

RETHINKING THE SCHOOL: A NEW MODEL FOR SAN JUAN, PUERTO RICO

By

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“The capability of banking education to minimize or annul the student’s creative power and to stimulate their credulity serves the interest of the oppressors, who care neither to have the world revealed nor to see it transformed.”¹

The way in which children learn is constantly evolving and so are the places in which this process occurs. Throughout the world educator, architects and others are redefining the learning environment to prepare students able to offer creative solutions to the world. In Puerto Rico this theoretical revolution has started but the implications the built environment has on them have not been sufficiently explored. It is that interest in the implications of the school building environment that ignited the ideals of this thesis. Schools are the cradle of the next generation of citizens and their experience throughout the learning process shapes them as citizen and will shape the Puerto Rico of the future. As a designer this particular environment has been a source of concern throughout the years. This thesis is the result of the research and exploration for a topic that represent an important component of a nation.

¹ Freire, Paulo. *Pedagogy of the Oppressed*. Translated by Myra Bergman Ramos. New York, London: continuum, 1970.

Dedication

To my parents and my brother, without your unconditional support I would have never made it this far.

Acknowledgements

This document is the culmination of a yearlong project on a subject that has been significant to me for a long time, but its successful completion could not have been possible without the help and support from different people in my life. It was an honor for me to work alongside with my committee, especially my chair Assistant Professor Isaac William, his expertise and direction was an immense help in shaping this project. Thanks to Associate Professor Brian Kelly for helping with the coordination of the meetings and his insight on the design process and development. My deepest gratitude to teacher Cecilia Malavé from the Antonio S Pedreira Elementary School in San Juan for all the insight and information that helped during the design process. I would like to also thank Wendy Osborne from the English Editing for International Graduate Students program of the English Department at the University of Maryland for revising the document and providing helpful suggestions. Special thanks to my thesis cohorts for being part of this wonderful experience especially to Claudia Santos Cortés for being my companion throughout the long working hours. Lastly, I offer my regards to all of those who supported me in any respect during the completion of the project.

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Chapter 1: Background

In order to propose a new model for the school building in Puerto Rico, an understanding of the existing conditions and of traditional education is important. In the last century, psychologists and experts in education have developed ideas about how children learn that expand beyond the “traditional” learning method. Although some innovative school buildings have been designed, in most cases there is still a large disconnection between the school building and the way children learn.

The Traditional School

*Narration (with the teacher as narrator) leads the students to memorize mechanically the narrated content. Worse yet, it turns them into “receptacles” to be “filled” by the teacher.... This is the banking concept of education, in which the scope of action allowed to the students extends only as far as receiving filing and storing deposits”.*²

The traditional school model facilitates only one type of learning, the traditional or “banking” concept of education. This type of education, and its corresponding classroom, promotes learning only by lecture. Although the lecture is important in the learning experience, having that as the sole experience can be detrimental to children’s development. In this learning modality, the teacher has the “superior”

¹ Freire, Paulo. *Pedagogy of the Oppressed*. Translated by Myra Bergman Ramos. New York, London: continuum, 1970.

role of imparting information. The student's role is to receive that information and store it. In such passive learning, knowledge is treated as dead and not as something that is alive and contemporary. Treating knowledge as a dead entity disconnects the information from the real world and any past, present, or future experience. If the student is not able to make the connection between the lessons and his or her own experience, the relevance of the knowledge gets lost. Eventually the learning experience turns into a mere task devoid of any proactive participation by the student.

In the traditional system, the best student is the one who passively receives and stores the most information. This system creates an unhealthy dichotomy between the teacher and the student. The teacher is expected to be everything the student is not. This creates a psychological repercussion that makes the student feel inferior to the teacher. In order to perpetuate this dichotomy and exert control, the classroom is arranged with rows of seats facing the front, where the teacher is located. This classroom arrangement discourages not only interaction between and among students but also project-based learning.

Education becomes depersonalized in this traditional learning situation. The student's intelligence is overlooked in order to serve only one type of learning experience that is compatible with only a (possibly minimal) percentage of the group. The architecture and the arrangement of the room predispose the teacher,

knowingly or not, to succumb [revert?] to the traditional learning methodology.³ Students who have a learning disposition that differs from listening and memorizing are dismissed as “less intelligent” or undisciplined.⁴ Even teachers who try to approach education differently and want to introduce activities other than lectures find it difficult to work within the existing classroom arrangement.

