

ABSTRACT

Title of Thesis: Revitalizing Cities through Vertical Education

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Throughout the years, public educational institutions have taught students from a young age various subjects without changing the learning structure or environment. On the other hand, recent global events such as the Covid virus have led office spaces to be used less by businesses. This thesis proposes the adaptive reuse of existing office space to redesign it as a school to create a better environment for enhanced learning by designing effective bioclimatic, sustainable, and interactive specialized programming spaces that work in an urban environment to create a better learning environment for students and faculty while addressing safety and other urban concerns.

REVITALIZING CITIES THROUGH VERTICAL EDUCATION

by

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Preface

Throughout the years, the educational system has been used to teach the younger generations various subjects that prepare them for higher education. However, new advancements in technology and design have proven to enhance students' creative minds by redefining environments. As the world advances, educational institutions should adopt and redefine the way of teaching students. Throughout this thesis, educational theories will be looked at and educational appliances will be tested and chosen to apply design tactics to an existing office space in an urban setting to create an adaptive school. After this, site analysis and diagramming will be done, and to conclude, a design solution will be proposed.

My parents are both from Colombia, which is in South America and once they arrived in the United States, did not have any higher education or good-paying jobs so began in the lower class. This meant that when I was born in 1998 and later began my education, I went to Viers Mill Elementary School. Viers Mill was 95% minority students and low-income level. A year after I graduated, the future president, Barack Obama, visited the school to encourage a better curriculum, and after that new development plan began. During this time, I attended A Mario Loiederman Middle School, which was also a low-income minority-based school. There was a lot of crime nearby and not enough room for improvement, so redevelopment was needed. I became interested in educational curriculums and brain development when I began high school. At this time, I began to question the educational system because I felt like there was not enough preparation for adulthood. Through this thought process, I

then began to wonder what the best way to was self-teach oneself and came across videos that began talking about the science of the development of the brain and a more effective way of learning.



Figure 1.01 - Do Schools Kill Creativity, 2006

In the ted talk above, Sir Ken Robinson, a British author, speaker, and advisor on the education system discussed the idea that children have an extraordinary capacity for innovation, yet educational systems limit the capacity by limiting the brain to work only towards a few functional items. Robinson goes on to speak about being prepared to be wrong, but if you are not prepared, you will never come up with anything original, yet nowadays, there is a stigma that if you are wrong, it is the worst thing. Unfortunately, educational systems imprint our minds to think that mistakes are the worst thing you can make, therefore the educational system is educating people out of their creative capacities. Sir Ken argues that intelligence is diverse, interactive,

and distinct. However educational systems make some creative and intelligent people believe they are not intelligent because what they are diverse in is stigmatized. But what people do not realize is that creativity is the process of having original ideas that have value, not just to humans, but to all of life. Educational systems right now are preparing students for the future, yet the future is unknown, so if creativity and ideas are shut down now, what will happen if we need them 50 years later? Robinson talks about the idea of the future and how it needs to adopt a new conception of human ecology which reconstitutes our conception of the richness of human capacity and that the task of educational systems is to educate the whole being of a human being for them to be prepared for whatever the future holds. As I thought about this idea, I wanted to investigate people's satisfaction with their jobs and found out that in a study conducted in 2022, 65% of employees in the US are satisfied with their jobs.¹ As I continued my thesis, I became interested in how I could design or propose a place where students would feel encouraged to learn but also continue to expose their creativity.

¹ 11 Surprising Job Satisfaction Statistics, 2021

Dedication

I dedicate my thesis work to my younger brother Benjamin David Lee Greer. Since you were born, I have always wanted you to exceed my success and create your story of great achievements and goals that will overcome every obstacle you face. I created this thesis because I want you to read it one day and expand your mind and become a great leader and a good person to everyone. My love for you is shown through my actions and this thesis. I would like you to continue this research in some part of your life and help others one day.

I also dedicate this work to a fellow friend of mine, Gary O'Riley who has passed away. I met Gary on the first day when I began working at TPC Potomac Golf Course. He was an older gentleman who worked hard despite his age and health problems. He was a great worker and an overall content person who loved his work and his family. Unfortunately, I never got to say goodbye to him before his passing and found out only after I returned to work the following summer. Gary, with this thesis that I dedicate to you as well, thank you for all the great times and for being an incredible worker and a good person. May you rest in peace Gary O'Riley.

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Chapter 1: Introduction

History of Public Education in the United States

Throughout centuries, public educational systems have been established to prepare the younger generation with the knowledge that will help them progress as a community and individuals in the future, but how did this all begin? Because this thesis is based in the United States, the historic background for education will be based on North America and referencing other nations that impact the learning environment. In the United States early years, the children who received education were primarily white children educated in church-supported schools or private schools. “Many children were excluded based on income, race or ethnicity, gender, geographic location, and other reasons” (ED606970).

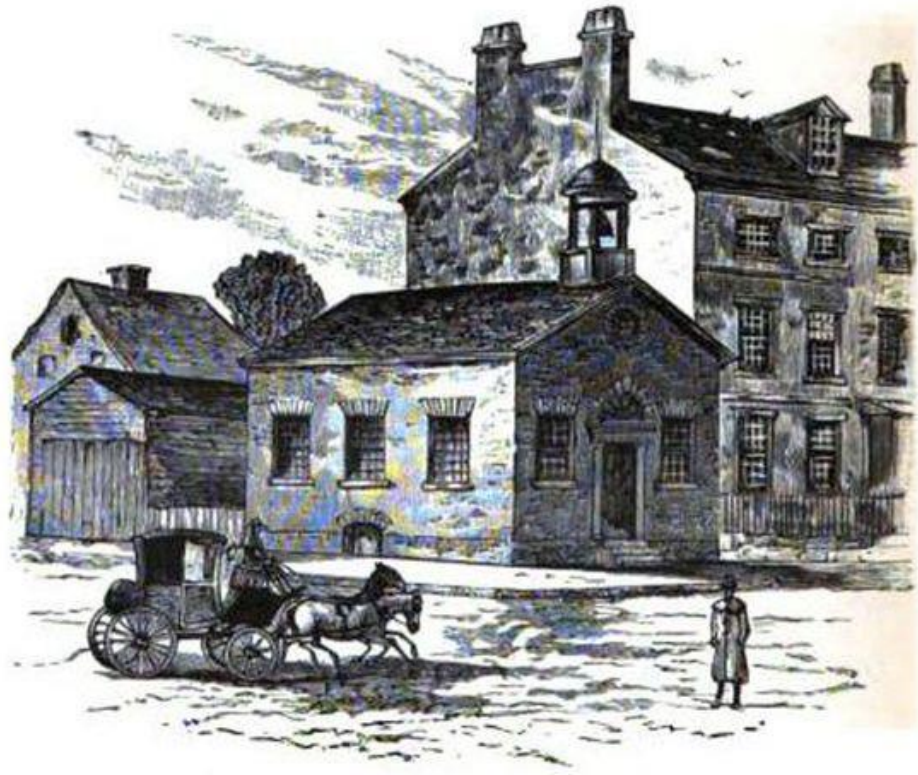


Figure 1.01 – First Public School in America, 2013

The Founding Fathers of the United States of America believed that the only way to preserve a democracy would be to require an educated population to understand political and social issues, be active in civic and political life, protect their human rights, and resist tyrants. When it began, education was seen to provide moral instruction and aid to a strong-minded character. In the beginning, founders knew that educating people for citizenship would be difficult to create and maintain without a systematic approach to schooling. Soon after the American Revolution in 1783, leaders came together to propose formal and unified publicly funded schools. While some communities had already established publicly funded schools by late 1780 the concept of free public education did not begin on a large scale until the 1830s. During

this time, Horace Mann, a Massachusetts legislator, and secretary of the state's board of education, along with others, emphasized that public investments in education would benefit the entire nation by creating and transforming children into productive citizens. Common school advocates then created the "three R's" system, which would be reading, writing, and arithmetic, which would also be taught along with other subjects such as history, geography, grammar, and rhetoric. Many urged that educating the low- and middle-class children would prepare them to obtain good jobs, which would ultimately strengthen the nation's economic position. Advocates from all around saw universal education to eliminate poverty, crime, and other social problems. Throughout the 19th century, some communities saw a faster pace in public schools, while others were at a slower pace in others. Public schools became more common in cities than in rural areas. As for racial and gendered classes, it took longer for girls, African Americans, and children with disabilities to gain access to these public educational systems. By the 1870s 78% of children aged 5 to 14 were enrolled in public schools. High schools did not have as high numbers until the 20th century as in 1910, only 14% of Americans aged 25 and older had completed high school. It was only up till 2017 that 90% of Americans aged 25 and older had a high school degree.² Creating educational environments however did create an exercise of community building and forged a sense of community since many people were invested in their schools which were then strengthened by school meetings, exhibitions, and other social activities.

² First Public School in America

The promotion of equality became a primary mission in the mid-20th century, especially in the case of *Brown vs Board of Education* declared that state-sponsored public educational systems were unconstitutional and while at that time received enormous backlash, continued to ensure equality in the learning environment. Events such as the elementary and secondary education act of 1965 and World War 2, helped ensure educational opportunities for children with disabilities and other minority groups. Federal and state programs then began providing food and after began offering other types of social services. While the educational system did create a place for learning for all students, the approach of the United States has created a more decentralized system than other countries due to authority being divided among the local, state, and federal levels. States end up making decisions about academic content standards, testing, and much more while the federal government has an influential yet limited role. As of 2020, there are 13,598 regular public school districts and 98,158 public schools across the United States. In the fall of 2020, about 49.4 million students attended public schools from grades K-12, with about 22.6 million of them being white, 13.8 million being Hispanic, 7.4 million being black, 2.7 million being Asian, and the rest other.

- All: **130,930**
- Elementary schools: **87,498**
- Secondary schools: **26,727**
- Combined schools: **15,804**
- Other: **901**

Here's what this looks like in chart form:

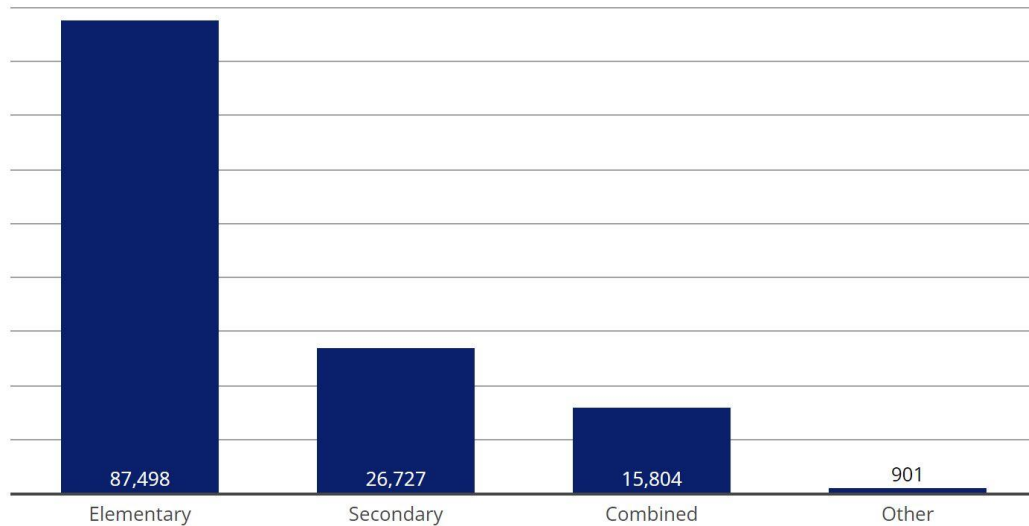


Figure 1.02 – National Center for Educational Statistics, 2017-2018

People involved in a Learning Environment

Educational systems right now have a community of teachers, students, parents, and communities that make sure that schools continue moving forward and engaging their students in learning various subjects that prepare them for the future. Teachers have an important impact on students because they are responsible for students during class time and must make sure that students understand what is being taught. They then must communicate to parents and the board of education how each of these students is doing in their subjects, which lets the school board understand how successful their institution is.

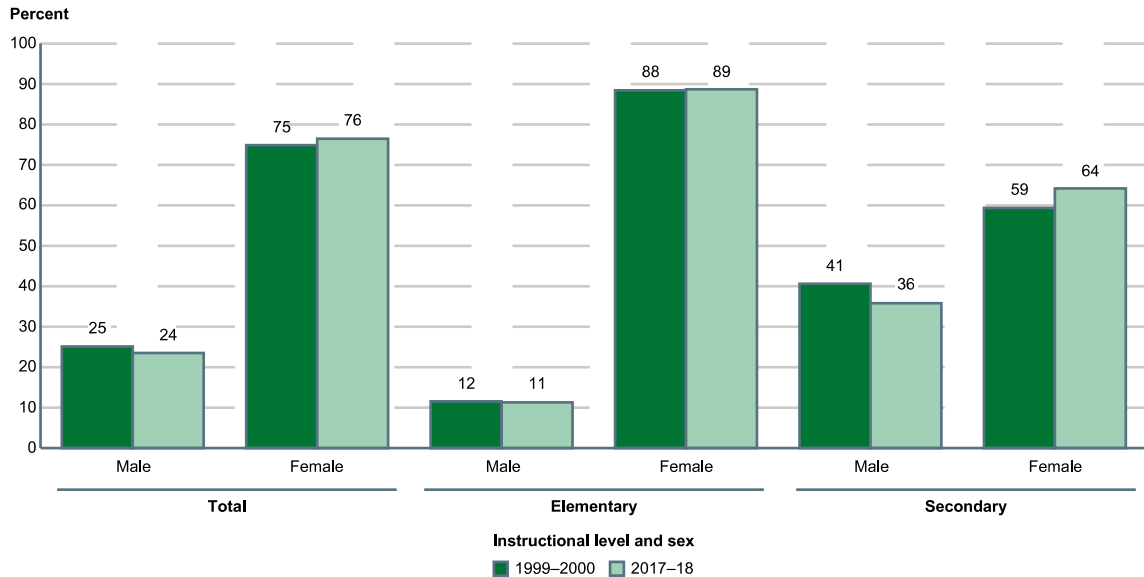


Figure 1.02 - Percentage Distribution of Teachers in Public Elementary Schools, 2017

In the figure above, the comparison of female and male teachers was created and contrasted between the years 2000 and 2018. Most teachers in both elementary and secondary education are females with them being 76% of the instructors. In the national center for educational statistics, the reported average base salary for teachers is \$57,900 in the US, taken in 2018. While the average income for teachers is good to pay in the USA, teaching has been considered a high-stress job for years.

Unfortunately, due to the pandemic that occurred in 2020, these stress levels have skyrocketed. Teachers became desperate in trying to figure out ways on keeping

students engaged through zoom. About 60% of teachers say they experience frequent job-related stress and about 41% say they are less effective when stressed.³

Research has gone to show that once teachers become stressed, so do students, which hurts their performance and engagement levels. In the past decade, teachers have reported they have had to accept more responsibilities and have been given fewer resources and choices in running their classes. Teachers from minority groups have also felt stressed as they experience isolation and feel pressured to feel obligated to lead conversations surrounding racism and inequities. This pressure is also placed on the government and the public regarding how the nation's history of racism should be taught. While these stress levels of instructors have been getting more attention in recent years, about 42% of teachers have said administrators have made little effort to help relieve stress. With, about 25% of teachers have said that job-related stress leads them to think about quitting and 16% say they dread going to their jobs.⁴

³ Percentage Distribution of Teachers in Public Elementary Schools, 2022

⁴ Teachers Are Not Ok, Even Though We Need Them to Be, 2021

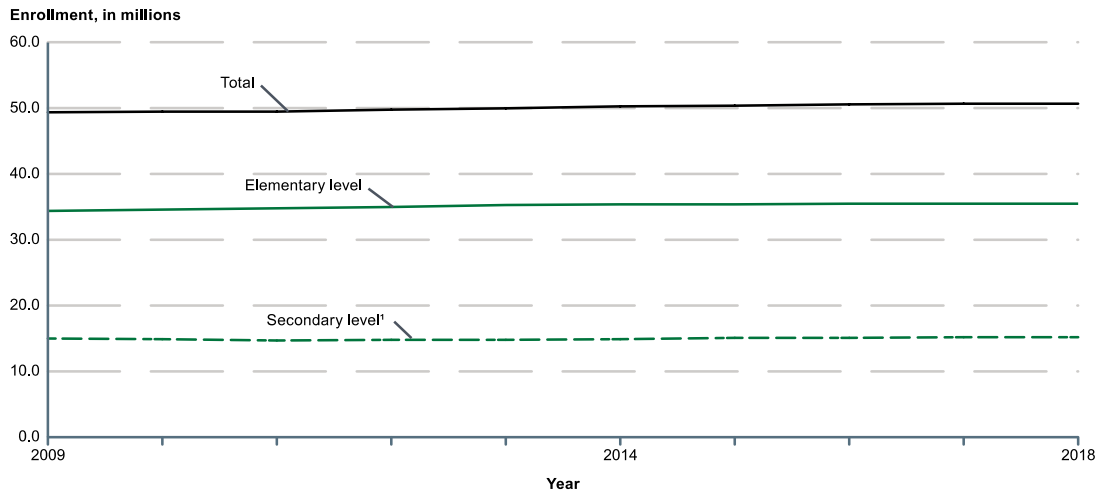


Figure 1.03 - Enrollment in Public Elementary Schools, 2018

Students are the reason for educational institutions and from a survey conducted in 2018, 50.7 million students are enrolled in public education. In 2019, 35.5 million children were enrolled k-8. In a study about learning through technology, about 42% of students would like to use digital learning tools more often. Students also understand how much teachers care for them as a study showcases that 76% of students agree that teachers care about them. 57% of all students say that they use access to the internet and its tools to learn about subjects. 34% of all students would also like to use digital learning tools outside of school.⁵ As students continue to learn, there are always new ways to educate themselves, especially through technology. But not all of it is technology, as hands-on learning has also proven to work as it allows students to correct themselves of any educational mistakes now, while still having their professor's guidance nearby. It also encourages students to think outside the box and experiment with the problems and tools that they will essentially have to work

⁵ Enrollment in Public Elementary Schools, 2018

with regularly throughout their future careers. The most effective way to prepare students for hands-on learning is to have students arrive at each lesson ready to explore the projects by familiarizing themselves with the procedure beforehand.⁶

Parents also play a crucial role in the education system as they are required to maintain their children in educational institutions. In a recent study about returning students to school after the pandemic, around 25% of parents indicated that they were not comfortable with having their kids return to school. Parents felt like their kids were in danger of spreading the virus and returning homesick, which is something that we as people now must deal with because the COVID-19 virus is still out there. As for commute time, about half of parents said that their children spent around 0-10 minutes traveling to school in the Fall of 2019. In a survey done in 2017, 71% of parents said they want “a good quality public school in their neighborhood, not the greater choice of schools to attend”. 68% of parents would also like for public schools to provide a safe environment that expands the children’s development that way students are more successful when they attend higher education or begin working.⁷ One other item that parents are stressed about is the inadequate funding and excessive standardized testing that has been occurring.

