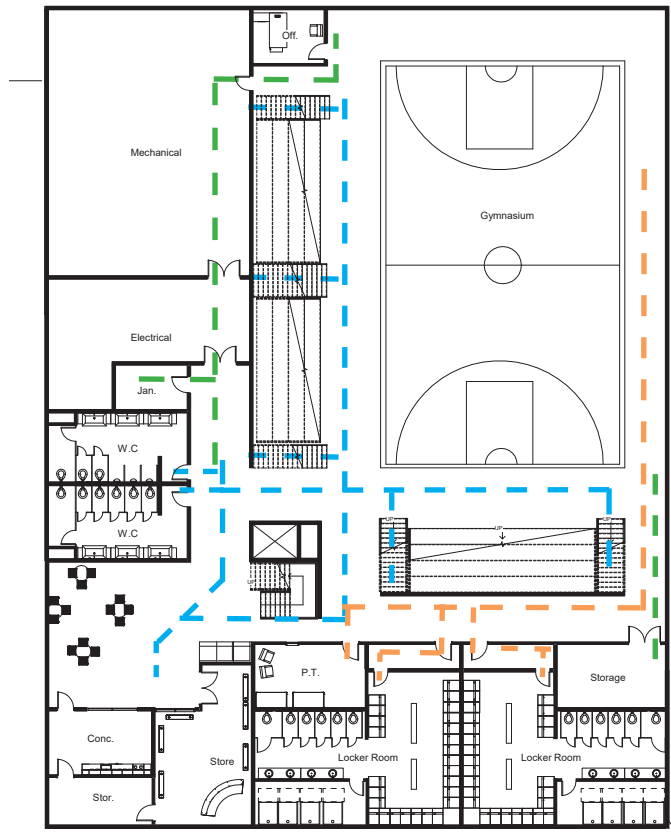


LOWER LEVEL

RELATIONSHIP TO THE BUILDING

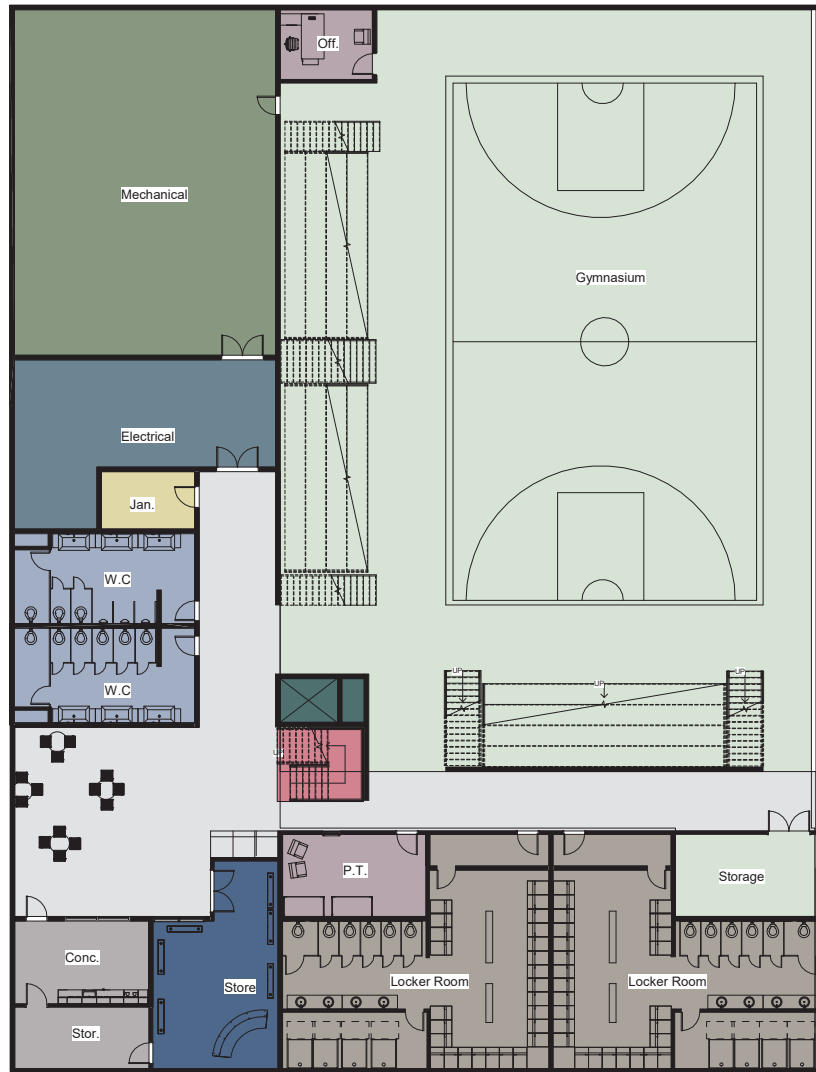


CIRCULATION



- COMMUNITY
- ATHLETES
- STAFF

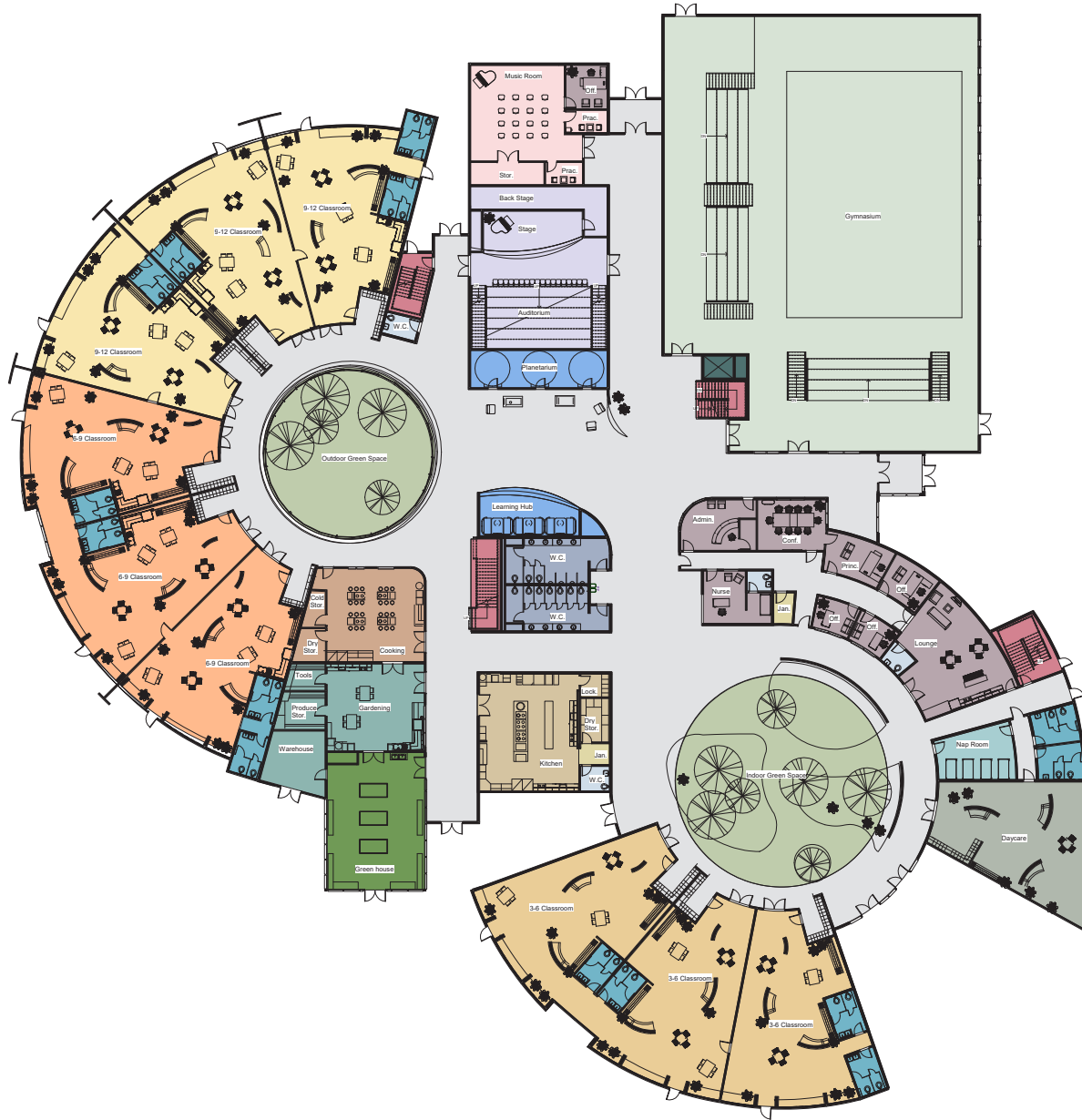
LOWER LEVEL FLOOR PLAN



- Administrative
- Janitor
- Stairs
- Restroom
- Elevator
- Gymnasium
- Mechanical
- Electrical
- Concessions
- Store
- Locker Room