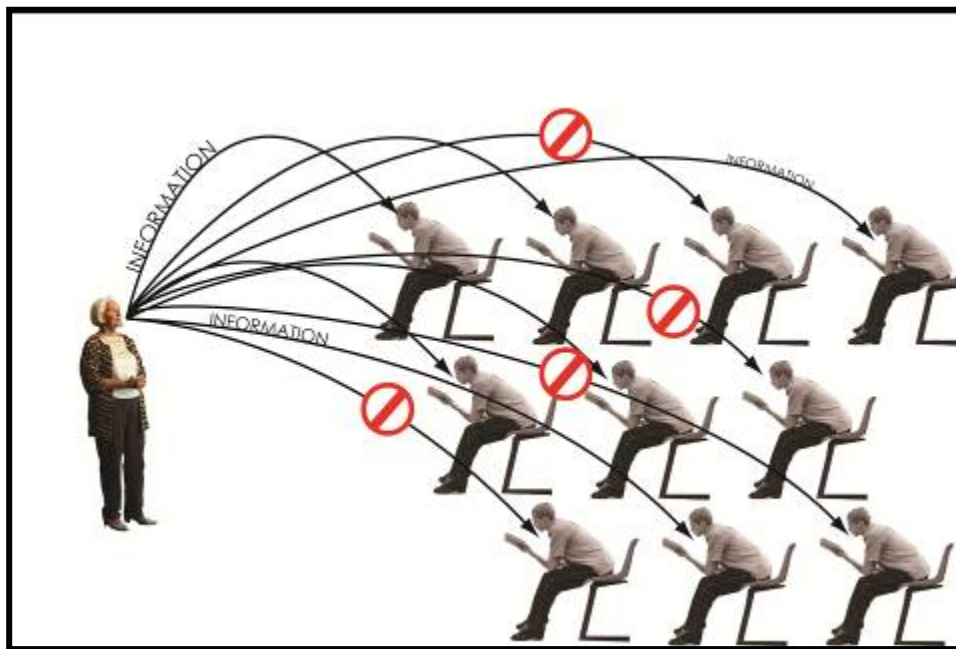


Figure 1: Traditional Learning Diagram (by Author)

³ Freire, Paulo. *Pedagogy of the Oppressed*. Translated by Myra Bergman Ramos. New York, London: Continuum, 1970.

⁴ Gardner, Howard E. *The Unschooled Mind: How Children Think And How Schools Should Teach*. Basic Books, 1993.

Toward a Personalized Education

This thesis does not intend to dismiss the traditional type of learning. For certain subjects and at certain moments [times?] in the learning process, this type of learning is important.⁵ The purpose is rather to provide a diversity of learning spaces that can be used for different learning modalities. These spaces range from intrapersonal learning spaces, such as “cave spaces,” to areas for kinesthetic learning, such as sports or hands-on projects. The role of the teacher becomes more that of a mentor or companion in the learning experience. The teacher is present to make sure that learning occurs and that the connection between the activity and the lesson is understood by the student. In order to achieve that condition, the teacher vs. student relationship has to be transformed into a student-teacher relationship. This new relationship results in a more progressive or liberal⁶ education. The goal of having a more personalized education is to help students realize the true nature of knowledge, how they learn, and how to apply that knowledge to their life. Ideally this realization will encourage a generation of critical thinkers who are prepared to excel not only in the academic world but also in real life.

⁵ Dewey, John. *Experience & Education*. New York: Touchstone, 1938.

⁶ Freire, Paulo. *Pedagogy of the Oppressed*. Translated by Myra Bergman Ramos. New York, London: Continuum, 1970.

Multiple Intelligences

To achieve a more personalized education, the building must reflect the diverse nature of intelligence.⁷ Spaces in the school building should allow teachers and students to realize a multiplicity of activities.⁸ According to Howard Gardner, there are multiple types of intelligence, which reflect the different way that children learn:

Verbal-Linguistic: This style probably relates most closely to the traditional learning experience. Students learn by reading, listening, and explaining. Spaces that are quiet and passive might promote a good reading and discussion environment.

Visual-Spatial: These students have strong inclinations toward spatial manipulation and visual representations of knowledge. They require applied knowledge activities. Spaces that are active and project oriented can encourage these kinds of activities.