⁶ Education Technology Use in Schools, 2019

⁷ Commuting Concerns, 2020

Who Has the Right Ideas for Public Education?

Confidence in People/Organizations to Have Right Ideas for my Public Schools

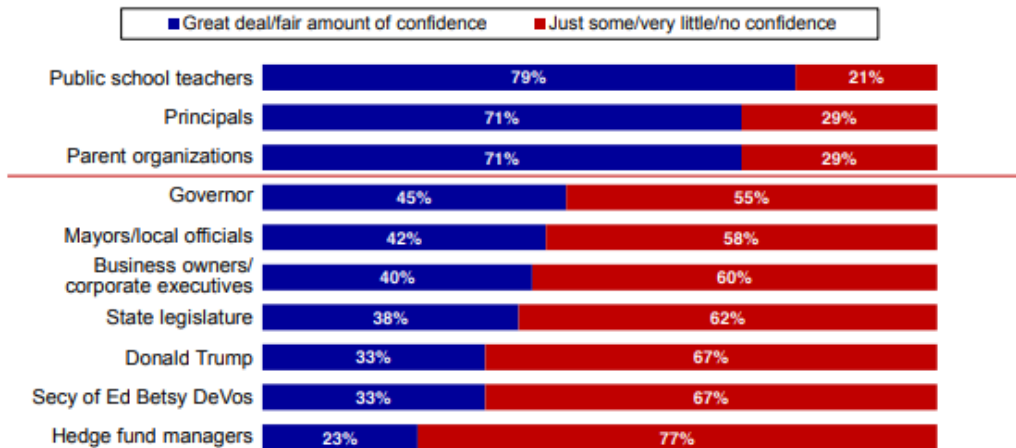


Figure 1.04 – Poll on Ideas for Public Education, 2017

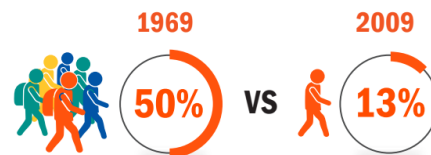
Office Spaces in the City

On March 16, 2020, the United States shut down its cities and everyone began to adapt to their new life as virtual workers from home. Since then, the broad shift to working from home has changed the commercial real estate market and has emptied various office buildings throughout cities. There has been an increase in office vacancy rates since Covid began with numbers reaching up to 17.2%.⁸ Even though Covid has slowed down in recent months, and companies have called workers back to

⁸ DC has Over 14 million Square Feet of Vacant Office Space, 2019

the office, full occupancy is unlikely. Workers have also seen the benefits of working remotely and have proven to function well remotely, which has led to the demand for hybrid work. Remote work benefits include the elimination of commute times and flexibility for parents and their children. Landlords will now have to think about how to reimagine building spaces to continue to thrive in cities. Occurring in the same environment, educational systems are finding issues such as obsolete facilities, barriers to new land acquisition, and a set of strategies for programs and mandates. Nowadays, social, and cultural trends are refocusing education, encouraging innovation, and challenging the conceptions and models of educational environments. Schools have been historically seen as centers of buildings that train humans and provide them with essential resources that provide them with the ability to work in the social fabric. However, in today's times, humans can carry an infinite level of information in their pockets that cannot be attained by a teacher. Due to this, schools now must switch from supporting knowledge to supporting skill development.

Within **one generation**, the % of children walking or bicycling to school has dropped from approximately **50% in 1969** to just **13% in 2009**.



Private vehicles account for **half of school trips between 1/4 and 1/2 mile**—a distance easily covered by bike or on foot.



In 2009, American families drove **30 billion miles** and made **6.5 billion vehicle trips** to take their children to and from schools, representing **10-14% of traffic** on the road during the morning commute.



Figure 1.05 - Safe routes to school partnership, 2018

Opportunity for Improved Learning

In today's learning environment there are plenty of opportunities to enhance student learning while also making a safe environment for both faculty and students. As technology advances, so can the learning environment. There have been thousands of studies on how the learning environment can be enhanced to create a better learning platform as well as studies on the human brain and how different materials and activities can be used to have the application of learning take a more effective route. Throughout this thesis booklet, we will first look at educational theories that have been used for centuries and extrapolate the pros and cons of each one. From there we will dive into educational appliances which are effective techniques that are used or can be tested to enhance a student's educational experience. Moving forward, we will look at three successful educational environments that have been designed and built and feature both theories and appliances. After that, the location of the site will be analyzed and diagramed as well as begin to approach the target audience and think about how to address the issues that were listed above. After this, the design tactics will be presented, which will go over the opportunities chosen to implement applications and theories towards the actual site and design. Finally, the design solution will strive to not only solve the issues stated in the introduction, but also provide a design for the site, which will enhance the educational environment by using design tactics, theories, and applications.

Chapter 2: Educational Theories

4 Main Educational Philosophies

Four main educational philosophies focus heavily on what educational centers should teach and the curriculum aspect throughout the globe. The first one is called Perennialism, and its main goal is to ensure that students become knowledgeable in the main ideas of Western Civilization.⁹ These main ideas have the potential to solve problems in any era which makes them manageable. The idea is to instruct thoughts that will continue forever and to look for consistent ideas by noticing how the natural

⁹ Educational Philosophies Definitions and Comparison Chart, Diehl, David. 2006.

and humanistic world does not change. The curriculum for this philosophy focuses on understanding cultural literacy and pushing students to endure in disciplines.

The second main educational philosophy is called Essentialism and it was formed on a common center of information that should be communicated to students in a precise and trained way.¹⁰ The main objective of this philosophy is that scholarly and moral norms should be the ways learning environments are taught. In the center of education, the structured program should be attaining fundamental information and abilities, which makes the school more practical and prepares students to become valuable students of their community. As said in the name, the essentials should be taught like writing, reading, speaking, and social interactions. Schools should not attempt to set policies but rather teach students about authority, discipline, and hard work. Professors should assist students with being able to control aggressiveness and carelessness.

The third main educational philosophy is called Progressivism and its goal is to place the attention on the student rather than on the professor or the content provided.¹¹ This instructive way of learning urges students to test ideas by having them interact through active experimentation. The content of the curriculum is made by the interests and questions of the students.

¹⁰ Educational Philosophies Definitions and Comparison Chart, Diehl, David. 2006.

¹¹ Educational Philosophies Definitions and Comparison Chart, Diehl, David. 2006.

The fourth and final educational philosophy is called the social reconstructionism theory which emphasizes the social questions and journey to create a better society.¹² The focus of this curriculum is based on educational modules that highlight social changes and uses this as the point of education. Due to WW2, the author of social reconstructionism, Theodore Brameld recognized the potential for the human obligation to create a useful society that utilizes innovation and compassion. Education is supposed to prepare the future generation to create social order and people should accept the frameworks must be changed to overcome abuse and create better human conditions.

¹² Educational Philosophies Definitions and Comparison Chart, Diehl, David. 2006.

Comparison of Attributes of Educational Philosophies				
Categories	Traditional		Contemporary	
	Realism	Idealism & Realism	Pragmatism	Pragmatism
Philosophical - orientation	Realism	Idealism & Realism	Pragmatism	Pragmatism
Theoretical-orientation	Perennialism	Essentialism	Progressivism	Reconstructionism
Direction in time	preserving the past		growth, reconstruct present, change society, shape future	
Educational value	fixed, absolute, objective		changeable, subjective, relative	
Educational process	focuses on teaching		focuses on active self-learning	
Intellectual focus	train, discipline the mind		engage in problem-solving, social tasks	
Subject-matter	for its own self-importance		all have similar value	
Curriculum	composed of three Rs		three Rs, arts, sciences, vocational	
Learning	cognitive learning, disciplines		exploratory, discovery	
Grouping	homogeneous		heterogeneous, culturally diverse	
Teacher	disseminates, lectures, dominates instruction		facilitates, coaches, change agent	
Student	receptacle, receives knowledge, passive		engages discoverer, constructs knowledge	
Social	direction, control, restraint		Individualism	
Citizenship	cognitive, personal development		personal, social development	
Freedom and Democracy	conformity, compliance with authority, knowledge and discipline		creativity, self-actualization, direct experiences	
Excellence vs. Equality	excellence in education, academic, rewards and jobs based on merit		equality of education, equal change to disadvantaged	
Society	group values, acceptance of norms, cooperative and conforming behavior		individual growth, individual ability, importance of individual	

Figure 2.01 - Adapted from Ornstein's and Oliva's Educational Philosophies. From the dissertation of Dr. David E. Diehl entitled "A Study of Faculty-Related Variables and Competence in Integrating Instructional Technologies into Pedagogical Practices."

Dutch Structuralism

The movement of structuralism began in architecture as a shift in attention to modifying user functions after the reaction of functionalism in post-war Dutch architecture in the 1950s. This movement was described as the use of modules as elements on a larger scale which then changed functions. Other attributes of this

movement included showcasing “honest” materials and a visible skeleton. The overall spatial configuration was composed of basic elements that would be moved relative to each other to create spatial richness.

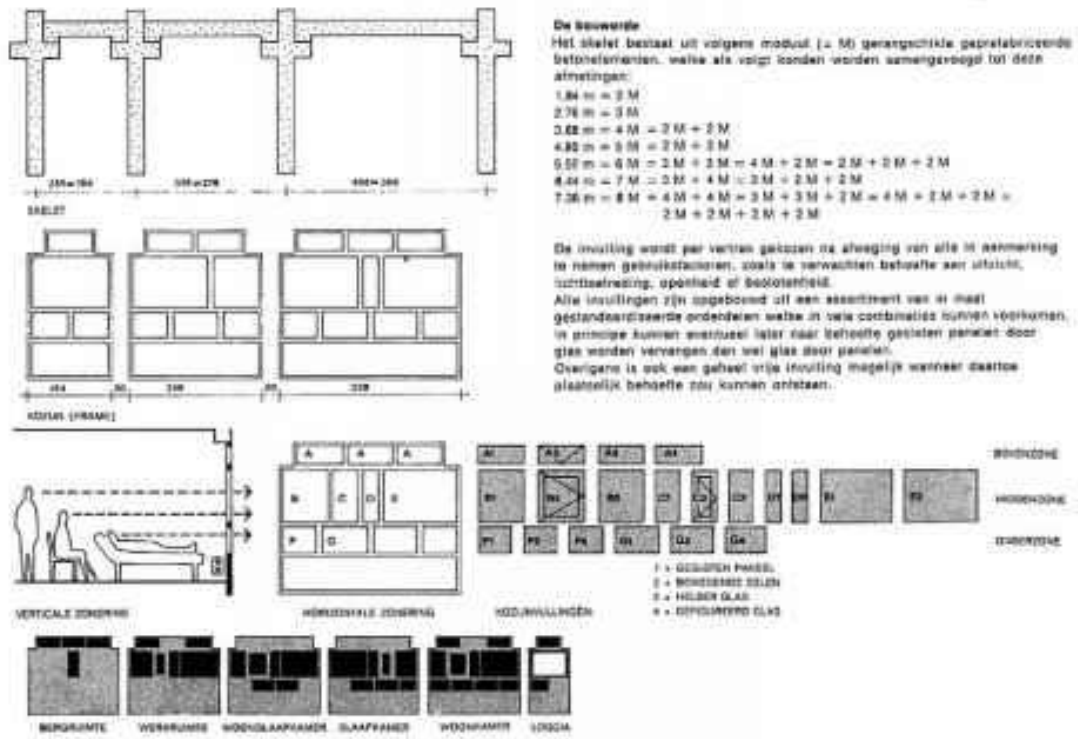


Figure 2.02 - De Drie Hoven, Amsterdam. Design by Herman Hertzberger, 1975

Montessori Educational Model

The Montessori Model was created by Maria Montessori in the early 1900s and it targets children-centered methods of education that involve child-led activities and classrooms with various ages children and teachers who encourage independence. Doctor Maria believed that children learn better when they are choosing what to learn

and this educational model makes it unique from the typical learning environment.¹³ This model includes various activity stations for children to pick up throughout the day and teachers move from group to group instead of standing in the front of the classroom. This style also features a nontraditional grading system. This system also focuses on the whole being of the student, social, emotional, physical, and intellectual development rather than just a focus on the retainment of knowledge.

Traditional	Montessori
same age groups (all kindergarteners in one classroom, 1 st graders in another)	mixed age groups (students ages 3 to 6 are grouped together in one primary classroom)
students are expected to sit at assigned desks or tables	students choose where in the classroom they want to work and may move around freely at any time
a certain block of time allotted for each subject, all students work on the same subject at the same time	uninterrupted work cycles, students choose when and for how long to work on each activity, many subjects are integrated
adult-centered: teacher controls the classroom and enforces discipline	child-centered: a carefully prepared environment encourages students to practice self-discipline
use worksheets, rote learning, and textbooks	use manipulatives, materials that appeal to the senses, purposeful, real-life experiences
focus on the product, use tests and grades	focus on the process, do not use tests or grades
emphasis on competition	emphasis on collaboration
teacher gives direct instruction to the whole class and to groups of students, based on a pre-determined curriculum	students independently use self-teaching materials, learn from each other, teacher provides individualized lessons for each child
standards-based learning	inquiry-based learning
students are expected to be within the norms of what is average for their grade level	students have the opportunity to advance academically at their own pace, without limits

Figure 2.03 – Comparison Chart of Educational Models, Net stars, 2015

¹³ Structuralism, 2020

The Montessori model, there are pros and cons which is why it is compared to the traditional model of learning.¹⁴ The first proof of the Montessori model is the emphasis on independent hands-on learning. There is a use of natural light and common space in classroom design. Creating these beautiful and accessible environments is done because of its impact on the children that direct their learning. If a child feels comfortable in a learning environment and has features that help them learn, they will become more effective in learning that subject. With these areas in place, students can also be allowed to learn at their own individual pace, and with independent materials, students could develop their concentration and coordination. Another pro to this learning model is the enhanced social interaction that model offers. Children most of the time become fascinated by what other classmates and people are doing and often try to emulate it. The Montessori model capitalizes on that by grouping children of different ages together in the same learning environments. With this, students not only learn from their teachers but also from their peers and that is proven to enhance their learning. This practice of mixed-age students also allows the life skills of acceptance and inclusion as well as creative ideas to be generated. This model also allows students to become more independent because they develop entrepreneurial mindsets.¹⁵ After all, learning is self-directed. The final pro is that this learning style is inclusive for students with special needs. Maria wanted to include students with all disabilities which is why the grouping of kids was also formed. Because these students are grouped, special needs students have less pressure

¹⁴ Northeast Stars Montessori, 2015

¹⁵ Exploring The Pros and Cons of Montessori Education, 2019

to keep up with their peers and because the learning style is individual and everyone has their own goals, special needs children can learn at their own pace.

While all these are great reasons for the Montessori model to exist, some cons need to be discussed. The first one is cost, which for this model can be very expensive. The cost of durable and high-quality materials as well as the extensive training for faculty can take up a lot of the funding provided for this learning environment. The Montessori model can also be seen as too loose for some parents as part of it is the initiation of students to independently learn their environment. Even though it is up to the teacher and their assistants to make sure the students' progress of learning is on pace; students have room for distraction. The final con is the open-ended structure that this model has. While its intention is meant for more effective learning, students also tend to like a routine and structure. This model is built to allow movement and change, which could then become a space for distraction.

The Waldorf Model

The Waldorf educational theory unifies age-appropriate content and various methods for each of the stages in a child's development era. It approaches the human being in three entities in nature which consist of the mind, spirit, and body, and educates all parts to prepare the student for the meaning and purpose of their own lives.¹⁶ This educational model was founded in 1919 by Rudolf Steiner who was an Austrian Philosopher and Scientist. The main point of this educational theory is to

¹⁶ Waldorf School Education, High Mowing

create each student’s special and unique capacities and teach them to accept those capacities and how they will fulfill their lives.