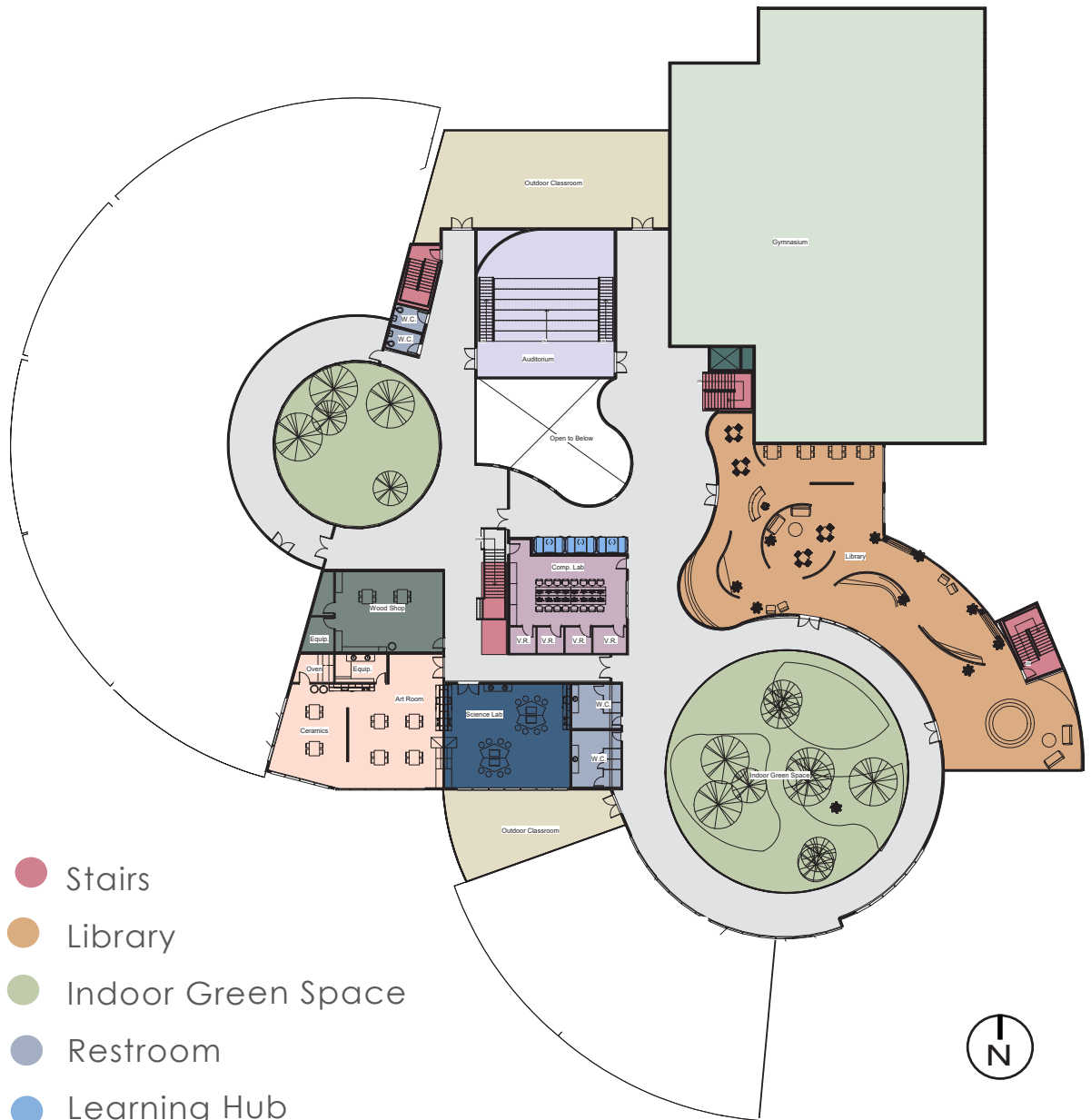
LEVEL ONE FLOOR PLAN



- Classroom Age 3-6
- Classroom Age 6-9
- Classroom Age 9-12
- Administrative
- Janitor
- Staff Restroom
- Stairs
- Nap Room
- Daycare
- Indoor Green Space
- Kitchen
- Restroom
- Learning Hub
- Gardening
- Greenhouse
- Cooking Classroom
- Music Room
- Auditorium
- Elevator
- Gymnasium



LEVEL TWO FLOOR PLAN



- Stairs
- Library
- Indoor Green Space
- Restroom
- Learning Hub
- Science Lab
- Computer Lab
- Wood Shop
- Music Room
- Auditorium
- Elevator
- Gymnasium

CLASSROOM SIZE + MAKE-UP

- Grade-levels are flexible and determined by the child's developmental range in 3-year cycles: (3-6), (6- 9), (9-12).
- Students are active, with periods of spontaneous quiet, freedom to move.