Interpersonal: Although the traditional system discourages this type of activity, these students learn by interacting with others and discussing information. Open spaces that promote group activities are best for this learning modality.

⁷ Gardner, Howard E. *The Unschooled Mind: How Children Think And How Schools Should Teach*. Basic Books, 1993.

⁸ C. Kenneth Tanner, Jeffery A. Lackney. *Educational Facilities Planning: Leadership, Architecture, and Management*. Boston: Pearson, 2006.

Bodily-Kinesthetic: These children learn through physical activity and body movements. Requirements include spaces that are open or outside for physical activities such as sports, dancing, and acting.

Music: These students learn through sounds and hearing and are good with music and memorizing sounds. Spaces isolated from other noises are ideal for this type of learning. Such isolated spaces should also prevent interruptions of other learning activities.

Intrapersonal: With this introspective type of learning, students are self-conscious and reflective. Spaces that promote individual and quiet learning are best for these students.

Nature: Children with this type of intelligence learning through interaction with nature. They are interested in analyzing and observing their surroundings. Exterior spaces and active learning can encourage a learning experience for these

students.
Logic: These students are good with mathematical problems, abstraction, logistics, and computers. This type of learning is strongly related to the traditional

concept of intelligence. Passive spaces that promote concentration are the best environment for this type of learning.

All students should be encouraged to participate in the different activities throughout their learning process. Offering the students the opportunity to experience all the learning modalities can help the school define the inclinations and strengths of each student. Some subjects and knowledge have greater potential for mastery through different modalities while others may be more limited. The teacher's role as a mentor and guide in the activities is essential to ensure that the learning experience is carefully planned and that the students achieve some knowledge. If the students understand that the teacher is a facilitator of knowledge, they may become conscious of the autodidactic and active nature of learning and thus be able to acquire knowledge even in a more adverse learning environment.