	WALDORF	PUBLIC SCHOOL
Early Academics	Play is the work of a young child. Waldorf seeks to nourish and inspire imagination and creative thinking. Academics are delayed until Grade 1 so that the child has more time for make believe, art, music, and the building of social skills and class cohesion.	Academic knowledge grows linearly. The earlier a child begins academics, the less likely they are to fall behind and the more they can learn by graduation. Early education curriculum focuses on children meeting a grade’s standards. (1, 2, 5)
Curriculum & Later Academics	In a same-aged classroom environment, Waldorf educators encourage a love of lifelong learning through the use of multi-disciplinary methods that incorporate art, music and craftsmanship. Lessons are language-rich and focused around all arts and multiple senses. Subject integration and classroom collaboration are key to the holistic academic experience.	In a same-aged classroom environment, public school educators encourage children to engage in accountable, individual learning. Lessons are focused around measurable academic accomplishments, where reading, writing, and math remain the sole focus. In later years, those skills are more broadly applied to special subjects and integrated into the older child’s day. (1)
The Classroom	The child thrives in a simple, rhythmic, and predictable environment. The teacher leads the students in the classroom as collaborators with one another, as often as they work individually, and provides regular guidance.	The child thrives in a state-of-the-art, structured environment. Teachers lead the students in the classroom, primarily as individual learners and then as collaborators under the guidance of the teacher, textbooks and technology. (7)
Teaching Methods	Children learn best through imitation, collaboration, and Socratic inquiry. Watching and working with a teacher and fellow students facilitates age-appropriate academics and skills.	Teaching methods vary by teacher. The essential focus is on student results from the teacher’s classroom. CoreStandards.org says: “Focus on Results Rather than Means.” (8, 9, 11)
Materials	Waldorf classrooms are filled with all natural and child created materials. Children create their own learning materials and textbooks based on lectures, special projects and other collaboration with the teacher. Technology is not a part of the elementary classroom.	All of the learning materials in public school are provided by the state for a specific academic purpose. Children take notes from books and lectures and sometimes fill in accompanying worksheets, tests and quizzes. Technology is an essential part of the classroom. (1,4)
Society	Waldorf education strives to give students a sense of ethics and to produce individuals who can engage the world with clear and creative thinking, compassion, moral strength, and courage, and to make sure students are able to adapt to a changing world.	The focus of public schools is to provide a consistent, clear understanding of what students are expected to learn to “find success in college and careers, and to make sure American students are positioned to compete successfully in the global economy.” (1, 3)
Social	The development of the student in the social realm is as important at school as academic learning. The teacher plays a key role in orchestrating how social skills develop with individuals and between students.	The development of the student in the social realm is addressed as it pertains to classroom learning. Parents are encouraged to tackle behavioral and social issues in the home. (6, 7)
Individuality	Children come into the world with unique personalities and gifts. The teacher’s role is to get to know the children, respect their nature, and guide and inspire them to reach their full potential with personalized methods of engagement and learning.	Growth of the individual child is balanced with the needs of the whole classroom. Since the focus is on results and not teaching methodology, there is no specific recommendation on how a teacher should address a child’s individual skills, except as they relate to measurable results. (10, 11)

Figure 2.04 – Waldorf vs Public School Comparison, Rocky, 2014

This educational model showcases those students learn best by having a routine and imitating their peers and teachers. These instructors create healthy daily rhythms and model-worthy behaviors. This model also enforces the daily lessons of abstract thinking and encourages ethical foundations. This model also integrates academic disciplines throughout all ages and encourages educational environments to not only test and read about subjects but create areas for students to experience them.

The Reggio Emilia Model

The Reggio Emilia Model is a different way of teaching and learning in which teachers observe what students know and are curious about, as well as what challenges them. With these recorded observations, teachers then reflect and develop various ways to help students expand both their academic and social skills.¹⁷

¹⁷ *What Is the Reggio Emilia Approach?* Child Discovery Center, 2018.

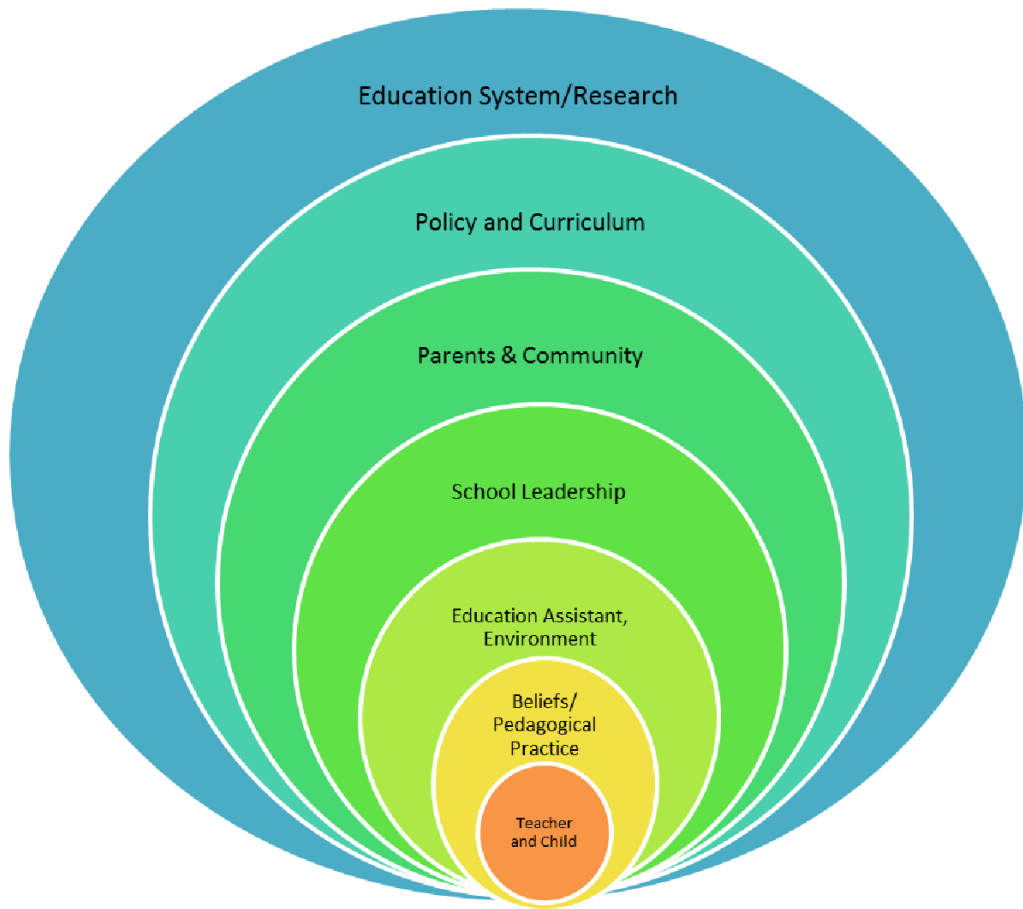


Figure 2.05 - Implementing a Reggio Emilia Inspired Approach in a Mainstream Western Australian Context, Claire Hall, 2013

Children are viewed as curious competent students that can connect with the world around them. Teachers in this educational model are mindful of this and are open to students' possibilities and because of this, assist in building up their work and environment for students to respond fittingly. Collaboration and participation are key factors in this model as the whole framework is planned to associate with students and to help them connect with everyone. In this model, students, faculty, and parents connect to move forward with the educational experience and community

improvement. The spaces in the school are teachers within themselves and teachers organize these spaces to guarantee a balance between individual, small, and large group activities. Lastly, parents are essential to their children's growth and learning experiences and can help by becoming part of family teams that are created within the educational system.

Finland Educational Model

Finland's educational model has proven to be an effective education because of its nine elements. The central focus of this educational model is to provide equal education to everyone that emphasizes learning through play type of experience. They also focus on personalized learning by supporting each student's challenges and working with their strengths. Students are encouraged to follow their learning path which is measured by overall development and not by standardized tests that focus only on memorization skills and overall scores. This model also focuses on minimal homework during the first grades to encourage soft skill development outside of the classroom. The Finland model also takes their latest technology and applies it to their learning environments, but they focus on making technology a mindful technique that enhances the learning experience rather than overpowering daily life.¹⁸

¹⁸ 10 Reasons why Finland's Educational System is the Best in the World, Mike Colagrossi, 2018

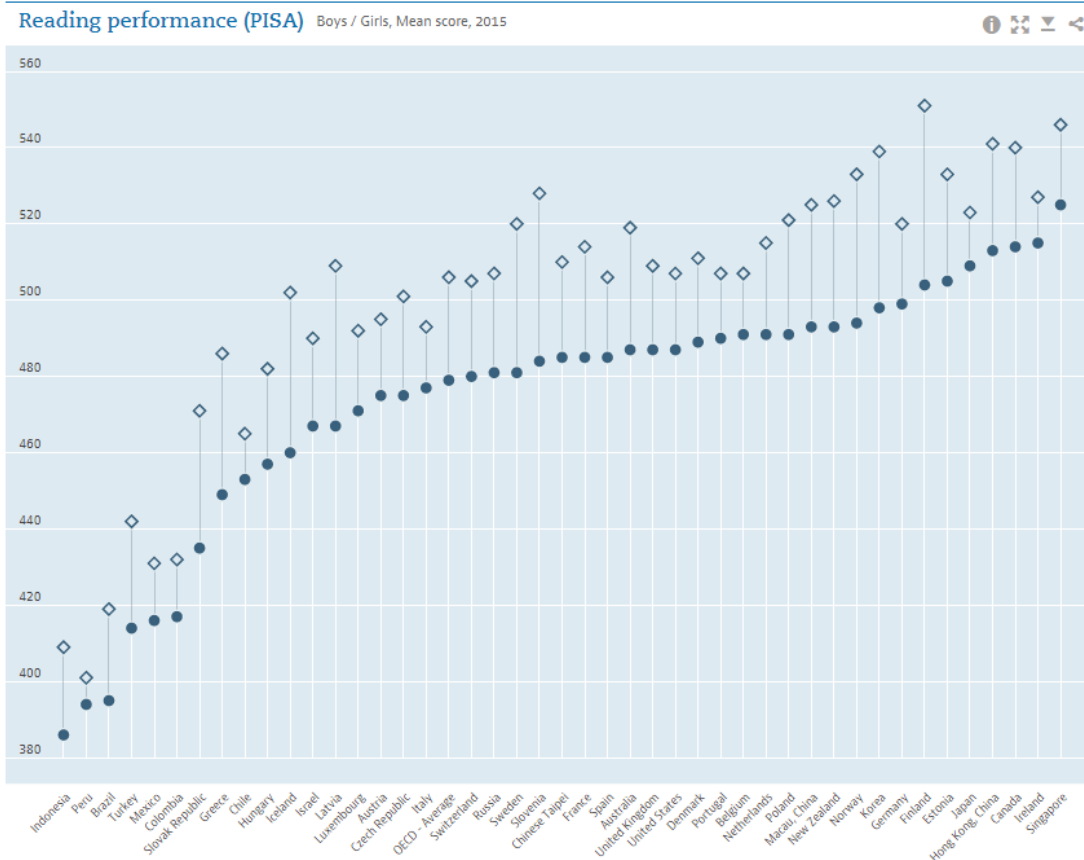


Figure 2.06 – Reading Performance, Data Oecd, 2015

Finland’s educational model also encourages everyone to promote lifelong learning by having a flexible system that allows everyone to continue with their education no matter their age. The final item that this model uses is highly trained teachers that have to have a master’s degree in education. Teachers are then motivated to create a plan to emphasize their teaching and resourcing. Teachers are also tailored to teach different kinds of students throughout their degree to be able to assist any student once they become certified educators.

The Gagne Learning Theory

Robert Mills Gagne was an American educational psychologist known for his five major categories of learning which included, verbal information, intellectual skills, cognitive strategies, motor skills, and attitudes. He believed that learning was an ongoing skill that is built on prior knowledge and that humans developed their intellect based on their physical capacity. Based on his research, Gagne felt that learning requires different instruction and various levels of support. Because every person is different, various strategies must be required to achieve different learning goals. Intellectual skills are an outline of how to follow procedures to get things done. Within this skill, there are five different categories which are discrimination, concrete concept, defined concept, rule, and problem-solving. Each concept should be practiced differently as children can retain each more effectively. The cognitive strategy has three main concepts which include the rehearsal, the elaboration, and organizing of materials by setting goals and tracking the progress and if need be, modifying these strategies for better learning. Verbal information is taught by using different techniques to recall items through memory. A student can use their visual recollection as well as any other mnemonic strategies to help make connections with the information that they are trying to recall. Motor skills are physical actions that can be assessed through complex performances such as skating, dancing, and writing.¹⁹ Once a student can become accurate by psychically doing an action, their minds become coordinated with how to do it and therefore they become more effective in that action. The final item is attitude, which can be students declaring their thoughts

¹⁹ Taxonomy Of Learning, 2021

and self-reporting to themselves. Of course, with this learning technique, students must have to try it for it to work. Students will be able to self-reflect easier in a positive environment created by design and the teachers.

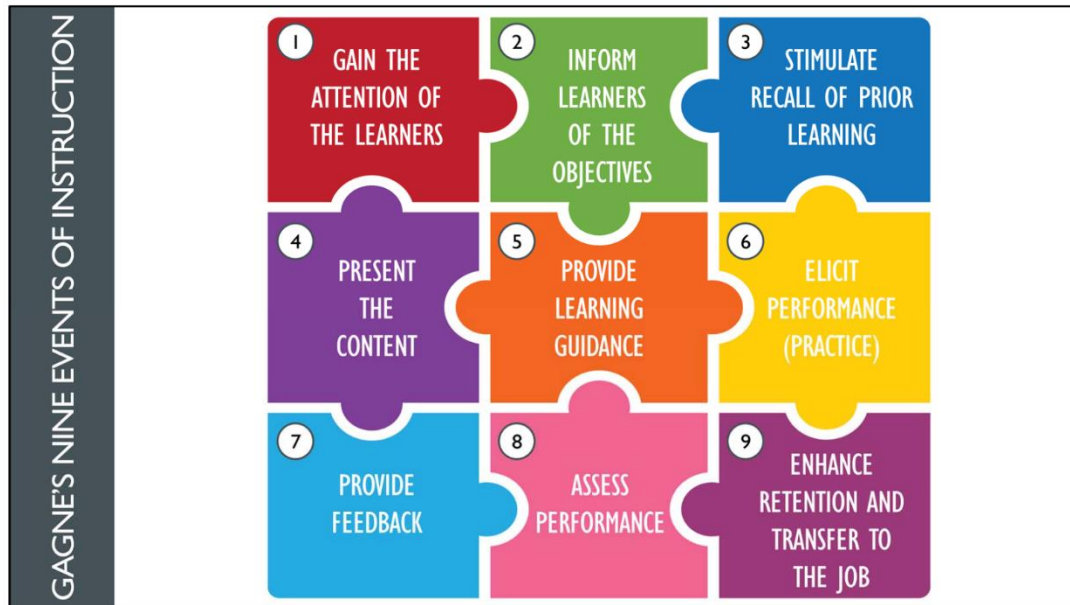


Figure 2.07 – Gagne’s Nine Events of Instruction, Kurt, 2021

Designing a Course Theory

Classroom design will play a huge impact on the learning of students. Teachers should allow enough time to carefully plan their courses and discuss with other teachers that have taught a similar course. The ADDIE model, which stands for Analyze, design, develops, Implement, and Evaluations, is a sequence that was created in 1975. This learning tool was implemented throughout all branches of the U.S armed forces but is used in learning environments throughout the globe. The Analysis Phase is where teachers set their goals and have a program that matches the skill level that each student shows. This is where teachers should test to see what students know and what they should know after the course is complete. The next

step is designed, which determines the types of resources and tools that will be used to create an effective learning environment for students. The development stage then begins the production and testing of students.²⁰ Teachers should already have some type of data collected from the previous phases to see what type of program needs to be taught for students to be able to grasp the information from the course. The implementation then continues to modify that program to make sure that it is the most effective way of learning for students in the class. Teachers can continue to analyze the learning environment to see if students are retaining the information. The final step is the evaluation phase which implements final tests that reach the items that were learned and where students struggled. Teachers then create a summary report to determine if initial course goals were met as well as see what could be done moving forward to make the most effective learning and success rate.

Education through Covid 19 Theory

In the year 2020, the entire globe experienced the Covid 19 pandemic where lives were claimed, and everyday life was changed and continues to change. With 466 million cases and 6 million deaths because of Covid, many implementations have been recently introduced to combat the virus and its variants.²¹ Education took a toll because it had to transition online and now moving towards in-person, but parents and teachers still feel hesitant at times. Guest professor Catherine Burke, who focuses on the 20th-21st century progressive education talked about the Covid 19 public health

²⁰ ADDIE Model: Instructional Design, 2018

²¹ COVID Live, 2020

crisis.²² This pandemic has altered relationships between teachers and students as well as schools and communities. While the pandemic has altered relationships and learning environments, it has also taught humanity how to design by using pop-ups and temporary structures that give access to communication while also maintaining health concerns. Burke talks about various politicians that want to change a few items in school furniture including shaped tables and the arrangements of seats. She believes in the 10 mythologies of school which say that students work better when instructed and where there is a set schedule. While I believe in some of these mythologies, I feel like there is room for improvement where designers can arrange spaces for students to grasp information more quickly. A mix of spatial elements, as well as the use of materials and various classroom techniques, can provide students the opportunity to embrace their creative side and learn how to become more engaged with the material that they are being taught.

Therapeutic spaces in Schools

As the world continues to change because of social events, viruses, and other items, schools should begin offering Therapeutic spaces for both their students and teachers. The low talk about therapeutic spaces is not often talked about which is something that should be brought up because of the mental health and well-being of everyone in the learning environment.²³ Four main principles need to be established for these types of spaces. These principles are the presence of a trained, trusted adult,

²² Mythologies Of Education in The Time of Covid-19, 2020

²³ Designing Therapeutic Spaces In Schools, 2020

enough time given to these individuals, an understanding community that is aware of mental health, and extreme attention to the quality of the space itself. While mental health is an important issue, the therapeutic spaces seem too expensive and unrealistic in low-income communities because of the time and money set to create each individual room. There should be a public space within the school where everyone can go yet feel comfortable expressing their feelings towards each other. There are parts in these principles that can be extruded out and placed into a design that can create a better learning environment for students and teachers.

Chapter 3: Sustainable Design Strategies for Academic environments

Passive Design Strategies

Well-designed buildings use passive design strategies all around the globe to minimize energy consumption. To use passive design, one will look at the building form and thermal performance of the building elements including but not limited to, mechanical, architectural, structural, etc. The ultimate vision of passive design is to

fully eliminate any requirements for active mechanical systems while maintaining occupant comfort throughout the day. While this seems close to impossible to design for every building, the implementation of passive design helps lower building energy use. The more buildings and owners implement a passive design, the healthier the planet and its inhabitants will be.