Simplicity

Minimalism

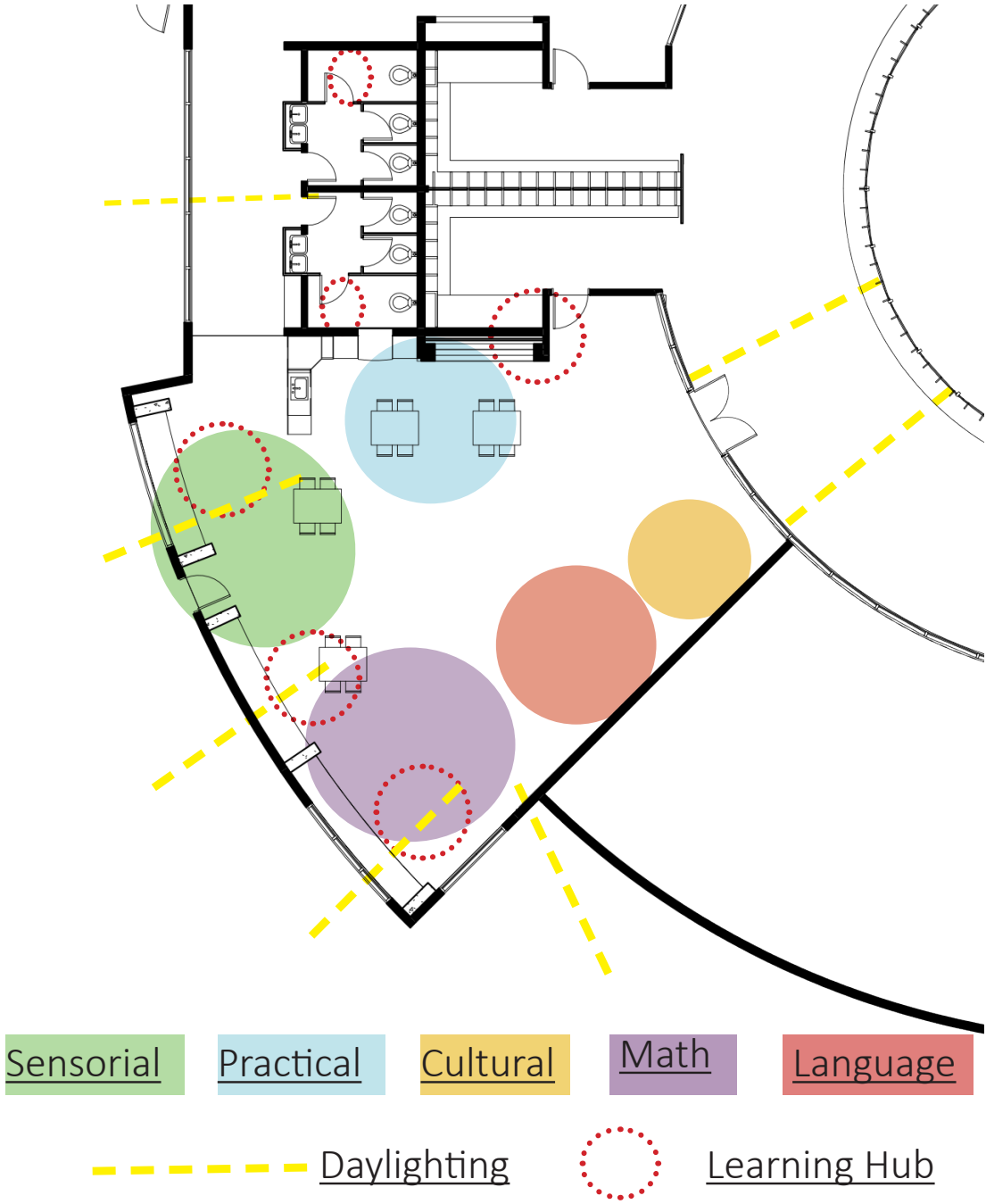
Organization

Accessibility

Security

Silence

CLASSROOM CUSTOMIZATION PLAN:



DAYLIGHTING + CHOICE OF MATERIAL

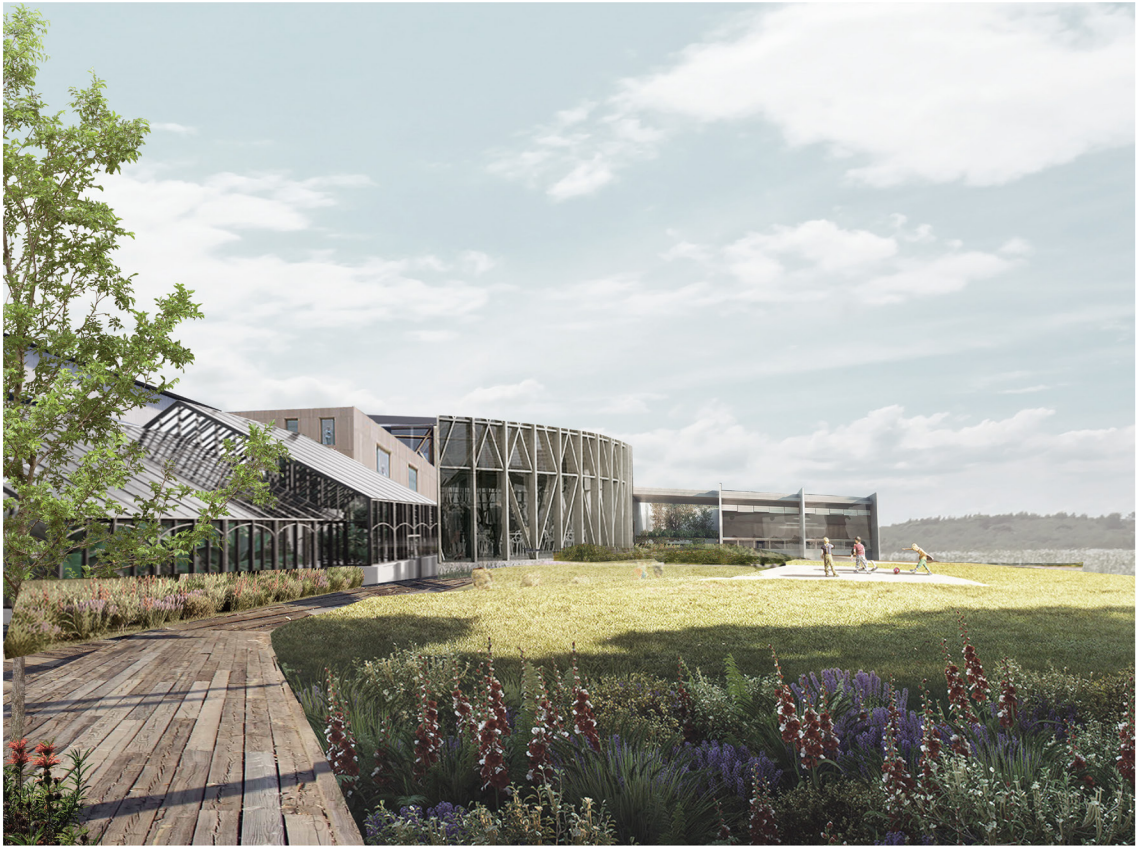


Common Space



Classroom Corridor

DESIGN SOLUTION DOCUMENTATION



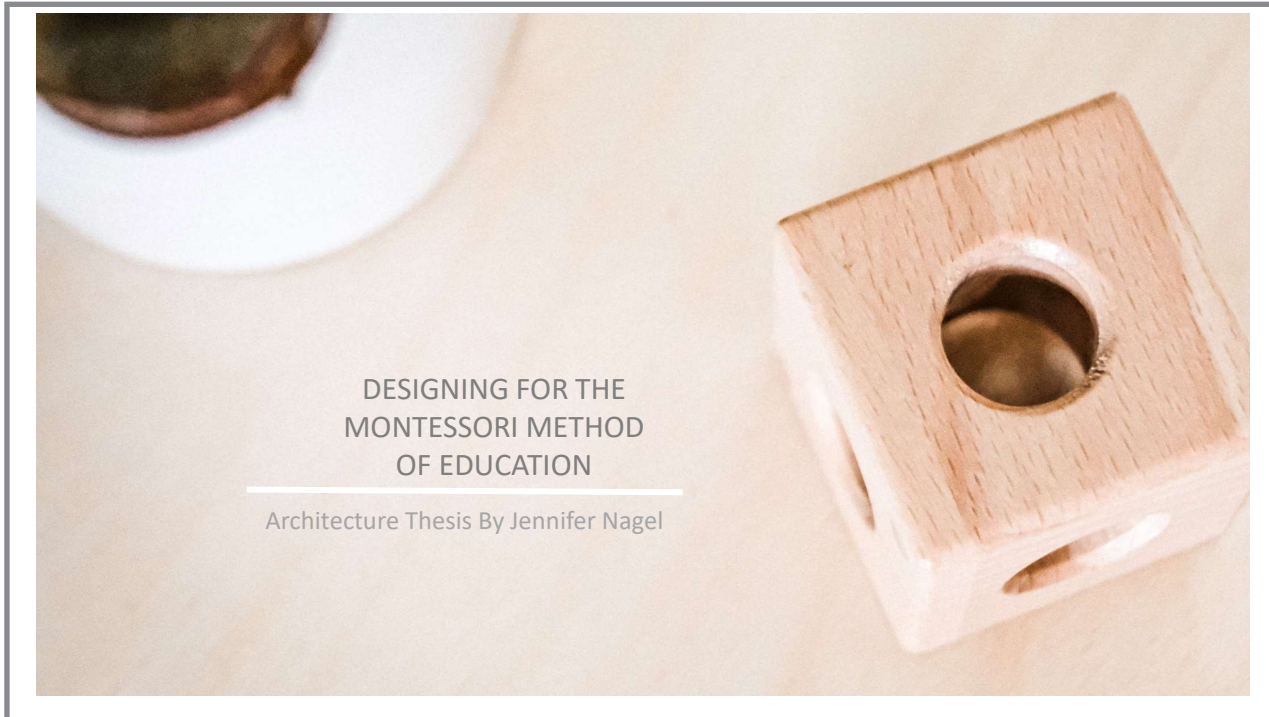
DESIGN SOLUTION OVERVIEW

The main purpose of Montessori education is to help children cultivate essential skills and focuses on child growth in all areas of their development; cognitive, emotional, social, and physical. This project proposes the ideal environment for Montessori education by giving form to the possibilities and opportunities a school designed with this method presents. The school is designed for children ages 3 to 12, set up in multiage groupings for peer learning, with specially designed learning materials. The spaces of a Montessori school support active learning and engagement with the surrounding environment and community to prepare them for the future.