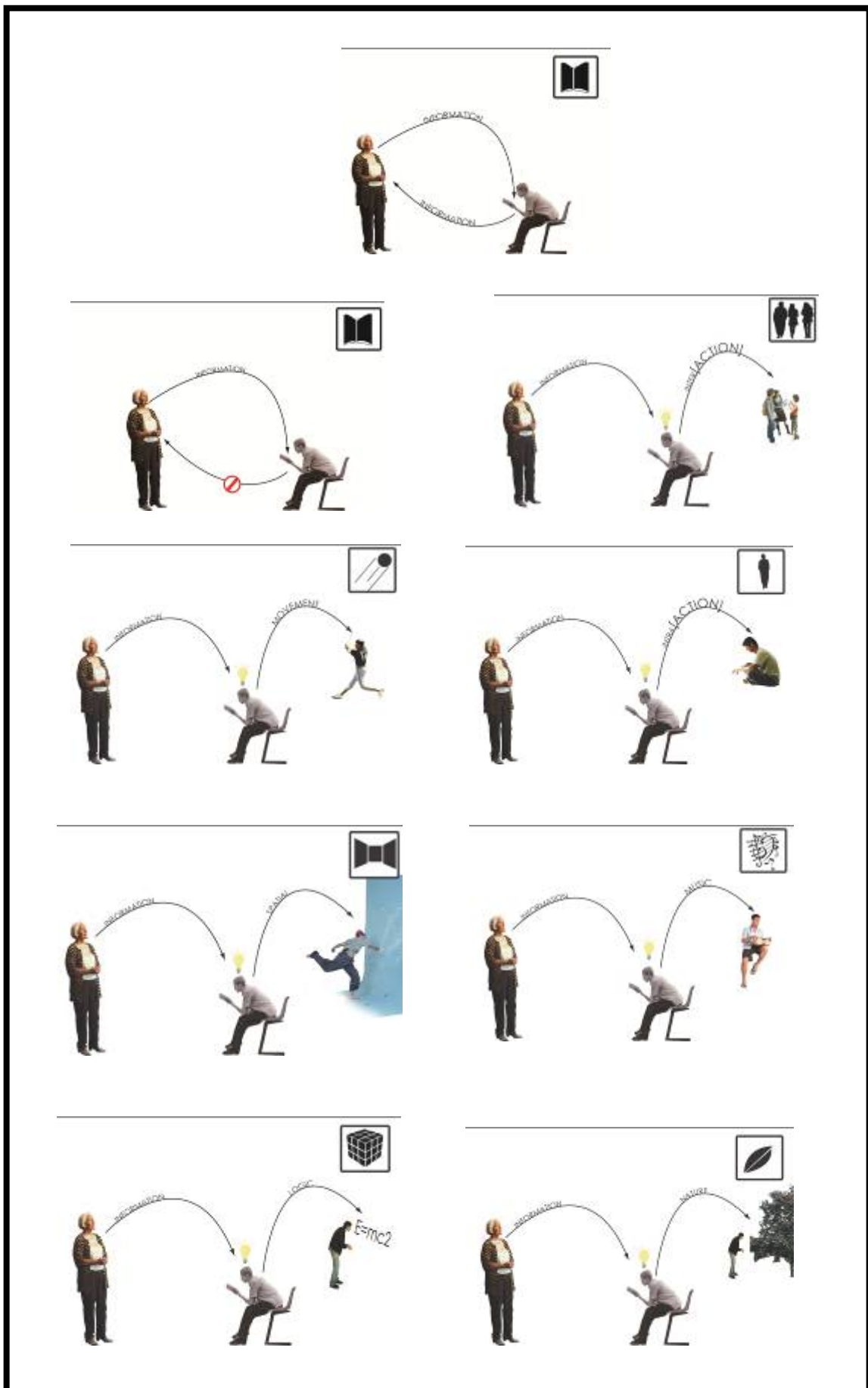


Figure 2: Learning Modalities Diagram (by Author)

Chapter 2: San Juan, Puerto Rico

In order to propose a building model that promotes an adequate learning experience, it is essential that the building respond to the realities of its location. It is, therefore, imperative to recognize the climatic challenges and opportunities, the existing educational system, and the nature of the school building throughout history. This background information could inform some of the aspects of the building so that the architecture responds to the culture within which it is embedded.

Location

The island of Puerto Rico is located 18 degrees north of the equator making it a tropical humid climate.⁹ The temperature only varies a few degrees throughout the year. The humidity is usually high, making outdoor exposure uncomfortable.¹⁰ Winds come predominantly from a northeast-easterly direction. The typical reinforced concrete construction is used frequently on the island, especially for small buildings. Aside from the economic reason for this type of construction, the buildings need to be resistant to hurricanes and frequent precipitation. The climate also requires some mitigation techniques to protect buildings from the intense heat. The constant

⁹ <http://welcome.topuertorico.org> (accessed November 2009).

¹⁰ *Weather Channel*. 2009. <http://www.weather.com>.

breeze allows a correctly oriented shaded space to be used throughout the year for exterior activities.¹¹

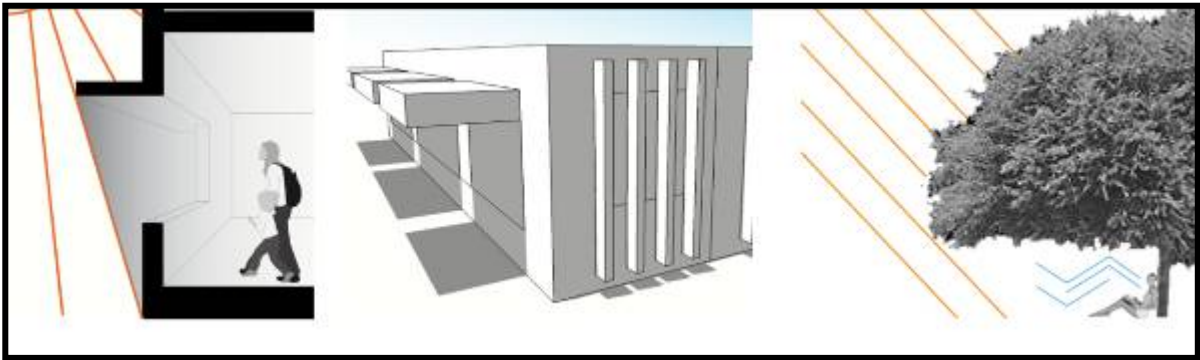


Figure 3: Climate Diagram (by Author)

Puerto Rico's Department of Education

In the Department of Education philosophy statement, some “progressive” ideas about learning are emerging. They recognize the learning process as “continuous and dynamic”¹² and acknowledge the importance of instilling cultural values early in the student’s education. Another value that constantly emerged from the document is interest in “reinforcing critical and creative capacity.”¹³ The philosophical statements of the department are concurrent with contemporary ideals of education and the idea of instilling creativity and critical capacity goes along with the goals of this thesis. Unfortunately the philosophy of the department does not

¹¹ Abruña, Dr. Fernando. *Fresco Gratis*. San Juan: Futures Conceptions LTD, 1980.