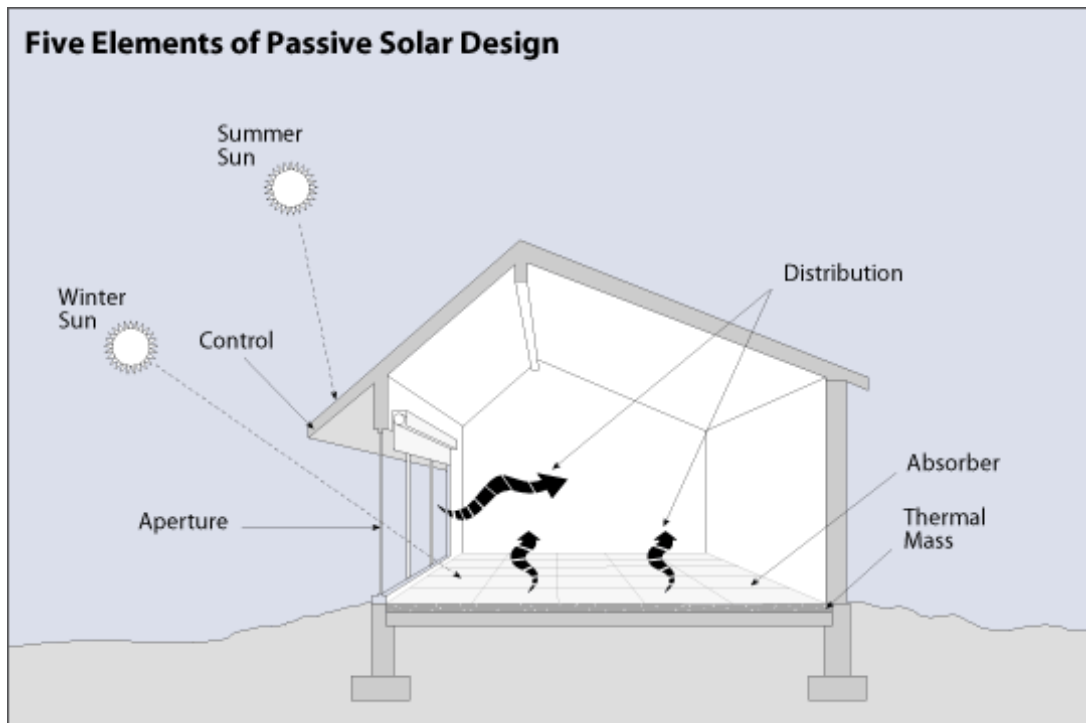


Figure 3.01 – Five Elements of Passive Solar Design, (date), Office of Energy Efficiency & Renewable Energy

Passive heating uses the building design to capture solar radiation and capture internal heat gains. Passive solar heating is formed by having a well-insulated

envelope with other elements that minimize energy loss and store solar gains for later use.²⁴

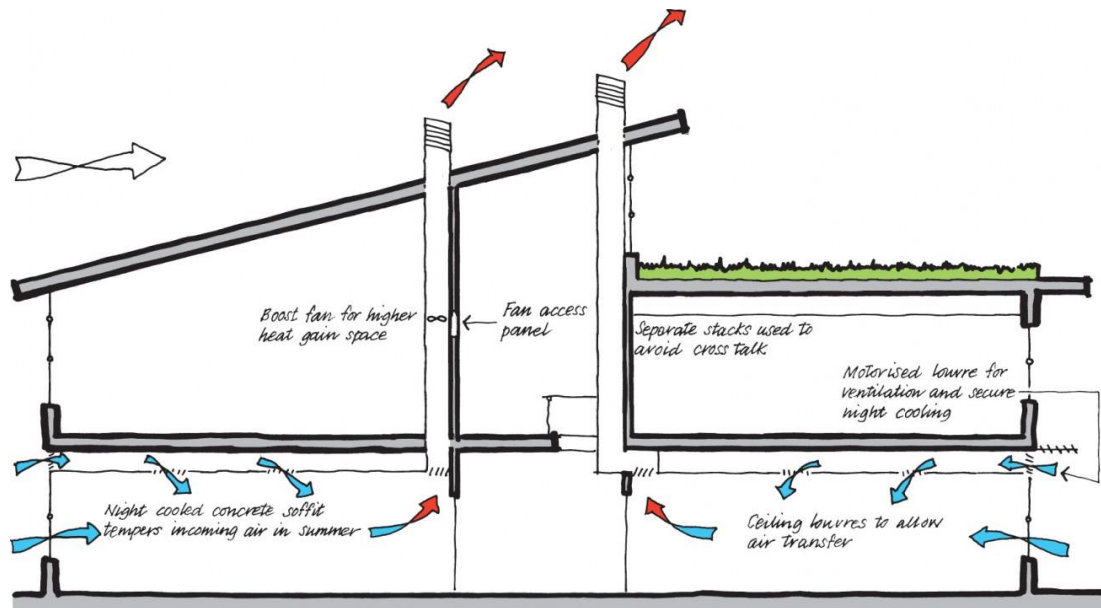


Figure 3.02 – Crossflow and passive stack ventilation, (date). Passivent technical support

Passive Ventilation uses the natural air circulation patterns surrounding the building to capture outdoor air into the desired space.²⁵ The winds caused by air temperature differences can create air pressured spots throughout various occupied spaces. Passive-designed buildings can enhance energy savings by capturing these natural air flows and taking advantage of them. Some examples of passive ventilation include operable windows, building shape, orientation, wind towers, shading, etc.

²⁴ Passive Solar Design, Willams

²⁵ Passivent Support, Passivent

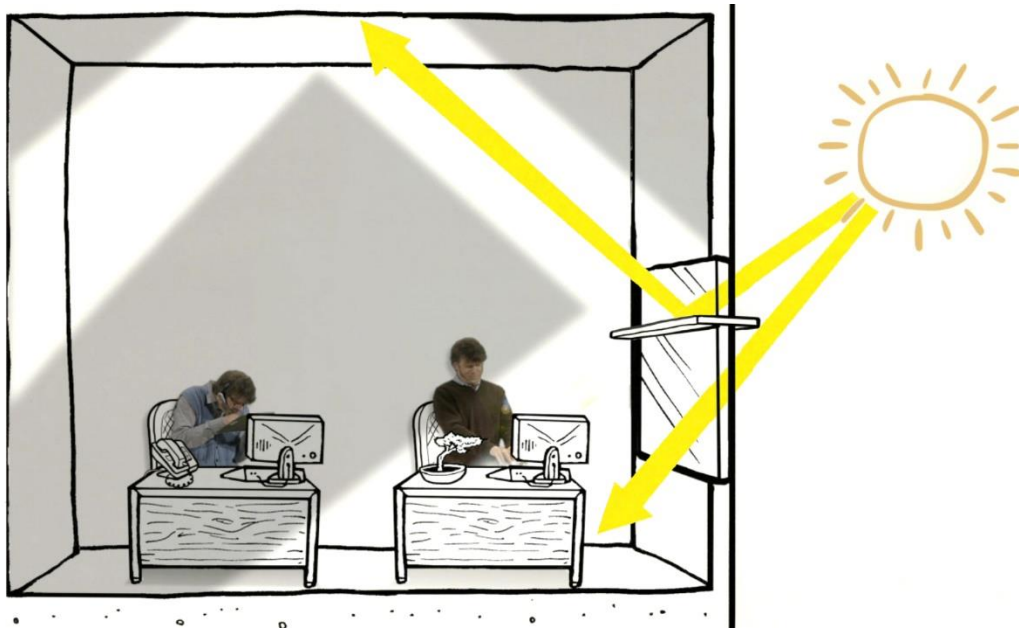


Figure 3.03 – Redirecting light diagram, 2015. Autodesk Sustainability Workshop

Daylighting in passive design strategies is being able to maximize the use and distribution of natural diffused daylight throughout the interior of a building to reduce the use of electric lighting.²⁶ Features that contribute to a successful daylighting strategy include space planning, height ceilings with tall windows, interior surface colors and finishes, light shelves, etc.

Applying these strategies can differ depending on the type of building that it is being used for. Typically, commercial and institutions have higher ventilation requirements than residential buildings. Some strategies for these types of buildings include having air and moisture-tight envelope, as well as having the window-to-wall

²⁶ Daylighting | Sustainability Workshop, 2015

area ratio limited to less than 50%.²⁷ The climate area of the building also impacts what strategies to use because a warm climate needs more ventilation support than a colder climate area. When designing passive buildings, benefits are not seen right away but will have a greater impact on the surrounding environment in the long run.

Biophilic Design

Biophilia is a theory that describes the internal connection between human beings to surrounding nature and living organisms. As research has shown, the human reaction tends to be more relaxed and calm-aware in natural spaces. Throughout an extensive amount of research, Craig Gauden Davis, Terrapin Bright Green, The Salk Institute, and Morgan State University have been able to understand and provide evidence showcasing the benefits that are seen in human performance when in these types of spaces. The biophilic design experiment was conducted on a 6th-grade math class at Green Street Academy and proved to reduce student stress, improve average test scores, and make the learning environment “calmer” and “easier to focus” for students.²⁸

As research began, designers questioned how people could enhance the built environment to improve cognitive performance. This led to the focus of neuroscience which gives a fundamental basis for visual perception, memory, and guided behavior. Neuroscience showcases that the cerebral cortex is the largest anatomical subdivision

²⁷ Buildings Using Passive Design Strategies for Energy Efficiency, 2014

²⁸ Impact of Biophilic Learning Spaces on Student Success, 2019

of the human brain and that one-third of this cortex is the visual cortex. This cortex uses patterns of activity and is the way living organisms can process visual information. Studies also showcased the visual image statistics of the natural world which reveals that it is smoother varying curvilinear contours. This visual study would then be translated from a forest to a classroom, as the visual ease afforded by patterns would let the brain relax and focus on the complexity of academic studies rather than negative environmental responses. Roger Ullrich led the earliest studies of health-related outcomes and biophilia in 1984 where some recovering patients were placed in rooms facing a brick wall while other patients were placed in rooms with a view looking towards trees and shrubs. This study proved to be a success as patients with visual access to the plants were able to recover at a faster pace and used fewer painkillers. The cognitive response also proved to lessen stress which has been proven since the 1800s by Olmsted. Later in the 1990s, Kaplan was able to find out that portions of the prefrontal cortex can quiet down while experiencing nature.

The 3 main implementations that were enhanced in the biophilic classroom were the view of nature, dynamic and diffuse lighting, and biomorphic forms and images. There was also a case study in Baltimore, MD that showcased how green schoolyards became a retreat for stress for students which urged professionals to understand the impact of stress on students' academic performance. The design tactic used in this case study was to place a garden outside of the classroom, which has already been proven to reduce heart rate and blood pressure.



Figure 3.04 – View of Garden, Impact of Biophilic Learning Spaces on Student Success, Patrick Ross Photography

With these plants, animals would be attracted, and this would allow students to take a short break from learning and look outside which would allow them to then restore attention. This proved to be effective as students were able to learn and attain more information. The next design tactic was to create nature-inspired patterns which were placed on classroom surfaces. This prompts student brains to be easily processed and reduces stress.



Figure 3.05 – Biomorphic Carpet Pattern, Patrick Ross Photography

The third design tactic was creating dynamic and diffused lighting which was detailed in various ways. The blinds were replaced with translucent shades which were operated by a solar cell and had imprinted images of tree shadows. This not only helped with natural light coming in depending on the solar amount throughout the day but also provided natural elements that helped reduce stress levels.

Active Learning Strategies

Active learning is defined as a set of strategies that promote students to actively participate throughout the educational environment. These strategies include hands-on activities, brief writing and reading assignments, problem-solving,

information gathering and synthesis, and reflection-based activities.²⁹ These strategies are emphasized by building connections between students and creating new experiences and concepts that are designed to challenge their understanding and develop new skill sets. These active learning strategies include individual and collaborative tasks and allow students to reflect on outcomes as well as share ideas with each other. The benefits of active learning include creating connections and encouraging students to create social skills as well as making effective thinking through analysis. This then prompts the teacher to discuss with the student and allows for better performance on assessments and overall lower failure rates.

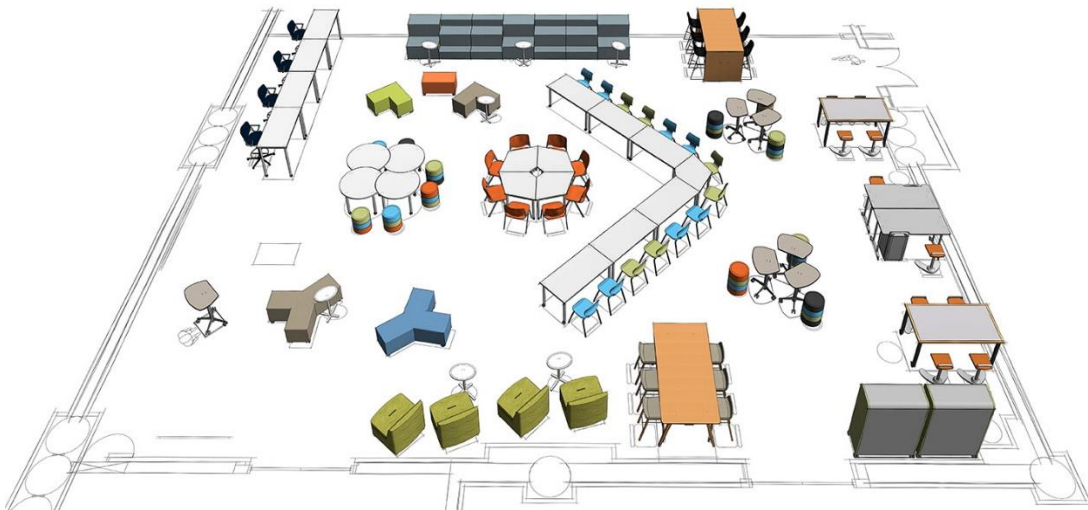


Figure 3.06 – Furniture Safety Tips for an active learning environment, Milius, 2018

Program Design

When designing an Elementary school, one of the first items to look forward to is creating a child-scaled environment. This is the first time a child is

²⁹ Active Learning: Teaching Guide» Center for Teaching & Learning | Boston University

“independent” from their family and depending on the size of the school, can have a daunting effect on students. A strategy used by EEK architects is to reduce the perception of a school which is often referred to as a monolithic and uninviting structure and institution. This can be done by creating environments that familiarize with homes or villages and then establishing them by having the teacher and student build strong relationships. An example of this is looking at a classroom like a house by giving it a “porch” which creates spaces outside the classroom by having tables and chairs outside. This creates space for extended learning in public spaces of the building and has the circulation act as a part of the learning environment. When creating a safe, welcoming, and supportive learning environment, the school design ensures the future of communities by demonstrating that these schools are educating the future generation.³⁰



Figure 3.07 – Design Considerations for a 21st-century classroom, HMC, 2018

³⁰ The Design of Elementary Schools, 2020

The square footage of a classroom is easy to find but the impact that these dimensions of spaces on education efficiency is harder to find without understanding how the classroom is used. Sometimes when a classroom is too small, it cannot accommodate the diversity of activity that larger classrooms can which causes children to not be able to create the same long-term projects that children in larger classrooms could. These spaces also need to be looked at from group learning perspectives, as students would need space to explore their ideas within the group that they are in. The furniture in these educational environments is also something extremely important as it is often misunderstood because the exploration and advancement of educational technology become more actively used throughout schools. There has been a study that ergonomic school furniture only fits 10% of students and 90% of students sit in chairs and tables that are too high or low for them. While ergonomic absence is typically due to financial issues, students have proven to learn and create more when in a relaxed state which can alter when they are not in a comfortable chair or table. Other furniture like bookshelves and cubbies also play an important role as it helps create distinct active centers. This flexibility allows and enables the teacher and the class to reconfigure classroom spaces to suit various activities and spaces. These spaces can be used as block areas, dramatic play areas, writing centers, and science and art. These spaces give the ability for students to change postures and positions to be able to learn and retain information, which leads them to learn at a more effective pace.

Sounds and color may seem subliminal but are equally important when designing classroom and learning spaces for students. Studies show that the ability to hear is one of the most critical performance abilities for a successful learning environment. Learning spaces must have a “signal to noise ratio”, which is the ability of teachers, students, and other media to be heard while controlling background noises and reverberation. The American National Standards (ANSI) published standards that define the maximum desirable background noise at levels of 35 dBA and a reverberation time of 0.6 to 0.7 seconds in core teaching environments. The sound transmission class (STC) has also specified various measures to ensure appropriate separation from adjacent sources of noise although exterior noise is often the most difficult to control, especially in an urban site, which often requires a greater performance and design in window and wall assemblies.

School	Number of Students	Number of Classes	ratio Student/class ratio	LAeq (30min) in during class time (dB)	LAeq (30min) in during recess time (dB)
1	205	10	20.5	64.08	76.6
2	201	9	22.3	58.8	71.67
3	414	14	29.6	72.3	84.4
4	480	15	32.0	61.9	82.69
5	366	12	30.5	63.8	78.88
6	343	14	24.5	61.8	81.25
7	200	8	25.0	68.8	79.9
8	402	15	26.8	62.3	74.6
9	250	9	27.8	65.6	79.3
10	324	12	27.0	65.5	79.8
11	401	14	28.6	70.7	87.4
12	348	14	24.9	68.9	85.1
Mean	327.8	12.2	26.6	65.4	80.1
SD	94.0	2.6	3.4	4.1	4.5
Max	480	15	32.0	72.3	87.4
Min	200	8	20.5	58.8	71.7

Figure 3.08 – Characteristics of schools with a level of equivalent sound pressure

level, researchgate

Studies of colors showcase those certain colors affect physiological changes in blood pressure and the performance of specific types of tasks. A study in 2009 by Meththa found those red influences higher performance on detail-oriented tasks and blue influences higher performance on creative tasks. As for design, being able to focus on the location of various colors helps reduce glare and eye strain. Other design tactics include applying color to three walls and another color to a single wall will reduce visual monotony in a learning environment. The ceiling can also be used to create an opportunity for suspending artwork or curtains from a grid and with technological advances, create experiences from above.

Staff Friendly Environments

Designing not only for students but for teachers and faculty is immensely important as teachers need spaces to interact with each other and students as well as enjoy what they are doing. Benefits for teachers are just the first step to a better working environment. The first step of design for teacher-orientated spaces can start with spaces that allow faculty to express themselves and their interests. For example, movable furniture can allow faculty to arrange their offices to showcase their culture and personalities. Natural light in these spaces can also create relaxed working environments.

Technology

As technology continues to advance, there is an inevitable implementation that continues to push forward in learning environments. In the year 2020 of the

COVID pandemic, there was a massive transition in the learning environment with zoom, which showcased that technology can be used to teach despite some of its flaws. Designing schools that adapt to technological advancements need to be learned in all learning environments as some spaces become irrelevant to the latest innovations. These spaces need to be flexible environments that can change into other areas without immense renovation. With, as technology becomes more mobile, classes should provide furniture that accommodates the use of laptops and other technologies. These technological advances to having outdoor activities while also learning what is on “screen”. Personalization of spaces in the learning environment through 2 and 3-dimensional displays also works for learning as technology allows for walls to be used as productive areas of learning.