To enhance this teaching pedagogy, Nature is an integral part of this project. It places value on giving children opportunities to draw inspiration from the world by fostering a harmonious relationship with nature. The classroom space extends into the outdoors and provides hands-on involvement through many developmental opportunities that staying indoors cannot.

In addition to providing students with immersive learning experiences, this project integrates modern technology, such as virtual reality, into the Montessori method. This intentionally designed space allows children to visit places not practical, or even possible in real life, which gives children the freedom to explore and develop to their fullest potential, all from the safety of the classroom. By fostering an understanding of the child's role in their community, in their culture, and in the natural world, this project will inspire students' creativity, spark their imaginations, and create an asset that the broader community can benefit from.

DIGITAL PRESENTATION



It is unquestionable that environments directly influence the behavior and emotions of their users. Human beings spend approximately 90% of their lives indoors, making it imperative that the spaces we inhabit stimulate positive behavior and feelings.



PROJECT TYPOLOGY:

K-5 Educational Facility

LOCATION:

Bismarck, ND

JUSTIFICATION:

- Demand
- Lack of options
- Need for redefinition
- Site relevant
- Many benefits from Montessori Method

This project proposes the ideal environment for Montessori education by giving form to the possibilities and opportunities a school designed with this method presents.

As designers, it should be our goal to come up with design solutions that meet the needs of its users. For my thesis, I have chosen to design a K-5 Educational Facility designed around the needs of children, while focusing on child growth in all areas of their development. For instance, cognitive, emotional, social, and physical.

Child development has always been a great interest of mine, and as I began to research different ways designers can improve the health and well-being of students in the learning environment, I noticed that many of my findings aligned with the Montessori Method of education.

This project proposes the ideal environment for Montessori education by giving form to the possibilities and opportunities a school designed with this method presents.



ABSTRACT:

How can architecture improve the health and well-being of students in the learning environment?

How can design focus on child growth in all areas of their development, such as cognitive, emotional, social, and physical?

Can we as designers use the Montessori child-focused approach to learning and apply it to architecture for children's education?

The questions I wanted to answer for this thesis project included:

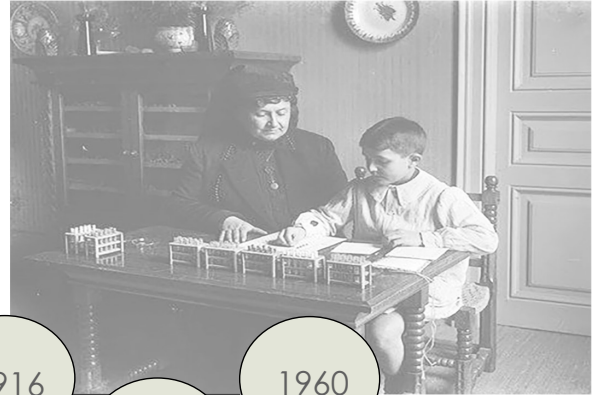
- How can architecture improve the health and well-being of students in the learning environment?
- How can designers focus on child growth in all areas of their development, such as cognitive, emotional, social, and physical?
- Can we as designers use the Montessori child-focused approach to learning and apply it to architecture for children's education?

WHAT IS MONTESSORI?

THE FOUNDER:

Dr. Maria Montessori (1870-1952)

YEAR: 1907



1907

1911

1916

1929

1960

"The child has a mind able to absorb knowledge. He has the power to teach himself." (The Absorbent Mind)

Maria Montessori was born on August 31, 1870, in Italy. In 1907, she developed a child-centered educational approach based on her scientific observations of children from birth to adulthood. Montessori educators believe all children have a natural hunger for knowledge and are capable of initiating their own learning in the right, supportive environment. In the book "The Absorbent Mind", Maria Montessori states,

"The child has a mind able to absorb knowledge. He has the power to teach himself." -Maria Montessori

1907: Dr. Maria Montessori opened Casa di bambini or children's house, in Rome.

1911: The first Montessori school in the US opened in Scarborough NY.

1916: More than 100 Montessori schools were operating in 22 states.

1929: Association Montessori international (AMA for short) was established.

1960: Dr. Rambusch launched the American Montessori Society or (AMS) for short.

THE BASICS

- Montessori serves children from birth - high school
- Age group most served: 2-12 years old
- Approximately 4,500 certified Montessori schools in the US
- Most are private but some are public

20,000+

certified Montessori schools worldwide



TODAY...

- Montessori serves children from birth through high school
- Age group most commonly served: 2 years-12 years old
- There are approximately 4,500 certified Montessori schools in the US and over 20,000 worldwide.

In an authentic Montessori program, the teacher, child, and environment create a learning triangle. This model basically means that the teacher sets up the classroom in a way that encourages each child to exercise his or her independence within a set of boundaries. Classrooms are orderly and calm, giving the children the opportunity to concentrate and go about their work independently. A quote from Maria Montessori states,

“Montessori is an education for independence, preparing not just for school but for life.” -Maria Montessori

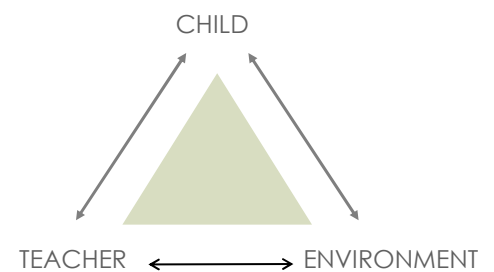
MONTESSORI HALLMARKS



"Montessori is an education for independence, preparing not just for school but for life."

-Maria Montessori

- Child-centered
- Multi-age groupings
- Activity choices
- Work time
- Learning materials
- Play is a child's work
- An aesthetically pleasing learning environment



To sum up what a Montessori environment entails, I have listed some of the most easily recognized hallmarks of this method.

For instance,

- The philosophy is centered around the child.
- Educators in the field set up an aesthetically pleasing learning environment to meet the needs of the students in three age groups: 3-6 years, 6-9 years, 9-12 years, which fosters peer learning.
- Guided work activity and meticulously arranged, specially designed learning materials are available to all students.
- While there is a focus on academics, the main idea is that children learn at their own pace.

"The greatest sign of success for a teacher... is to be able to say, 'The children are now working as if I did not exist.'"
-Maria Montessori



TEACHING STYLE

- Children typically have the same teacher for three years.
- Children work at various learning stations and groups according to their interests.
- Mixing age groups encourages older children to serve as role models and help for younger children.

The teaching style of Montessori classrooms foster independence- another quote by Maria Montessori states,

"The greatest sign of success for a teacher... is to be able to say, 'The children are now working as if I did not exist.'"
-Maria Montessori

In the classrooms...

- Mixing age groups encourages older children to serve as role models and help for younger children.
- Children typically have the same teacher for three years.
- Children work at various learning stations and groups according to their interests.
- Within Montessori classrooms, there are 5 areas of learning;
 - Practical, Sensorial, Math, Language, and Cultural Studies.



ENVIRONMENT

- Contain many places for children to learn and play
- No focal center to the classroom
- Scale and proportions
- Natural materials
- Connection to Nature

Montessori classrooms are peaceful, happy places designed to meet the developmental needs of each child in every stage of life.