Figure 3.09 – Education by Design: Challenging the traditional definition of learning space, National Education Association

Security

Security in learning environments is crucial for stress-free education. Being able to create safe and secure environments requires the consideration of intruders and bullies. The first tactics that come to play for adding security are video cameras, magnetometers, x-ray machines, etc. Although these tactics work at times, design ideas are also able to take advantage of more productive strategies toward a stronger learning community.³¹ For example, a single, clear front entry point where administrators can look at the outdoor entry space. The reception area can also be designed to become open and welcoming, which makes immediate contact with arriving guests.



Figure 3.10 – Safe School Design, SMMA

³¹ The Design of Elementary Schools, 2020

The other sense of security that occurs is bullying, where spaces are usually not seen by adults. Design can intervene by organizing a series of spaces that encourage greater interaction with students and adults, which reduces potential bullying. Another design opportunity to reduce bullying is the use of transparency that eliminate areas where students are out of sight. Security can also be created by involving the community and bringing more “eyes on the street”. The way this can be achieved is by offering zones of the school as a community center for afterschool hours. These multiroom spaces and events offer a strong relationship with the community and its school, which in turn keep property active more and with active districts, there tends to be less crime due to the limit of unused spaces.

Chapter 4: Educational Environments

Avenues: The World School

Avenues, The World School is a project located in New York City and was introduced as a global project for students with the same curriculum. The developer wanted to create an educational environment that supported its curriculum and provided a high-performance learning area for the 21st century.³²



Figure 4.01 – Avenues New York, Avenue, NY

³² Avenues: The World School, Perkins Eastman

When first looking for a potential site, the client had trouble finding a vacant lot because of the high density in the area, but then decided to look into existing office spaces. Once the client had a site, they contacted Perkins Eastman to begin designing, and with this type of space, some design challenges came with the previous warehouse. The vertical circulation was not adequate for a school environment and the first floor was a loading dock. The two spaces that sought the most design challenge were the theater and the gym. The gym was placed on the top floor so several columns could be demolished, and a higher roof could be built. With 10 stories, there was enough room for the proposed 1600 students. This precedent can showcase how adaptive reuse buildings such as a warehouse, in a highly dense urban area can work despite their design and site challenges. The ten-story building was able to function as a school by careful planning within existing condition limitations.

BASIS Independent School

BASIS Independent School is a project located in McLean, Virginia, and is part of a growing national network of independent schools. For this design, the client purchased a former vacant corporate headquarters campus in Tysons Corner. This educational building would facilitate its adaptation of a reused building and create an environment for STEM-focused, liberal arts programs.³³

³³ National Network of Prek-12 Private Schools | BASIS Independent Schools



Figure 4.02 – Exterior, Basis Independent Schools

Different programs in this building were placed around the atrium, which became the heart and central space around the school. During this design, Perkins Eastman faced some constraints which included egress capacity and building codes for the occupant load of a school. The previous HVAC system was also changed to meet school demands and stairs were added to provide convenient transitions between classrooms. In addition to the prominent entry space, a vestibule was added to allow for oversight of visitors to the school. The client was also able to work with the local parks department and allow for school daytime use of fields across the street which became a partnership.

Discovery Elementary School

Located in Arlington, Virginia, Discovery Elementary school opened in September 2015. The school was designed by VMDO Architects and was one of the first Net Zero Elementary schools in the United States. Its size is 98,000 SF and it houses around 600 students. While this school is not an adaptive reuse building, It is a great case study because of its focus on performance and engaging students in what VMDO says is “building as a teaching tool”. This project was the first school to receive the U.S Green Building Council’s LEED Zero Energy certification and demonstrate a net positive energy balance.³⁴



Figure 4.03 – Discovery Elementary School, VMDO Architects

³⁴ *Discovery Elementary School, VMDO Architects*

The site is located near the nation’s capital, Arlington County which is one of the fastest-growing counties in Virginia. This school shares the site with an existing middle school and goes into an existing hill. The name of the school was chosen by the students and reflects the forward-looking, learning base that takes place in this environment. The name also reflects John Glenn who lived nearby and was the first American to orbit the earth in 1962. The design of the school takes advantage of the topography of the site and creates academic zones and separates exterior play spaces for different students in grade levels. The public spaces were designed to have a large roof canopy that is the length of the school and acts as a front porch to the building. The main entry features a canopy with an oculus which allows the entry to become a solar calendar that indicates the time of day and year. Various light designs were implemented to help students with ongoing experiments. The use of colors also comes into play on different sides of the school to represent different natural expressions, such as the moss that grows on the north side of the trees.



Figure 4.04 – Exterior Façade, Discovery Elementary School, VMDO Architects

VMDO also organized the school's programs by reflecting on each grade's expanding curriculum and identity. As students advance throughout school, their environments expand. An example of this is the first floor having a theme around animals found in the earth ecosystems and the second floor themed around the elements of the heavens. This story is reinforced by graphics along the entry walls on each grade level. This school can inspire students and faculty to use the building to their creativity to learn and explore with engagements of support at different scales. This school offers different furniture and two-story slides that encourage creative expression and choice. There are also foldable partitions and one on one technology that enables research and collaboration to happen in various spaces. Interactive dry erase and magnetic walls encourage students to express themselves. With these design tactics, students are allowed to experience their school as a living laboratory and are encouraged to understand the earth and their community.³⁵

Throughout all these three precedents, each has shown an immense level of detail that coincides with their site and building strategies to enhance learning in different environments. Each precedent had design challenges that came with either the building or the site and its community, but the design tactics that were used proved to showcase how architecture can solve and create amazing learning environments. The proposal for the existing site will take design tactics and site

³⁵ *Discovery Elementary School, VMDO Architects*

information and challenges from all three of these case studies and apply them to the site in Washington DC where an existing public office building with being converted into an adaptive reuse school that will solve its design challenges of a heavily dense urban site environment as well as provides areas that encourage students to enhance their learning by different levels of details at different scales.

Chapter 5: Potential Site Selection

Site Matrix

Selecting a site became critical for how the design of an addition or full redevelopment of a school was going to begin. The selection of a site would also give access to begin looking at environmental and community concerns and who the design environment was going to impact. A site matrix was created that would compare 3 existing elementary schools and evaluate them by giving them a grade. These grades were given and created by a set of factors that would heavily impact the design proposals moving forward.

SELECTION MATRIX	East Silver Spring Elementary, Silver Spring, MD	Dorothy Height Elementary School, Baltimore, MD	Whittier Elementary School, Washington, DC
Neighborhood Safety	N/A	N/A	N/A
Teachers	39 +	24 -	42 +
Diversity within Community	82.5% Minority +	98% Minority +	55.2% Minority +
Satisfaction with existing conditions	3 Rating +	3.3 Rating +	3.2 Rating +
Number of Students	497 +	341 +	365 +
Parks within the area	4 +	5 +	2 +
Walking distance to potential sites	10-15 min +	15 min +	15 min +
Student to Teacher Ratio	13:1 +	16:1 +	17:1 +
Schools within a Districts	128 -	103 +	37 +
Income levels	50% Economically Disadvantaged students +	69% Economically Disadvantaged students +	35% Economically Disadvantaged students +
Light and air	N/A	N/A	N/A
Public Bus Stops Nearby	10 min walk from school +	2 min walk from bus stop and 15 min walk from train station +	2 min walk from bus stop and 15 min walk from train station +
Quality of Commute	N/A	N/A	N/A
Available Square footage	57,093 SF +	64,238 SF +	89,252 SF +
TOTAL	10	10	11

DARYL VARGAS

ARCH 797 - SELECTION MATRIX

PROFESSOR TILGHMAN

Figure 5.01 – Initial Site Matrix, By Author, 2022

While the candidates above worked on addition and/or a full remodification, the idea of adaptive reuse soon became as important as the idea of enhanced learning as major concepts of this thesis started coming together. As cities and communities shift over time, properties lose life expectancy value, and few efforts are made to maintain office buildings. Therefore, while the selection matrices stayed the same to allow for a selection of a site to be made, two other candidates were added to the list that were existing office spaces. However, both sites had to be government-owned since the school is supposed to be public. Most of the precedents were private adaptive-use buildings because of who owned the site, which was an opportunity to look for government-owned businesses in low to medium-income areas which would allow for the adaptive reuse building to become a public educational institution.

Whittier Elementary School

J.G. Whittier Elementary School is located on 5th St in Washington DC and houses around 365 students per school year. It is a 3-story existing school building that is adjacent to a high school and is a 16 min walk from Takoma metro station. The building itself has not been cleaned or remodeled for a while.



Figure 5.02 – Exterior Photo, Google Images

The school has open courtyards and a garden space which allows for the school and community to work together and grow local foods.

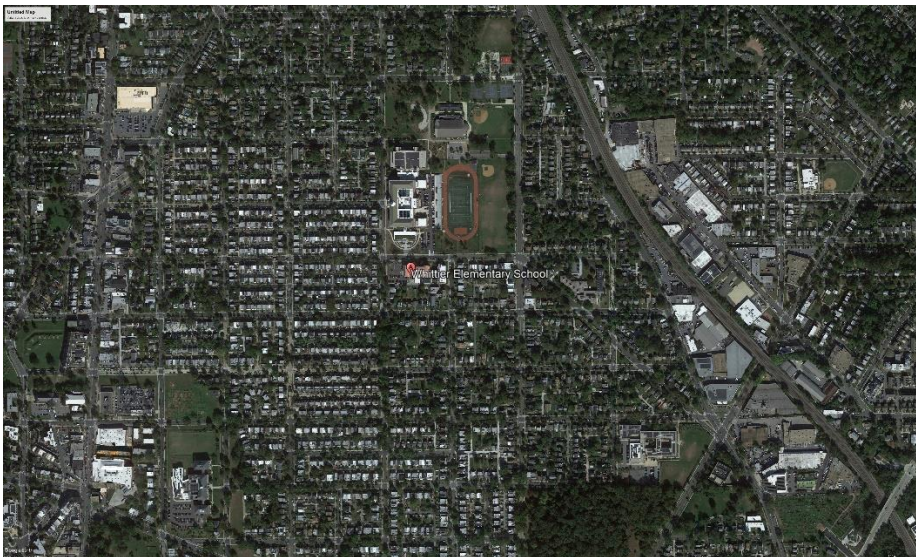


Figure 5.03 – Site Plan, Google Earth Pro

District of Columbia Housing Authority

The District of Columbia Housing Authority sits on North Capitol St in Washington DC and is an independent government agency that provides affordable housing for its community. It is a 3-story building that was founded in 1934 and is about a 12 min walk from the NoMa-Gallaudet U New York Ave metro station. In some areas of the building, it seems like the stone has been repaired or repainted.



Figure 5.04 – Exterior Photo, Google Images

The building itself is deteriorating on the sides and needs to be fixed on the side of the ramp. The site also offers green spaces and front, back, and side parking as well as a rooftop area. The building itself is not open to the public and has around 13000 employees. It has a good amount of security on the exterior as well as the interior.



Figure 5.05 – Exterior Photos, by author, 2022

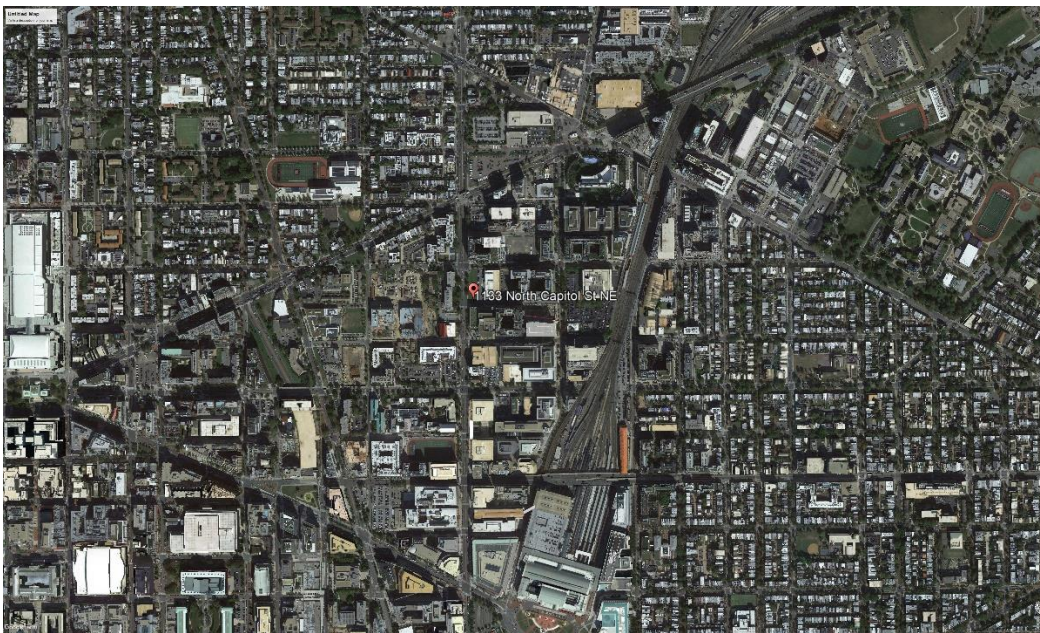


Figure 5.06 – Site Plan, Google Earth Pro

DC Housing Finance Agency

The DC Housing Finance Agency is located on Florida Ave in Washington DC and is a commercial and mixed-use typology area. This building is a 4-story building that has private office spaces above and gathering spaces on the first floor. The building is closed to the public and has various types of security measures to protect its tenants. It has its private garage as well as various means of egress.



Figure 5.07 – Exterior Photo, Google Images

The building offers different open spaces as well as a unique building shape which offers the opportunity to play around with shape and space typologies.



Figure 5.08 – Interior Spaces, by Author, 2022

Chapter 6: Design Solution

Introduction of Design Tactics

As the cities and communities change over time, the use of office space buildings shifts towards newer ideas which leave older buildings to be torn down or abandoned. While the term adaptive reuse buildings are not new, the strategy to reuse buildings for enhanced learning environments is. The idea is to not only use an existing building and convert its building typology but to establish a set of principles that allow vertical urban enhanced education to become more socially accessible in the years to come. The use of design tactics is a set of ideas that allow this type of education to be possible because not only does it challenge traditional educational design, but also creates an opportunity for the younger generation to themselves into their urban communities while also enhancing how these students learn in their educational environments.

Site Context

While all site previous were great options, 999 E St NW, Washington DC was able to give information based on the building that was crucial in the development of the project. The current diagram showcases the proposed site which is in Ward 2 of Washington DC in the intersection of 10th and E ST NW.

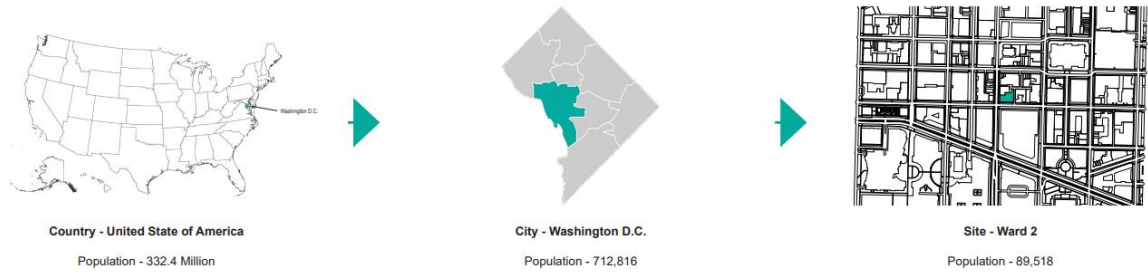


Figure 6.01 – Site Location Diagrams, by Author, 2022



Figure 6.02 – Initial Site Plan, by Author, 2022

The current building sits within a commercial district that has some amenities that let this neighborhood light up with activities for people of all ages.

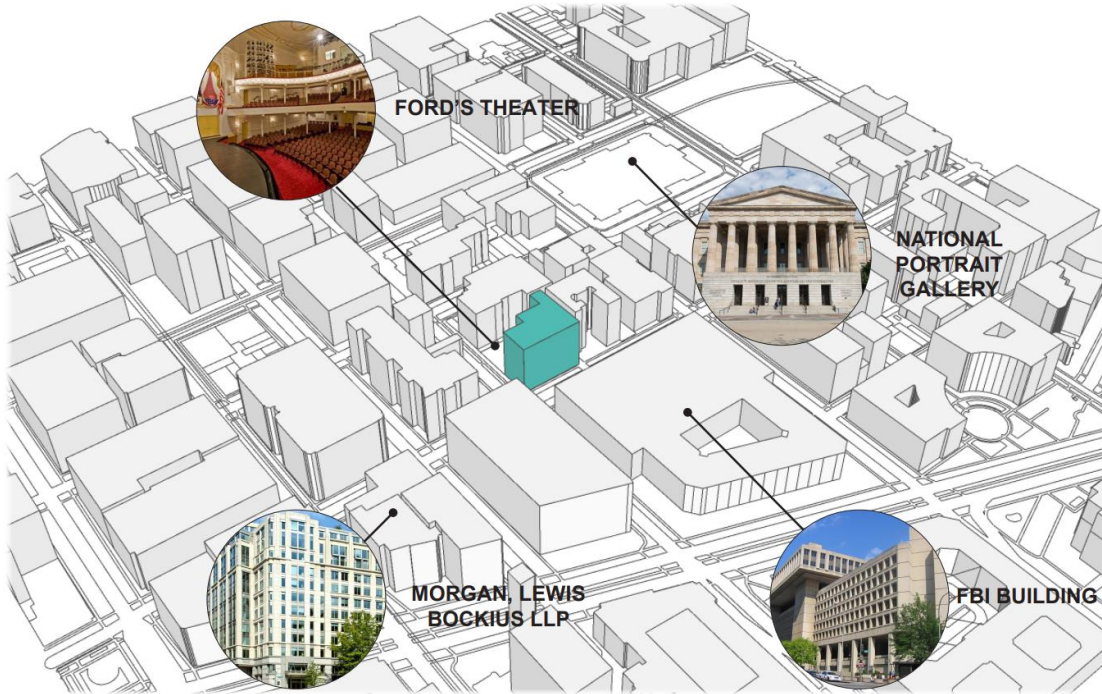


Figure 6.03 – 3D Axon of Site, with images from Google Images, by Author, 2022

Opportunities

The current two problems addressed in this thesis first of all is the continuing Office Vacancy not only in Washington DC but throughout the Country, which rose higher than expected when the pandemic hit in 2020. During the same time, schools have changed with the help of technology and have shown that they must adapt. In the year 2022, Both math and reading scores have lowered throughout the nation. With both issues at hand, there is a common opportunity for improving education and reducing vacancy rates. We live in a unique time, have an opportunity to inhabit our cities in different ways, and schools are part of that.