When children first enter a Montessori environment, there is an immediate and touching moment when they realize that this place is for them. All items in the environment are scaled to the child's size, including furniture, shelves, and so on..

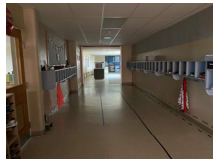
There is no focal center to the classroom; this reflects that the teacher is not the focus of the children's attention, but that they are all one community together. Children can work by themselves, in pairs, in small groups, in large groups, inside, outside, at tables, on the floor.

Natural materials are used throughout the building.

CASE STUDY



Christ the King Elementary School located in Mandan, ND.



To gain a deeper understanding of what the ideal Montessori environment looks and feels like, I conducted a personal interview with Derrick Nagel, the principal of Christ the King Elementary School in Mandan, North Dakota. This helped me understand what a typical Montessori school day is like.

Christ the King Elementary School is the only Montessori K-5 facility in the Bismarck/Mandan area. It was originally founded in 1958 as a traditional elementary school, however In 2016, Christ the King School began a significant transition into Montessori based education.

Unfortunately, being designed and built as a traditional school has caused some issues during the transition into a Montessori School. For instance, the main entrance is not very welcoming, the corridors have minimal daylighting, and the playground space does not provide learning opportunities that meet the needs of the child's development.

In the classroom, however, I found a few characteristics that I wanted to incorporate into my own project.

PROJECT GOALS

Education and Development

Ease of Access

Scale and Perspective

Use of Technology

Community

Daylighting and Materials

Independence



Project Goals

EDUCATION/ DEVELOPMENT

EASE OF ACCESS

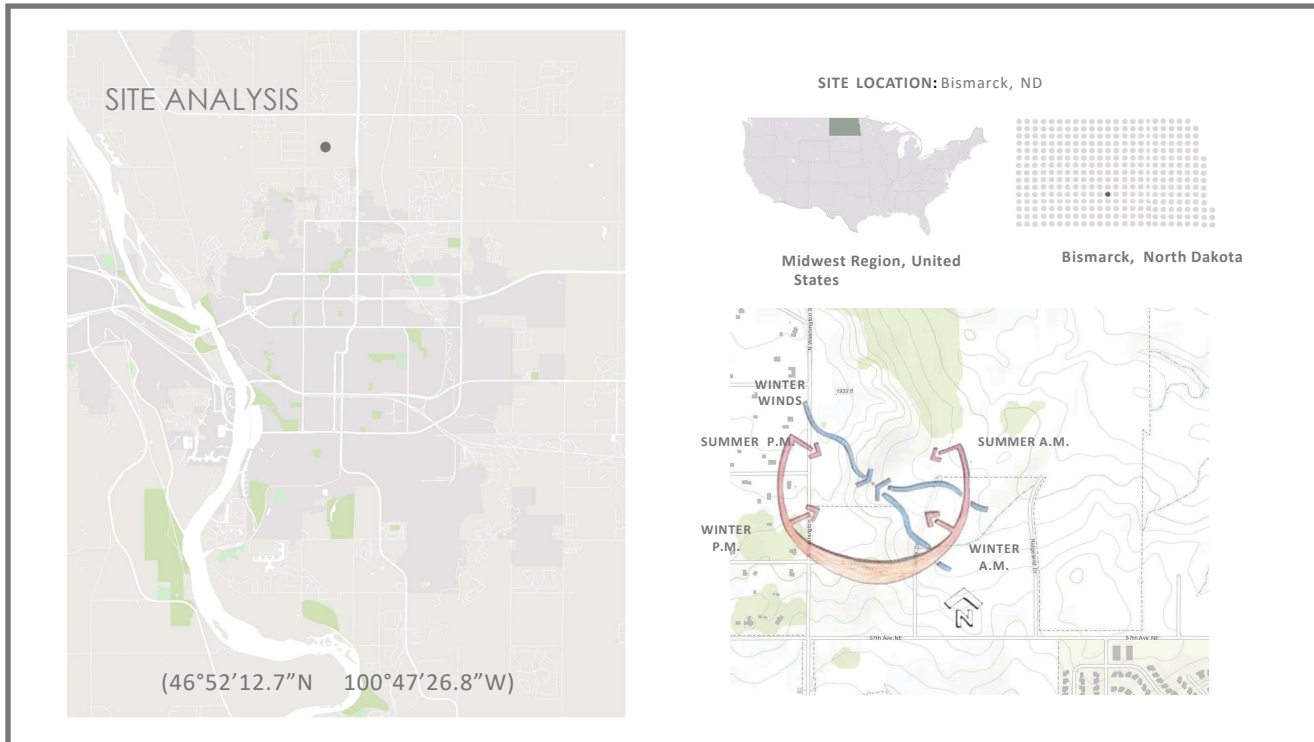
SCALE + PERSPECTIVE

USE OF TECHNOLOGY

COMMUNITY

DAYLIGHTING + MATERIALS

INDEPENDENCE



My project is in Bismarck, ND. I chose this location not only because of the lack of Montessori schools in the area, but with a 2020 population of 74,129, it is the 2nd largest city in North Dakota and is currently growing at a rate of 0.41% annually and its population has increased by approximately 21% since the most recent census, in 2010.

The grey circle on the map shown to the left is where my project's location is in relationship to Bismarck.

BISMARCK, ND DEMOGRAPHICS

GENDER



49.58%

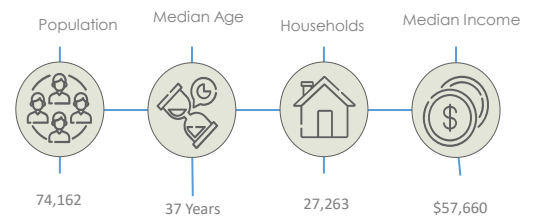


50.42%

Annual
Precipitation:
15.4 inches

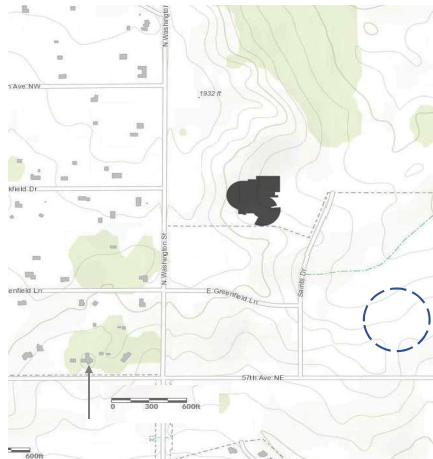
Average Wind
Speed:
10.2 mph

Second Largest
City In ND



One of the main reasons I chose this site is due to the increase of population of this area. As stated on the previous page, the population in Bismarck is 74,162. Combined with the Mandan population of 22,301, a grand total of 96,463 people live here and there is only one Montessori school serving this area.

THE SITE



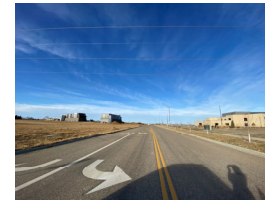
North



East



West

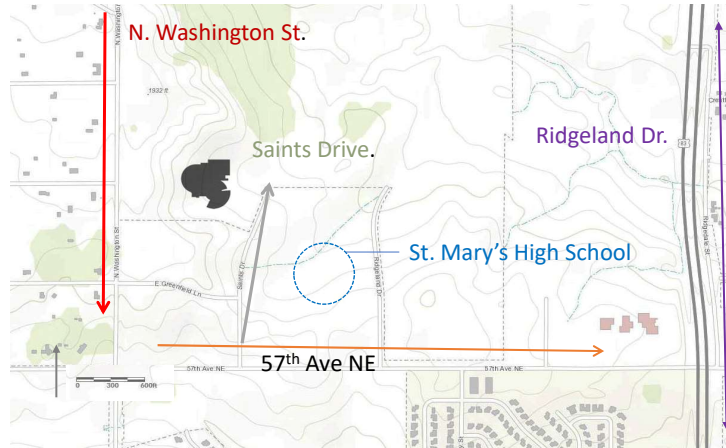


South

Here are some images of the site.