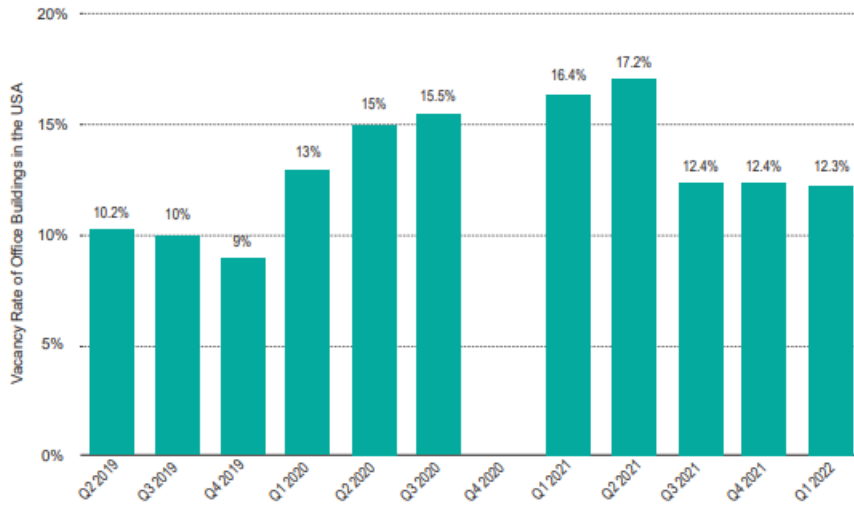


Figure 6.04 – Office Vacancy in USA, Data from Statista, by Author, 2022

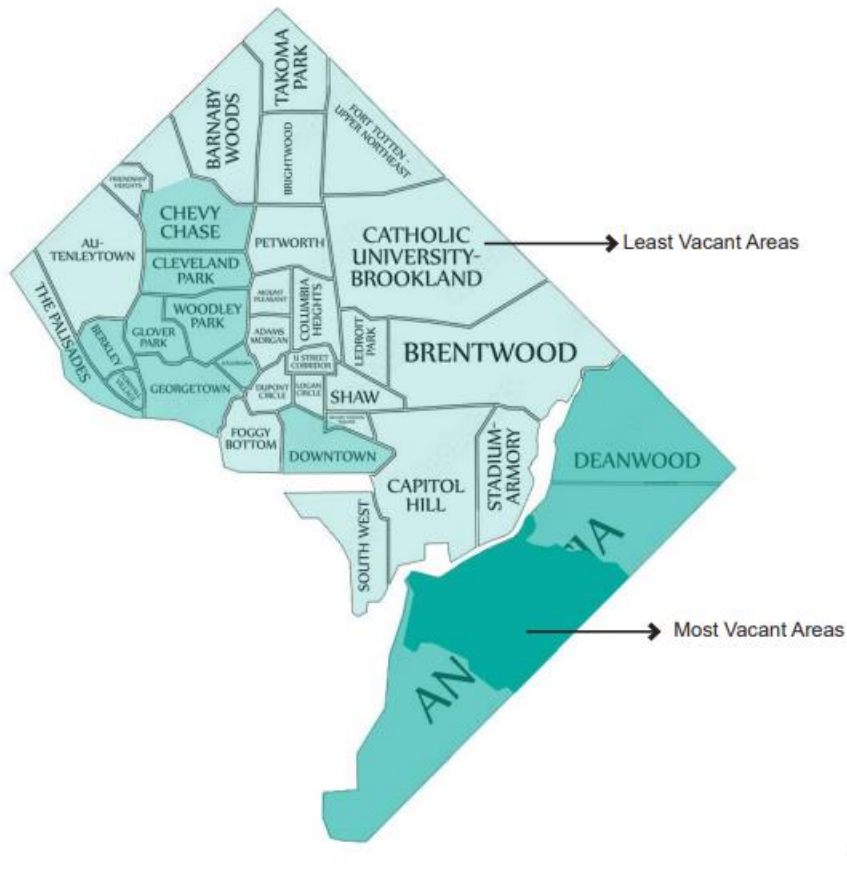


Figure 6.05 –Vacancy Diagrams in Washington DC, by Author, 2022

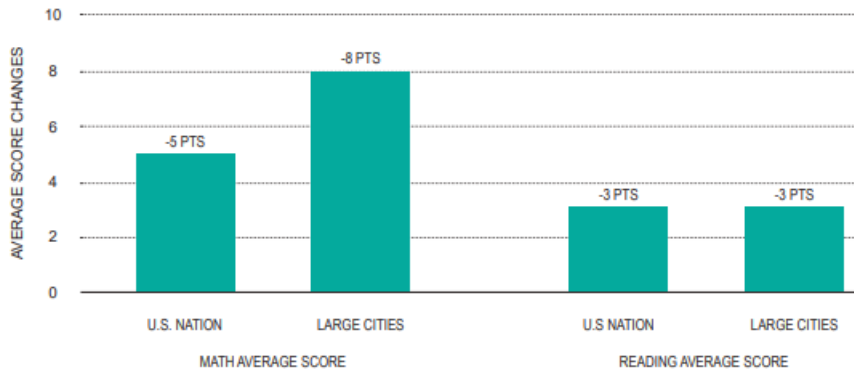


Figure 6.06 –Learning Models, by Author, 2022

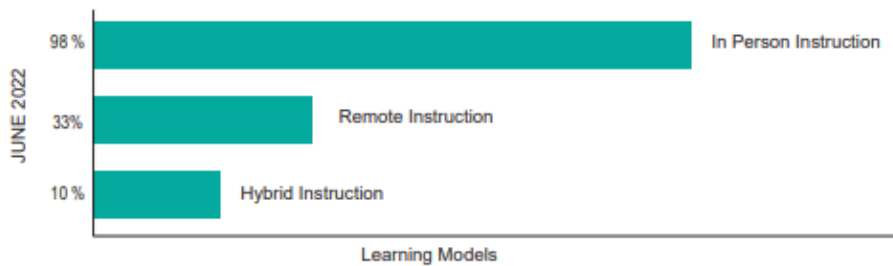


Figure 6.07 –USA Report Card, by Author, 2022

School Issues

Overall school issues demonstrate that educational institutions need to design to improve safety from both external threats as well as internal bullying that may occur due to poor design strategies. SMMA looked at designing safer school strategies. There is also the issue of how to design vertically for educational spaces. There is also a design issue that needs to be addressed which is the different design techniques for different grades. Since this is an elementary school, kindergarten students need to have a different approach than older students. Due to the building form itself, there also needs to be an approach for how natural ventilation and sunlight enter spaces.

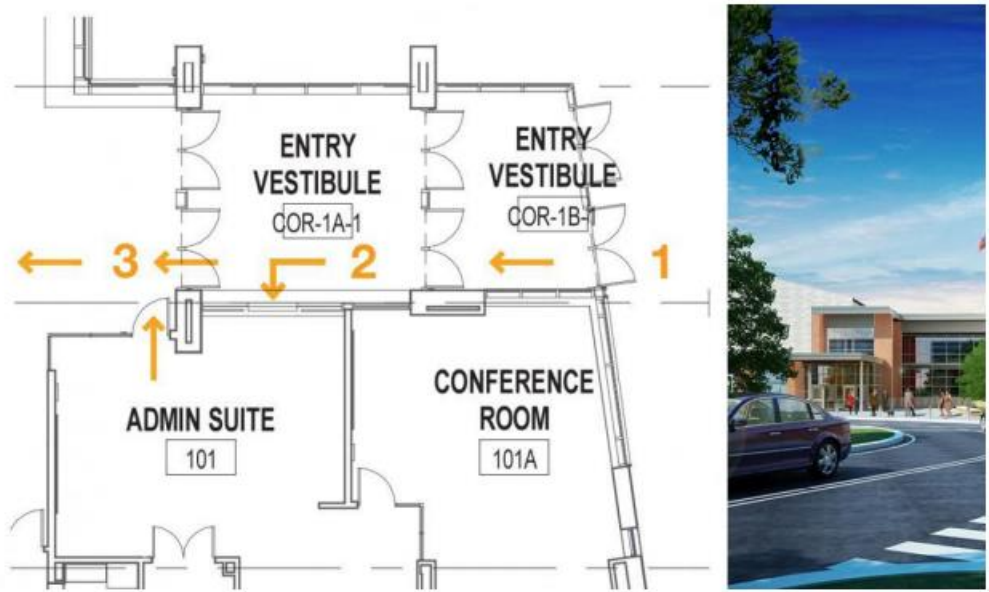


Figure 6.08 –Designing Safer Schools, SMMA, 2022

DESIGN VOCABULARY

<p>1 Break the Stack to foster open learning environments.</p>		<p>From Visual to Physical Possibilities include: interior windows, staggered levels, double and triple heights, networks of spaces.</p>
<p>2 Offer Soft Thresholds to learn from the city and contribute to the local community.</p>		<p>From Public to Private Possibilities include: urban porches, shared courtyards, canopies, operable elements, elevated terraces and lanais, shared rooms.</p>
<p>3 Hike the School to encourage exercise and promote health and wellness.</p>		<p>From Static to Dynamic Possibilities include: spaces for lounging, playing, walking, running, climbing, etc.</p>
<p>4 Multiply Outdoors to allow learning and playing both inside and outside</p>		<p>From Seeing to Feeling Possibilities include: courtyards, permeable walls, planting terraces that will allow sunlight, breezes and rain.</p>
<p>5 Be Public Space by mediating between the public and the private and adding to the designed public space of the city.</p>		<p>From Passive to Active Possibilities include: interactive and projection facades, through-fares, satellite structures and playscapes.</p>

Figure 6.09 –Design Elements for a Vertical School, UHCDC, 2022



Figure 6.10 – Elementary School Classrooms, Google Images, 2022

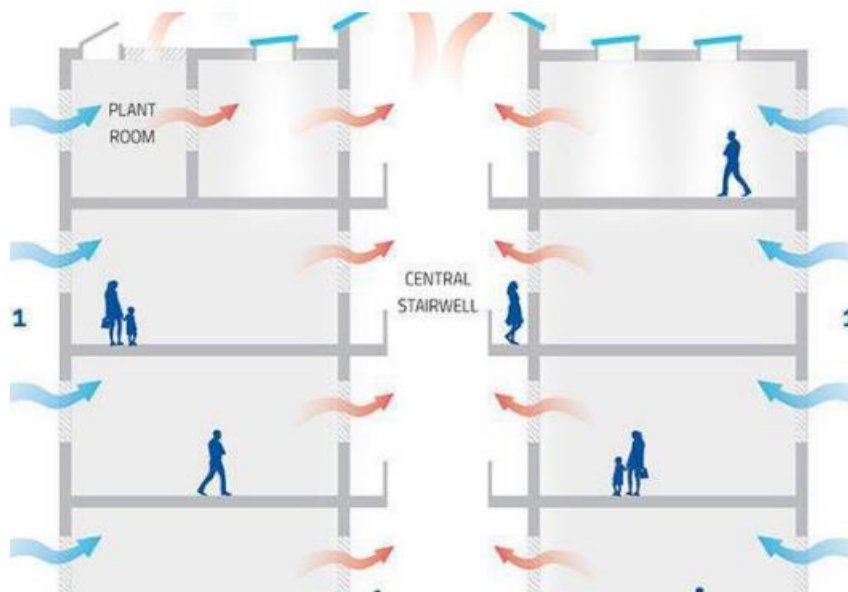


Figure 6.11 –Natural Ventilation in High Rise Buildings, by Google Images, 2022

Site Analysis

With all these design strategies being thought about, the first scale to look at this project was from an urban scale. This site offers opportunities for public transportation as

well as various districts within walking distance. This site also has a residential zone to the north of its mixed-use district which opens the opportunity to think about what the city could shape into. The existing neighborhood is currently evolving into a livable neighborhood that people will increasingly move in to and the existing surrounding amenities like the landmarks, museums and markets offer it that opportunity. With neighborhoods shaping to this, schools would need to be implemented to create a sense of community and provide a change in how cities work based not only on business but social and family life.

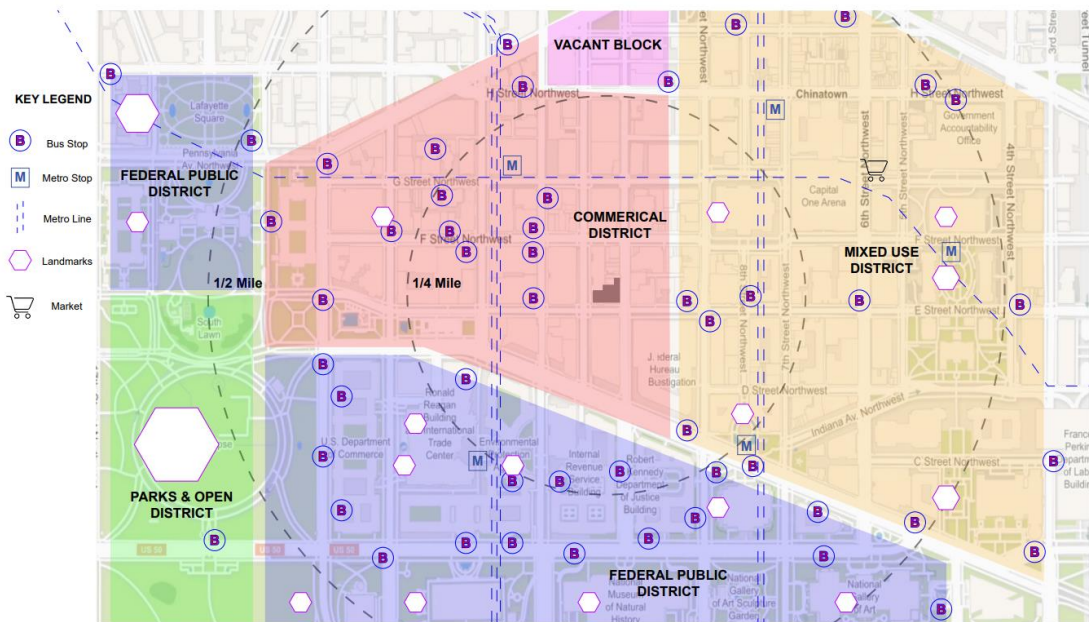


Figure 6.12 –Site Analysis Diagram, by Author, 2022

Zooming into the building itself and its conditions, most of the building is vacant in its higher levels except at the western part of the ground floor which hosts a 2-story restaurant. This space is highlighted in gray and goes to show that this building is not fully vacant and has a bit of constraints. The plan also shows its existing column grid.

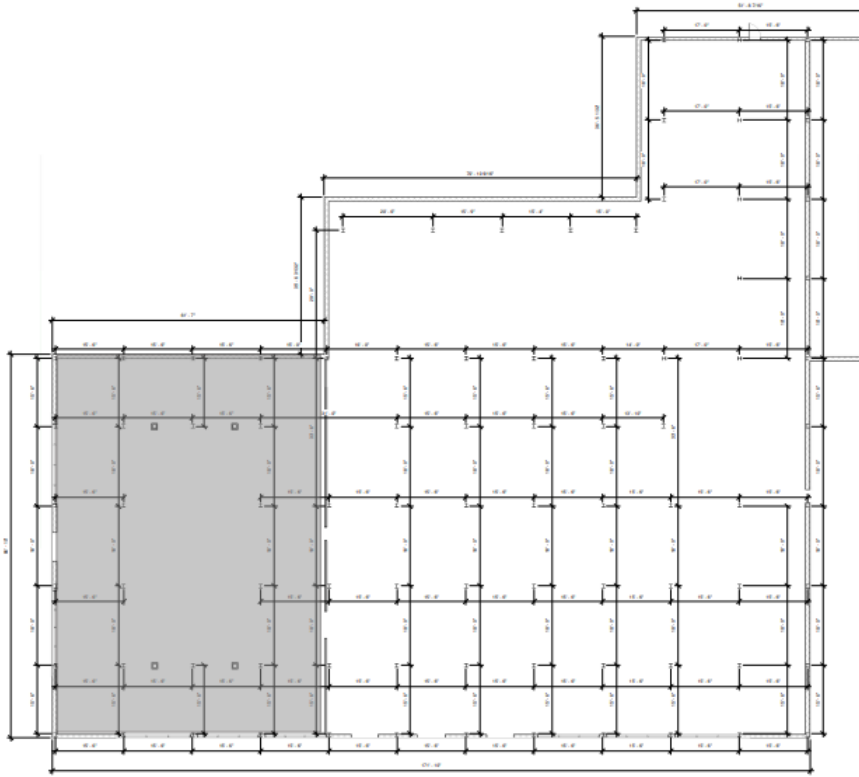
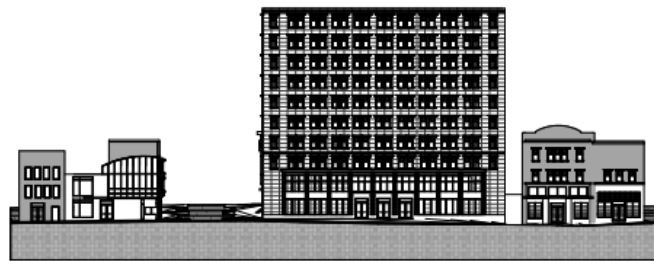
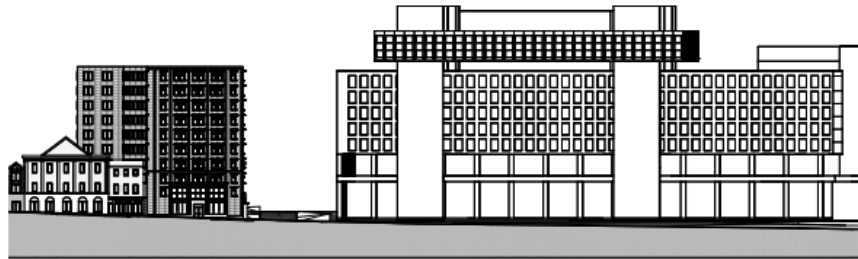


Figure 6.13 –Existing Building Plan, by Author, 2022



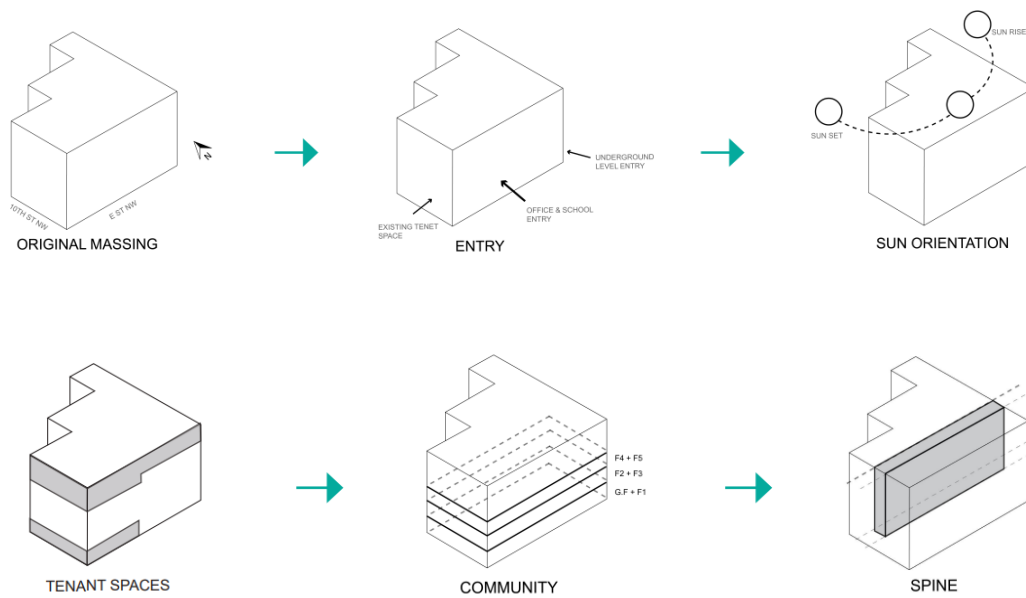
Existing (South) E St NW Elevation



Existing (West) 10th St NW Elevation

Figure 6.14 –Existing Elevations, by Author, 2022

Next would be to begin the massing of the building and then understand the existing entrances available. After that, solar orientation was looked at to see best positionings for classroom layouts. tenant spaces were highlighted and planned out. The existing tenant space on the ground and first floor was designed to be kept and proposed tenant spaces above the school space were designed since the sq footage of the school wouldn't take up all the building. Next up was breaking up the school levels into communities for the different age groups and programs. 3 communities were created every two floors. Following the Design vocabulary for vertical design, a spine was extruded from the middle of the massing to create a centralized vertical circulation experience. This spine also offered the ability for ventilation and natural sunlight to come in. It also created a separation of space where two different learning areas could be placed on either side. Other extrusions were made to plan out how more sunlight could enter and establish areas that would be used from the program.



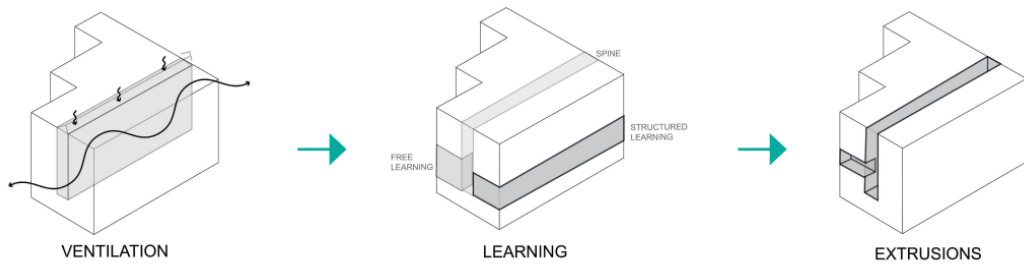


Figure 6.15 –Building Massing Diagrams, by Author, 2022

Initial Diagraming

Parti diagrams were then created to understand the space via plan. The upper floor parti would then offer the ability to break up the structured classrooms facing E St. Vertical circulation then used the spline in the middle as well as fire stairs at each end.

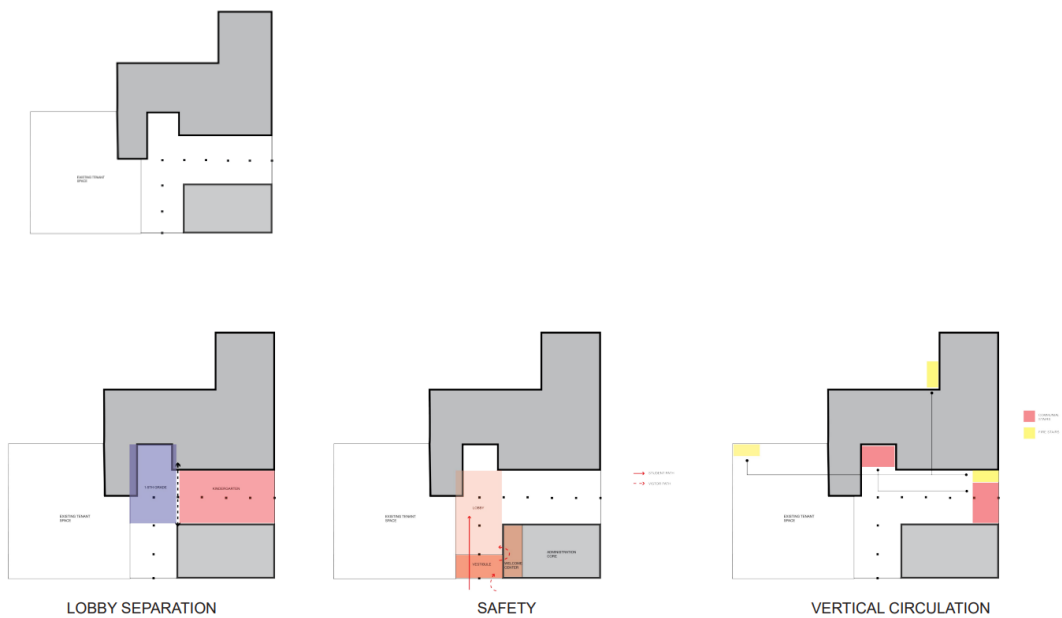


Figure 6.16 –Lower Floor Diagrams, by Author, 2022

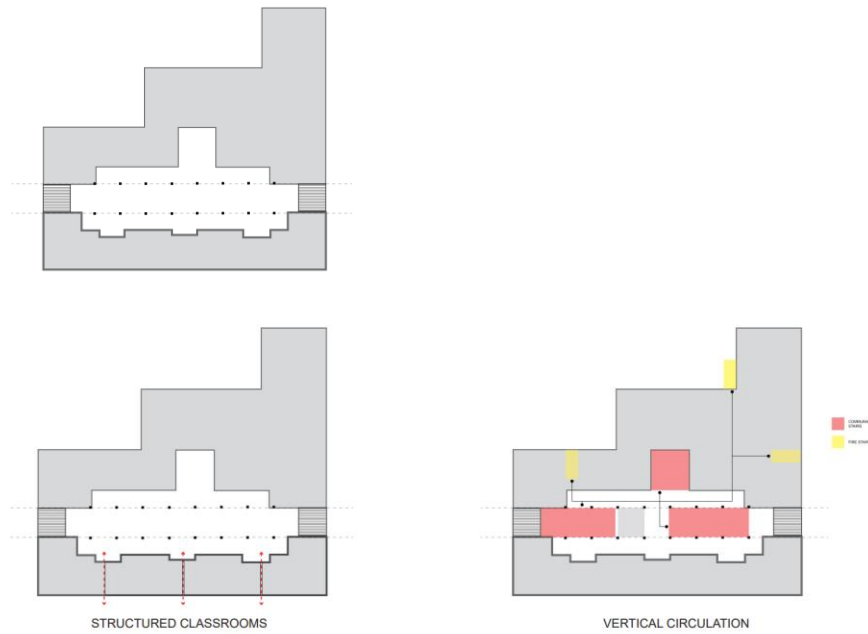


Figure 6.17 –Upper Floor Diagrams, by Author, 2022

Moving on, diagramming these in sections would aid in being able to understand how the spaces would feel and what moments could be created. It also helped understand where these independent learning spaces would be placed and the spatial difference between them and the structured learning environments. The extrusions from each end of the spine would also allow for garden spaces on those ends. The communities would then take a different color and shape to help establish itself and its grade levels.

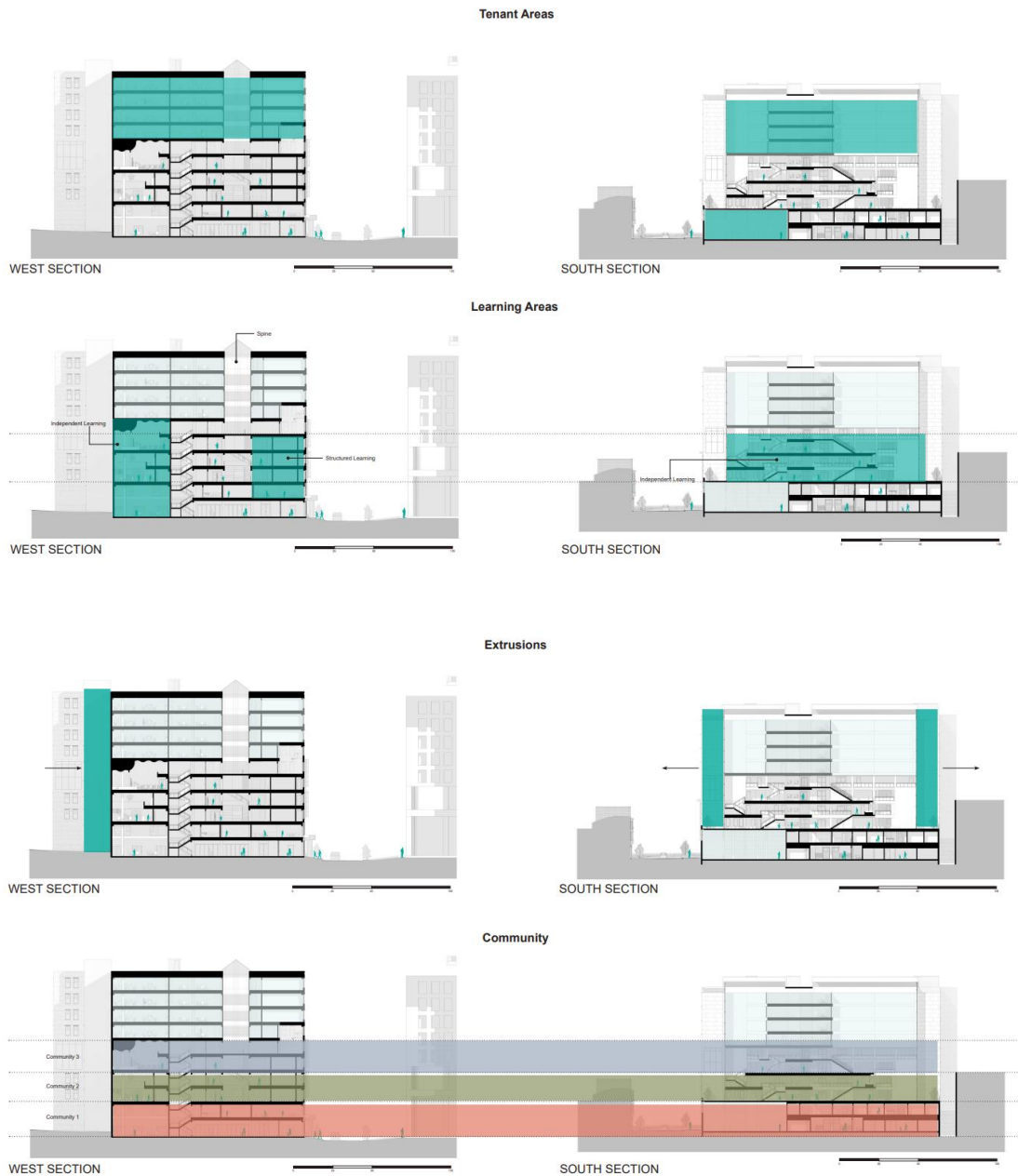


Figure 6.18 –Sectional Diagrams, by Author, 2022

After these initial ideas in both plan section and massing, next was to break each floor up into conceptual areas that would follow the DC Ed Spec program for 400 students. The administration would be towards the front for safety purposes and the cafeteria would be in the back for service purposes. Moving along, kindergarten

students would have their own dedicated space in the first floor and 1-5 would continue moving up to floors 2-5 which would allow double height spaces to continue in the floors up above and be surrounded by building services and other programs. The next step that was taken was to begin sketching out how these moments would feel like in perspective and section.

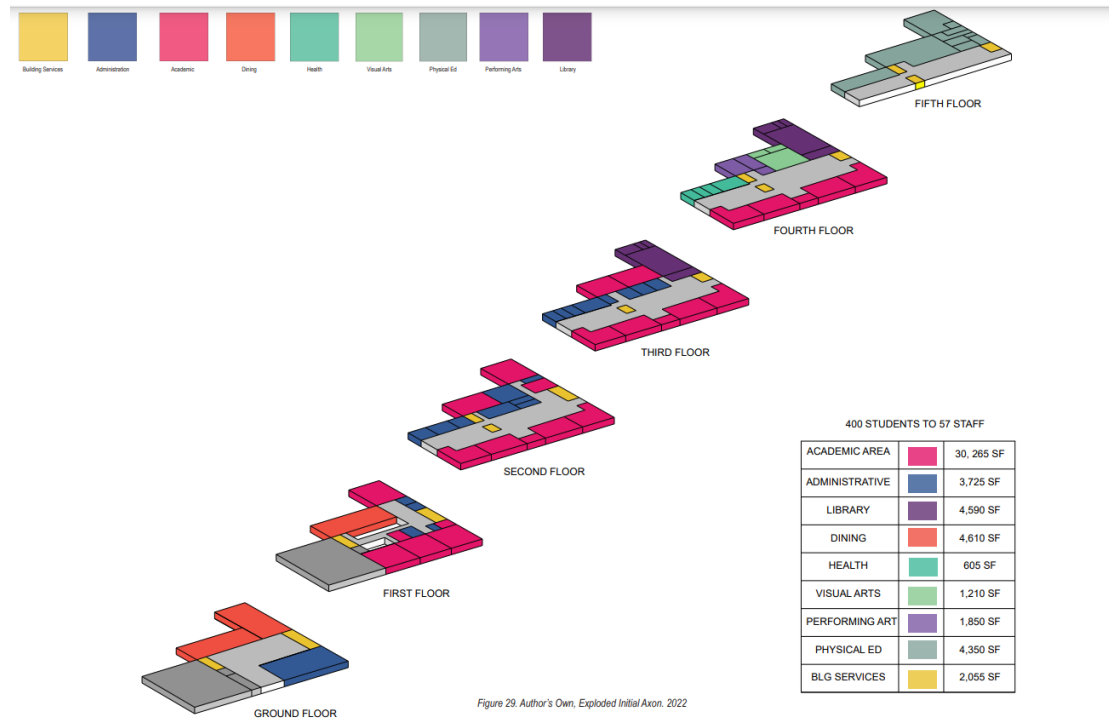


Figure 29. Author's Own, Exploded Initial Axon. 2022

Figure 6.19 –Exploded Initial Axon, by Author, 2022

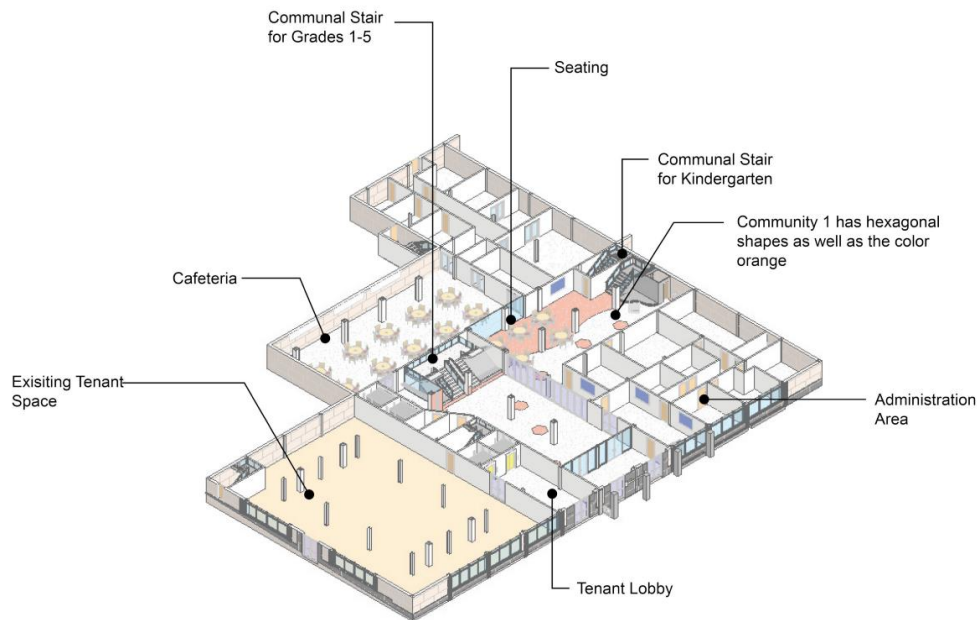


Figure 6.21 –Ground Floor, by Author, 2022

The first floor would then host most of its classrooms facing E st and have a mezzanine looking down at their lobby. The cafeteria will expand into a two-story community area. The axon also showcases the “porches” created outside of

classrooms to offer parents the experience of dropping their children off right in front of their classrooms.