Although it looks like it is in the middle of nowhere, there are a lot of new neighborhoods and developments popping up around the surrounding area. St. Mary's High School is a new high school that opened in 2019, which is located where the dashed circle is shown on the map. Most of Bismarck's new development is being built north of town, making this a great spot for a new elementary school.

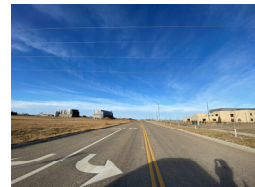
SURROUNDING AREA



St. Mary's Entrance



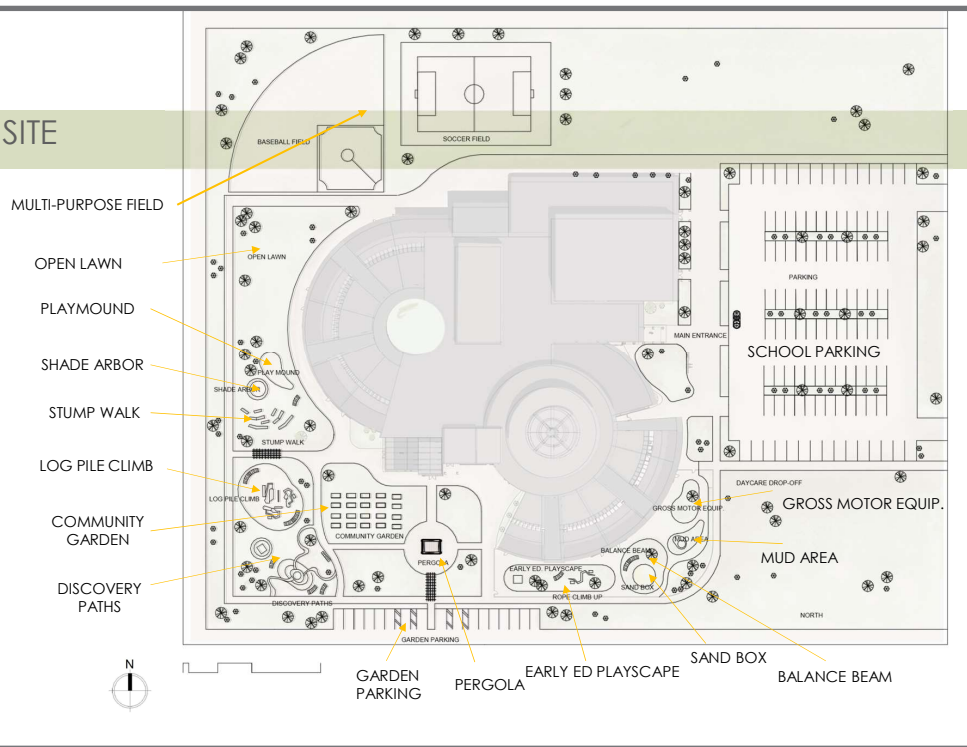
Saints Dr. Facing North



Saints Dr. Facing North

Here are some images of the main roads in the area. My project is shown in the black shape right off of Saints Dr. which will be the road used to access the new facility.

DESIGN SOLUTION: SITE



Here is a brief make up of the elements that I have incorporated into the site design.

After visiting Christ the King School, I knew that I wanted my project to incorporate an outdoor environment that can be used for hands-on engagement and discovery. The site I have designed provides more learning opportunities than a typical playground found on a traditional elementary school site.

Before I dive into what these elements are, I want to point out that the school is divided by two wings depending on the age group. The classrooms for the 6-9 and 9-12 age group are located on the far west side of the building. The 3-6 age group classrooms, as well as the daycare, are located on the south-east side of the building.

This is important to point out because one of my goals was ease of access. I have arranged the site elements in a way that benefits the developmental stages of the age groups it is located near, in order to accomplish the goal.

For example, the multipurpose field is situated closest to the classrooms for ages 9 to 12, because that age group would start to have extra curricular activities such as baseball and soccer.

The play mound is situated by the 6 to 9 age classrooms, as well as the open lawn area. There is very little existing vegetation on my site so I added new trees and elements (such as the shade arbor and pergola) to keep students comfortable during warmer days.

Another project goal I have addressed on the site was materials. My design incorporates natural playscapes such as the log pile climb, the stump walk, and the play mound, which are shown in the images on the left. By doing this, I accomplish my goal for using natural materials. These elements follow the Montessori guidelines as well as create opportunities for hands-on engagement and sensory development.

It is important to note that all of these elements are scaled down to the size of the child; in order to accomplish my goal of scale and perspective. There is also a sandbox, a balance beam, and a rope climb-up, which all benefit the physical development of children ages 3 to 6. One of my project's greatest responses to the goal of community is the community garden and greenhouse. The main entrance and the school's parking are located on the East side of the building.

Montessori education encourages the exploration of the natural environment, which can sometimes be messy, but through these opportunities, the child can make observations and learn from their experiences.

Main Entrance



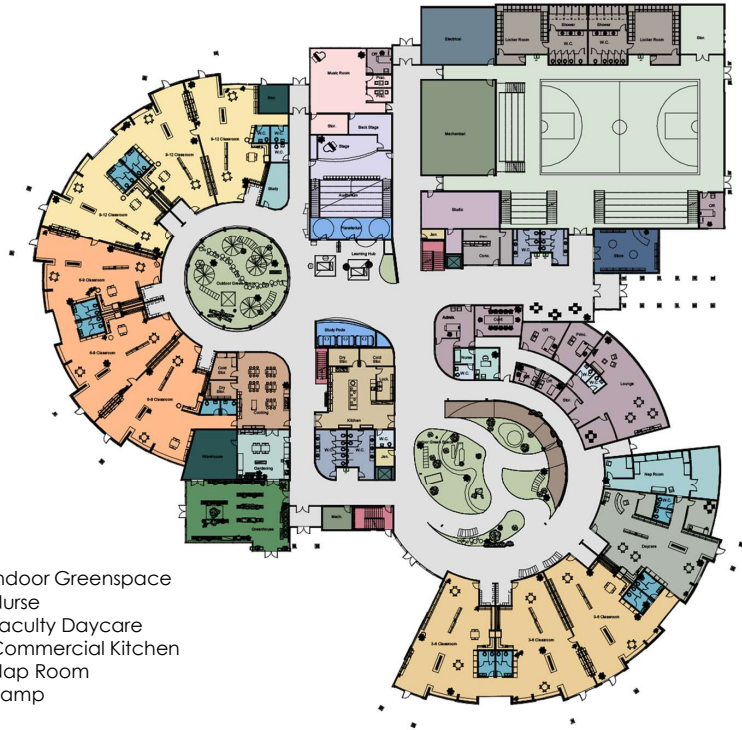
Here is a render of the school's main entrance.

The lowered walkway approach is welcoming and brings the scale down to a comfortable child proportion. I have incorporated natural materials, as well as local plants and other vegetation, to the site.

LEVEL 1

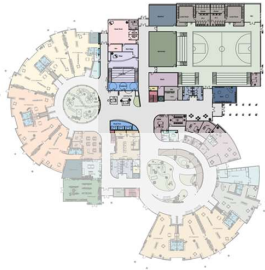
- Store
- Gymnasium
- Locker Room
- Public Restroom
- Concessions
- Elevator
- Stairs
- Music Room
- Auditorium
- Administration
- Learning Hub
- Mechanical
- Electrical
- Studio
- Janitor
- Greenhouse
- Class Restroom
- Study Room
- Staff Restroom
- Outdoor Greenspace
- 3-6 Age Classroom
- 6-9 Age Classroom
- 9-12 Age Classroom
- Cooking Classroom
- Warehouse

- Indoor Greenspace
- Nurse
- Faculty Daycare
- Commercial Kitchen
- Nap Room
- Ramp

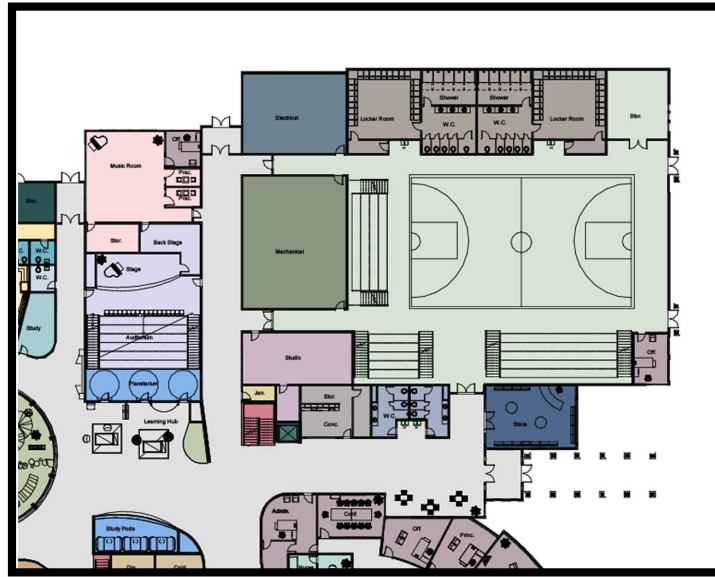


FIRST FLOOR

LEVEL 1

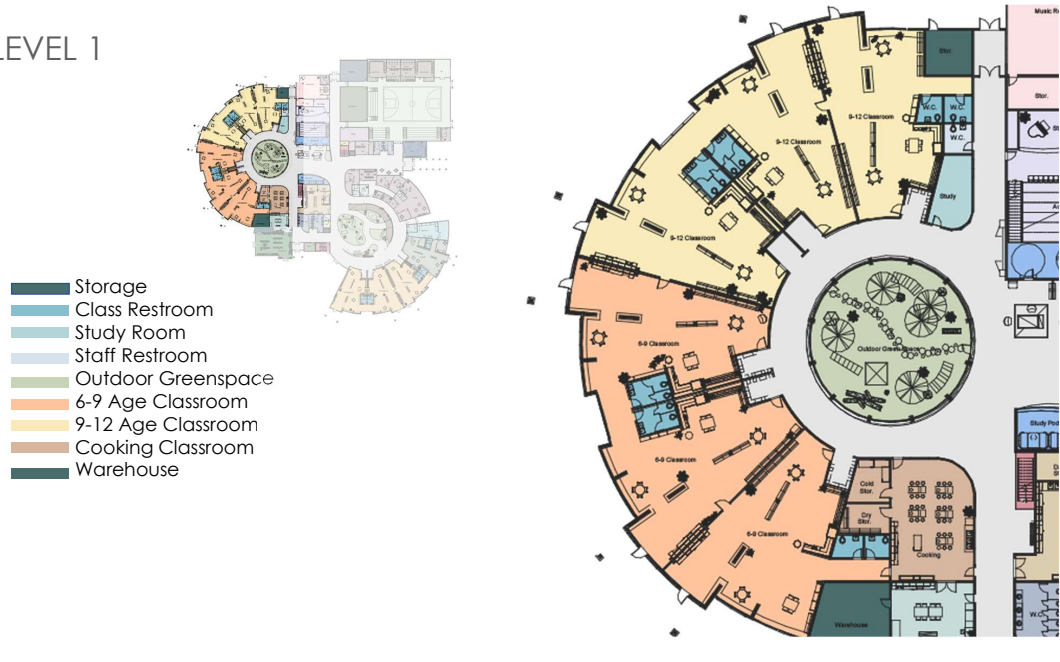


- Store
- Gymnasium
- Locker Room
- Public Restroom
- Concessions
- Elevator
- Stairs
- Music Room
- Auditorium
- Administration
- Learning Hub
- Mechanical
- Electrical
- Studio
- Janitor



DISCOVERY ZONE

LEVEL 1



UPPER ELEMENTARY CORRIDOR

AREAS OF LEARNING WITHIN THE CLASSROOM

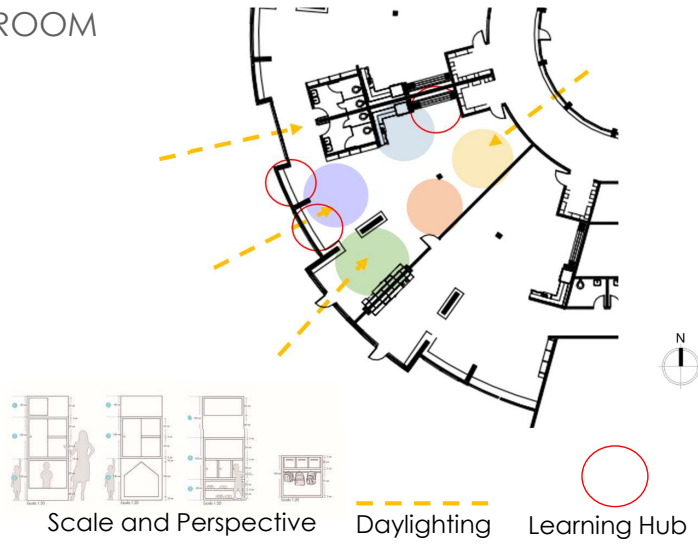
SENSORIAL

PRACTICAL

CULTURAL

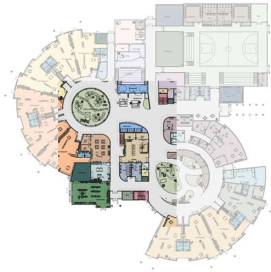
MATH

LANGUAGE



CLASSROOM

LEVEL 1



- Storage
- Class Restroom
- Study Room
- Staff Restroom
- Outdoor Greenspace
- 6-9 Age Classroom
- Cooking Classroom
- Warehouse
- Greenhouse
- Public Restroom
- Mechanical
- Stairs
- Commercial Kitchen
- Janitor
- Learning Hub



GARDEN ROOM



GREENHOUSE

THE BENEFITS OF HAVING A SCHOOL GARDEN

- Improved Academic Outcomes
- Improved Social Development
- Physical and Mental Health Promotion
- Positive Community Impact

LEVEL 1



This floor plan shows the indoor green-space area, which offers indoor play and learning opportunities for children of all ages. This also provides year round learning and play for students and guests, and is equipped with a ramp spiraling up to the second level. This promotes inclusivity among students of all needs and implements learning in a fun way.

The daycare is offered primarily for the staff members with children under the age of 3, but can be offered to families if there is additional room available. It is conveniently located near the nap room and teacher's lounge.

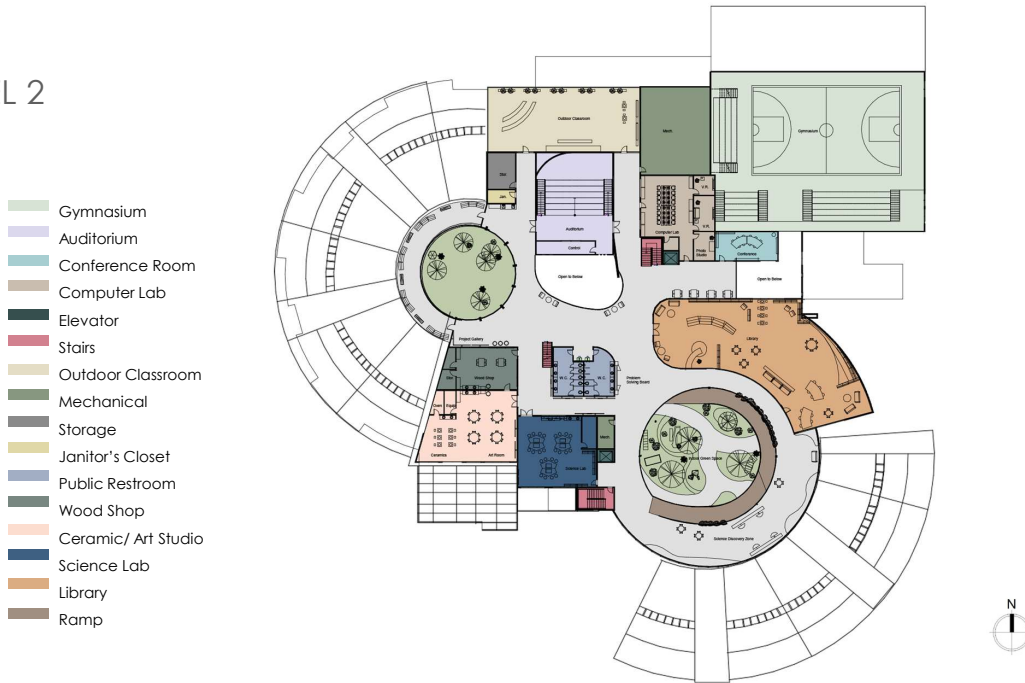


INDOOR GREEN SPACE

Here is a render showing the indoor green space.