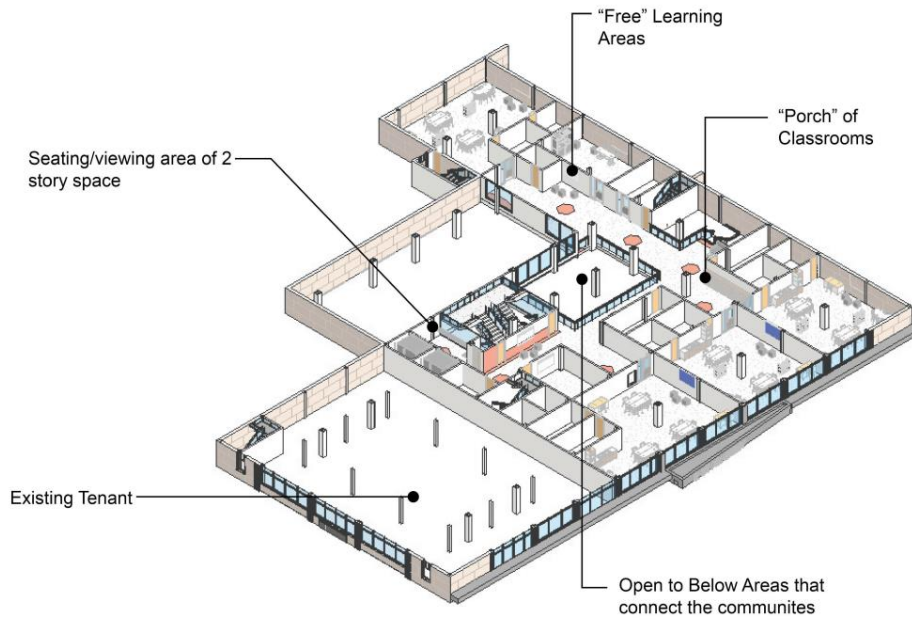


Figure 6.22 –First Floor, by Author, 2022

The second floor then showcases the beginning of the spine as well as independent learning areas inserted in between classrooms. The color and shape of this community is a green square and that can also be seen within the walls and floors. This community also offers a 2-story library which sits toward the back of the building.

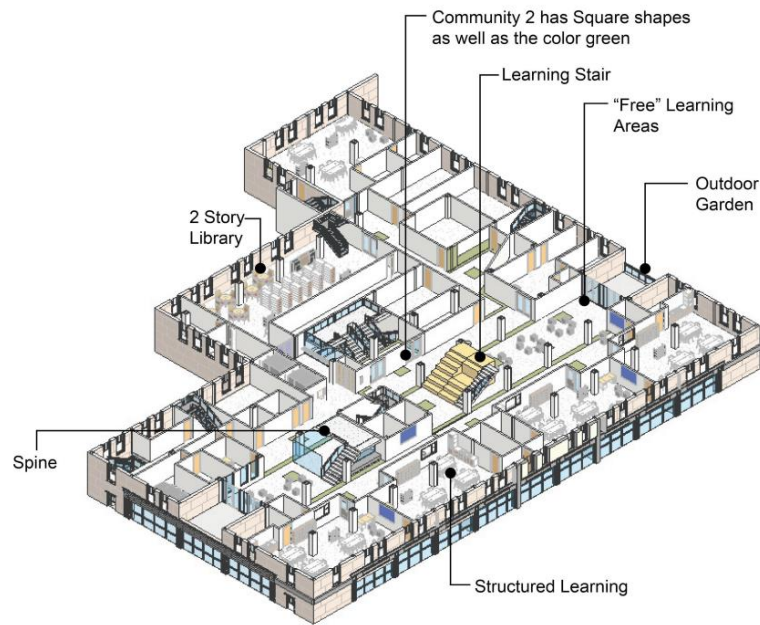


Figure 6.23 –Second Floor, by Author, 2022

The third floor continues the color and shape of the community and offers a slight change in vertical circulation with the spine to showcase a shift of community. The initial staircase for students still stays intact but the various forms of circulation give the student the freedom to pick how they circulate throughout space.

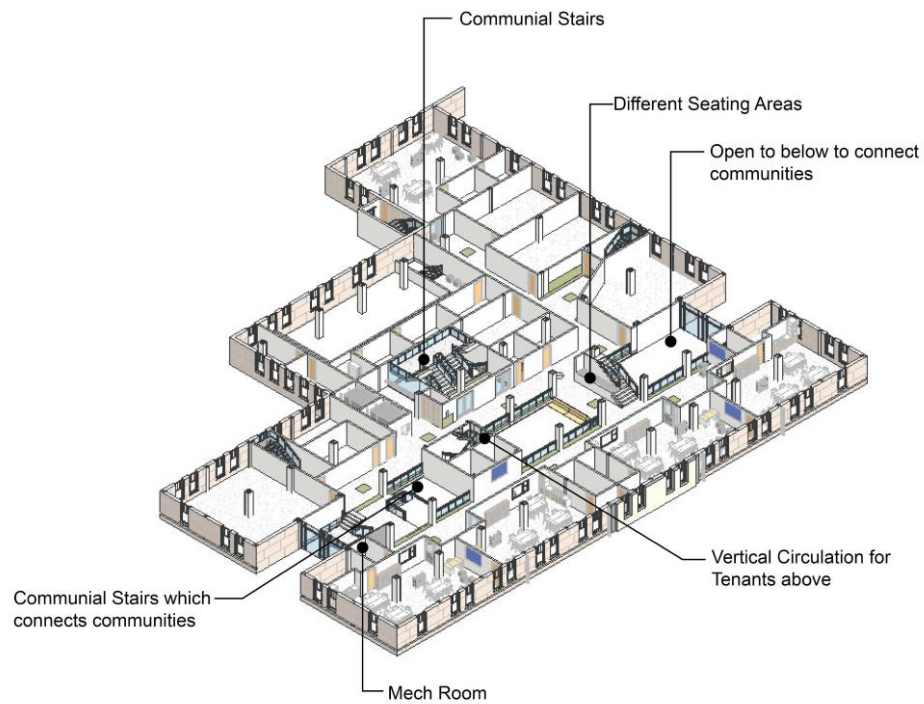


Figure 6.24 –Third Floor, by Author, 2022

The fourth plan then creates the third community whose color and shape are a circular blue. This community offers a double heighted music room, art lab, outdoor playground, and outdoor classroom while also giving students a mirrored learning stair from the second floor.

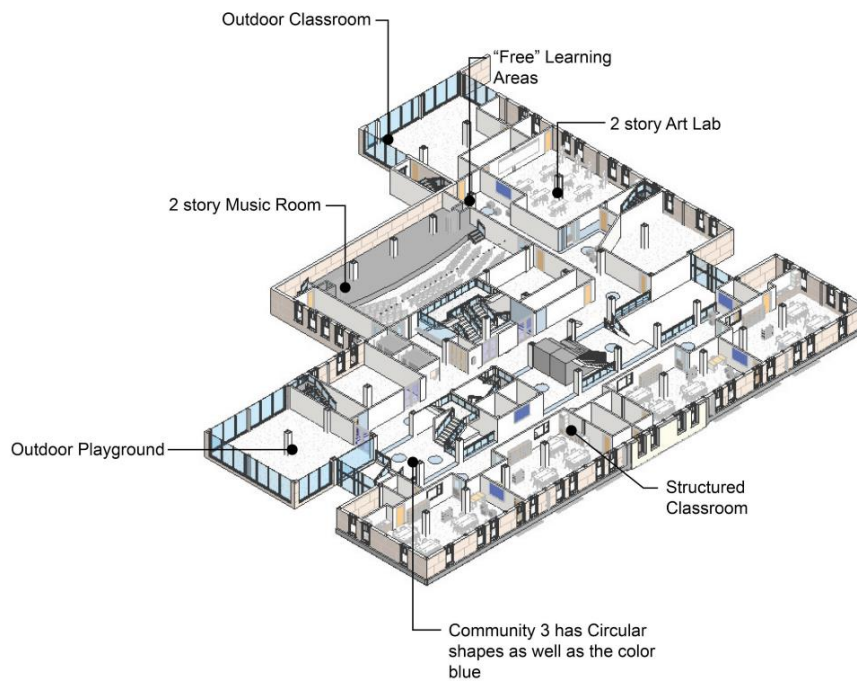


Figure 6.25 –Fourth Floor, by Author, 2022

The final floor of the school offers some extra academic programs as well as the gym. The axon shows how most of the spaces from the floor below are those double heighted spaces and how the spine allows for open ventilation.

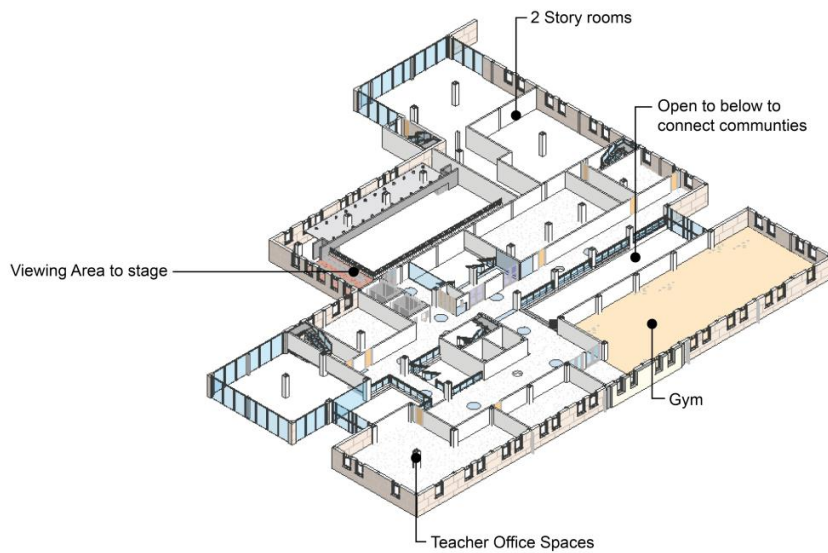
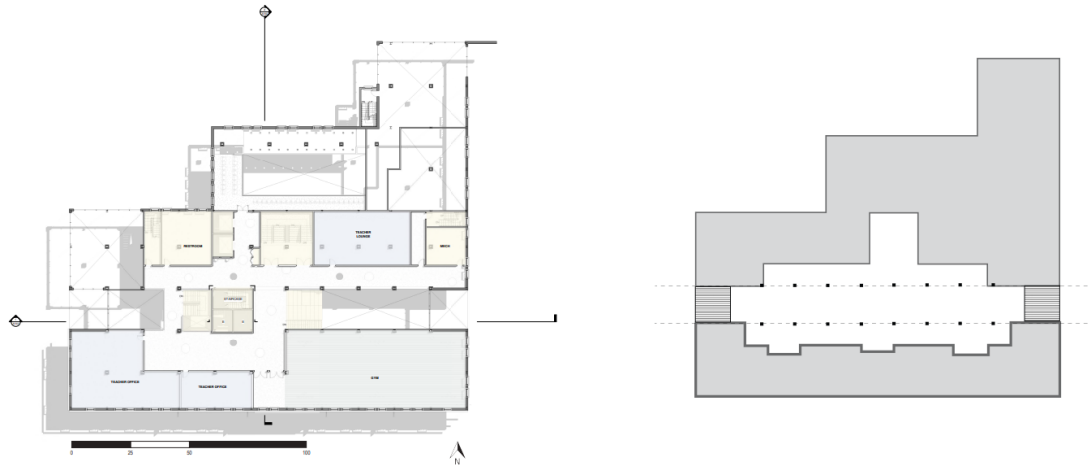


Figure 6.26 –Fifth Floor, by Author, 2022

The elevation shows how a canopy was extruded to create a waiting zone outside the school as well as also placing a furring wall on top of the school entry to

establish a stronger arrival point. Shading fins help create a pattern with the 3 communities.



Figure 6.27 –Building Elevation, by Author, 2022

The first section shows the double heighted spaces as well as the spine head on with its skylight roofing system as well as the lobby space for 1-5. It also shows the frosted reflective wall material from the office spaces above to help bounce light downward. Moving on the section section cuts through the spine and shows the various vertical experiences as well as the extrusions that create garden spaces on each end.

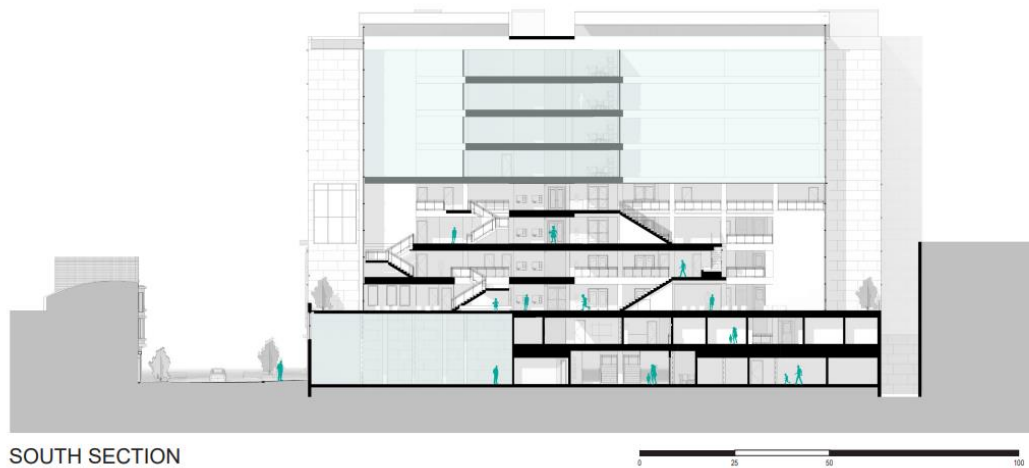
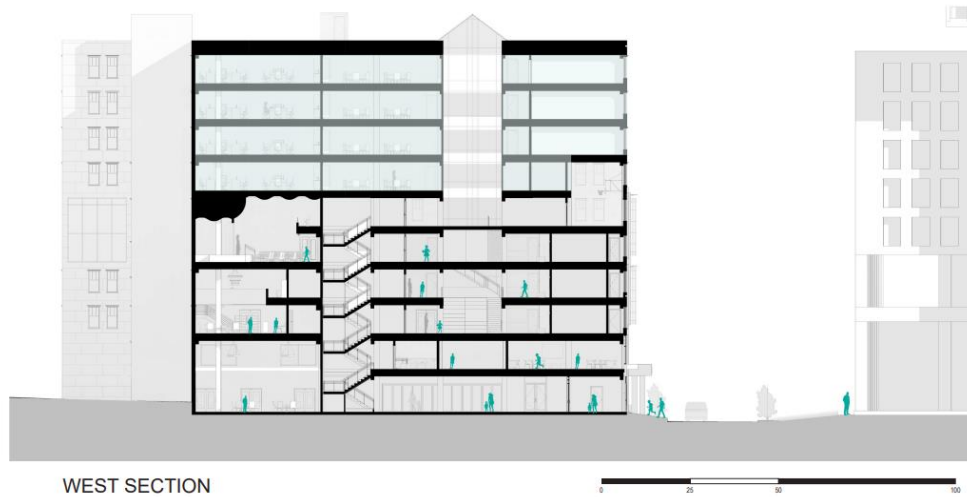


Figure 6.28 –Building Sections, by Author, 2022

Next up is the perspectives which start off with the arrival of the school. The sidewalk on part of E St was designed to allow for pick up as well. Entering the building we land next in the kindergarten lobby where you can see the double heighted space and the vertical experience. Going upstairs to the porch of a kindergarten classroom, students can be dropped off by their parents and enter the classroom. Moving to the second community or second floor, there is a view of the spine that uses a learning stair to encourage independent learning. On the same

floor, the double heighted library offers students various sitting and reading areas as well as conference rooms. Moving to the third community, the art lab also offers a double heighted space as well as various learning stations to encourage students to work independently and together.



Figure 6.29 –Arrival Perspective, by Author, 2022



Figure 6.30 – Lobby Perspective, by Author, 2022



Figure 6.31 –Porch Perspective, by Author, 2022



Figure 6.32 – Spine Perspective, by Author, 2022



Figure 6.33 – Library Perspective, by Author, 2022



Figure 6.34 – Art Lab Perspective, by Author, 2022

Conclusion

This thesis was created to take an exiting typology that can be implemented into various city locations to be able to ask how cities can be shaped moving forward.

While central commercial districts are dying, cities need to populate their buildings to create an adaptable future. The future generation is a great asset to think about when planning out what cities can be. While existing conditions can add a bit of constraints, it offers a designer the ability to adapt and work with what is there and what there can be.

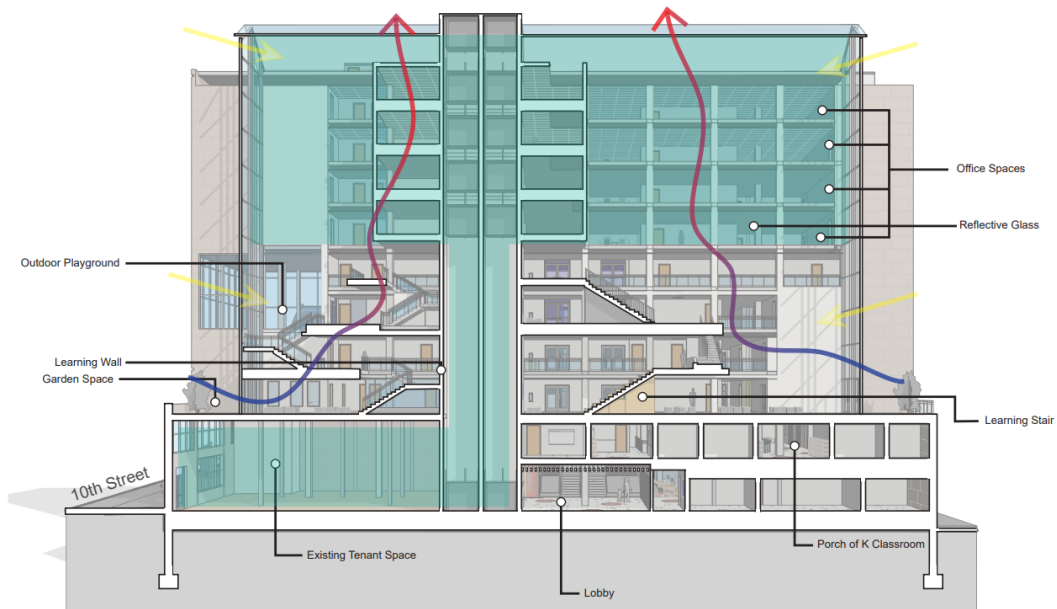


Figure 6.35 – Section Perspective, by Author, 2022

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