This space responds to the project goal of education and development, ease of access, daylighting and material, and independence.

LEVEL 2

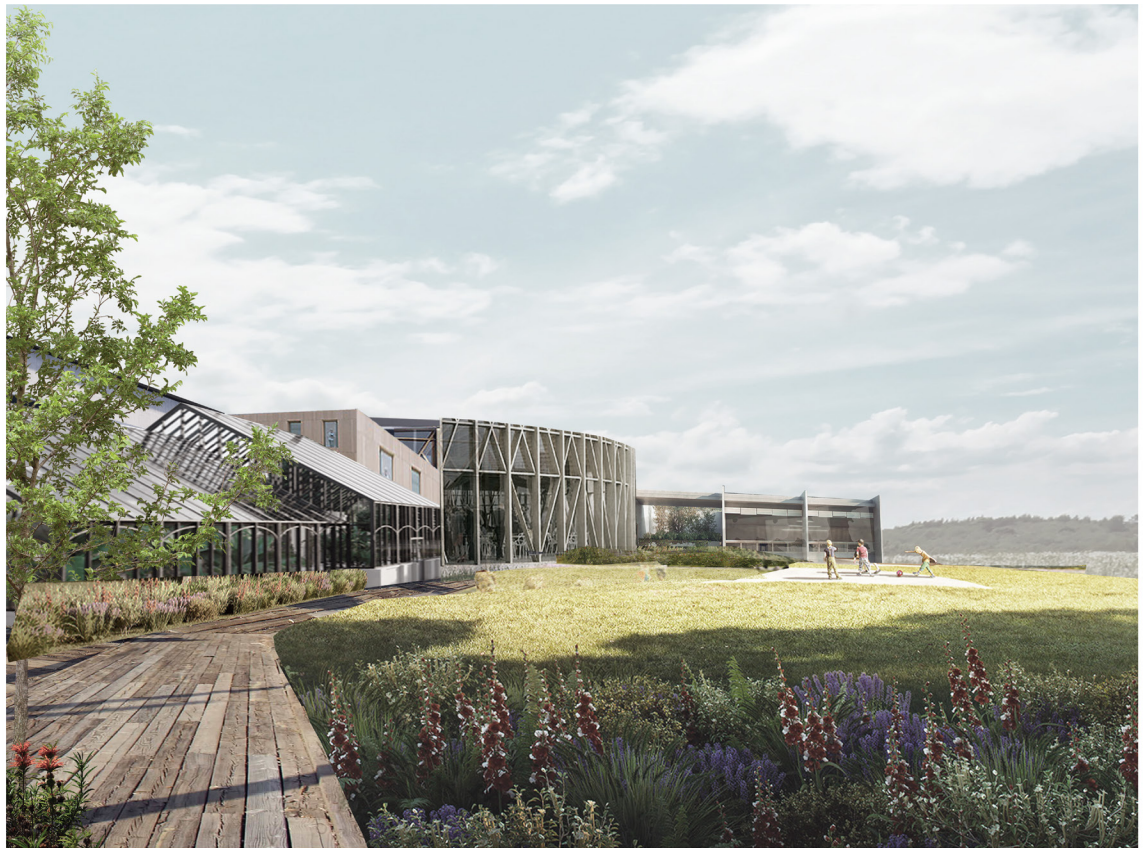


The second level of the building is mainly for special learning days where the teacher will take the class out of the classroom for lessons. This may include the wood shop, arts and ceramics studio, the science lab, the science discovery zone (which looks over the indoor green-space), the library, and the project's response to the goal of "Use of technology".

Technology is usually not implemented into the Montessori method of education, however, with today's new advances in technology, I find it crucial that children can use this to their advantage in a way that allows them to experience the world they normally would not have the chance to do. VR creates an entire digital environment, a 360-degree, immersive user experience that feels real. In a VR setting, students can interact with what they see as if they were really there.

I incorporated a computer lab with virtual reality stations. Students can use the virtual reality for opportunities to experience cultural activities they normally would not have the chance to do in a regular day in Bismarck, North Dakota. For example, a student who is interested in farming may choose to use the virtual reality station to garden in Asia. Another student interested in the ocean might use virtual reality to experience what the ocean is like without ever leaving the school environment.

Technology provides us many benefits and by incorporating it into my design, I can use these advantages to enhance the teaching pedagogy of the Montessori method of education. In addition to providing students with immersive learning experiences, this project will inspire students' creativity, spark their imaginations, and create an asset that the broader community can benefit from.





DESIGNING FOR THE MONTESSORI METHOD OF EDUCATION

BY JENNIFER NAGEL

"THE GOAL OF EARLY CHILDHOOD EDUCATION SHOULD BE TO ACTIVATE THE CHILD'S OWN NATURAL DESIRE TO LEARN."
-Maria Montessori

BENEFITS OF A MONTESSORI EDUCATION

Freedom Within Limits

"Freedom Within Limits" is the idea that a student who has been shown how to use a material, may work with that material or any other when they choose. If they are very curious about letters and reading, they do not have to wait for a specific period or time of day. They are able to navigate their interests and work accordingly.

Multi-Level Socialization

"Freedom Within Limits" is the idea that a student who has been shown how to use a material, may work with that material or any other when they choose. If they are very curious about letters and reading, they do not have to wait for a specific period or time of day. They are able to navigate their interests and work accordingly.

Focus on the whole child

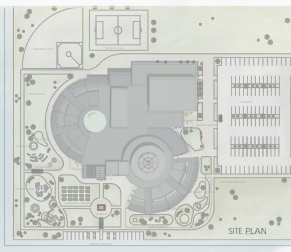
The Montessori school environment allows your student to grow not just academically, but also socially, emotionally, physically an mentally. So your student won't just be well rounded in terms of math language science social skills than handwriting but they will also learn leadership skills and how to resolve issues with their friends and how to choose what they want to work on.



LEARNING HUB



GREEN ATRIUM



SITE PLAN



SECOND FLOOR



FIRST FLOOR



CORRIDOR



CLASSROOM



GARDEN ROOM



GREENHOUSE

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PREVIOUS STUDIO EXPERIENCE

SECOND YEAR

FALL SEMESTER - MILTON YERGENS

Tea House Project
Boat House Project

SPRING SEMESTER - DARRYL BOOKER

Bird House Competition
Dwelling Project
Mixed-Use Project

THIRD YEAR

FALL SEMESTER - RONALD RAMSAY

Chapel Project
Shaker Barn Project

SPRING SEMESTER - REGIN SCHWAEN

Student Facility Project
Native American Museum Competition

FOURTH YEAR

FALL SEMESTER - AMAR HUSSEIN

Miami High Rise Project

SPRING SEMESTER - PAUL GLEYE

Belgium Study Abroad

FIFTH YEAR

FALL SEMESTER - LANCE JOSAL

Fenway Park Surge Facility