¹² Education, Department of. "Department of Education ." *Department of Education*. December 2009. www.de.gobierno.pr (accessed December 2009).

¹³ Education, Department of. "Department of Education ." *Department of Education*. December 2009. www.de.gobierno.pr (accessed December 2009).

recognize the school building as being an important part in achieving these goals; therefore, the necessity of a new building model is not a department priority.

Elementary School Supply

The Puerto Rico department of education divides the island into school districts (San Juan has five), which are further divided by levels (elementary, secondary, middle, and high school) and by grades. Each school is supposed to service a particular zone in the city based on proximity to the school building. There are enough schools to service all the areas of the city even though every child under the age of 18 is required by law to attend school. In the school system, the elementary school serves as a supplier and first step in the educational system. Currently in San Juan, 77 elementary schools (K-6) serve 19 middle schools (7-9) and, eventually, 14 high schools (10-12). Some elementary school students can enter one of the nine intermediate schools (7-12), which are usually specialized.¹⁴ Because elementary schools serve as suppliers for the system, there is a great opportunity to explore a personalized approach to early education and analyze its repercussions on later education. Even if the students end up in a traditional school later on, the progressive elementary school will have given them the opportunity to explore

¹⁴ *puerto-rico.schooltree.org*. 2000. <http://puerto-rico.schooltree.org> (accessed November 2009).

different learning approaches and, it is hoped, inspired some critical capacity that can serve as a tool for future challenges.

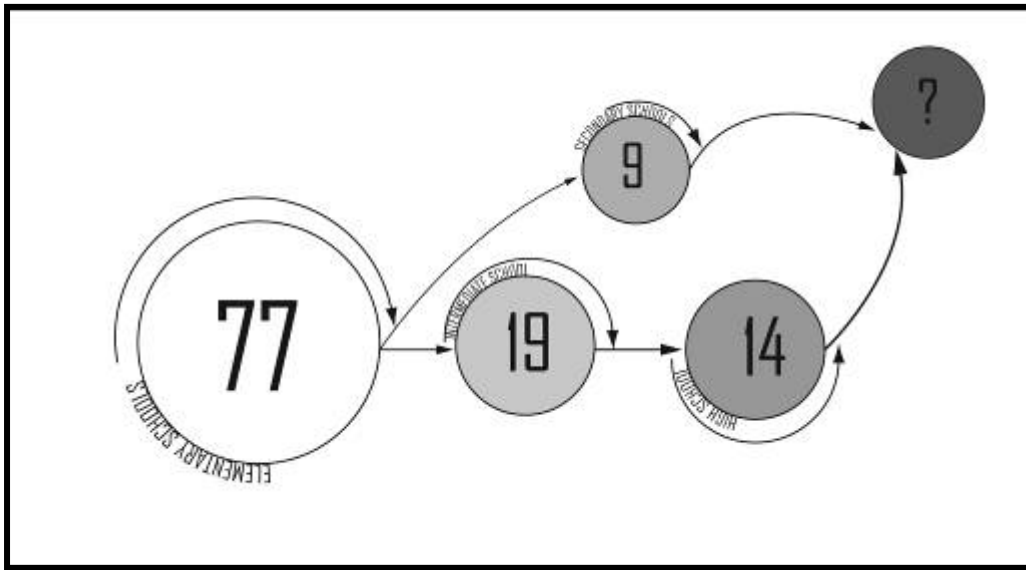


Figure 4: Elementary School Supply (by Author)

Puerto Rico School History

Spain (1493-1898)

When the Spanish settlements in Puerto Rico grew and entire families had immigrated, the need to educate the children became an important issue. Contrary to popular belief, the Spanish regime recognized the importance of education and developed a model for the organization and construction of school buildings. Schools were not divided by grades but the boys and girls were separated, and the teachers lived in the school building. One teacher taught only one class for each gender. The schools were located in proximity to the community it was meant to serve. Although the schools were small and community centered, the teaching methodology was through repetition and memorization.¹⁵

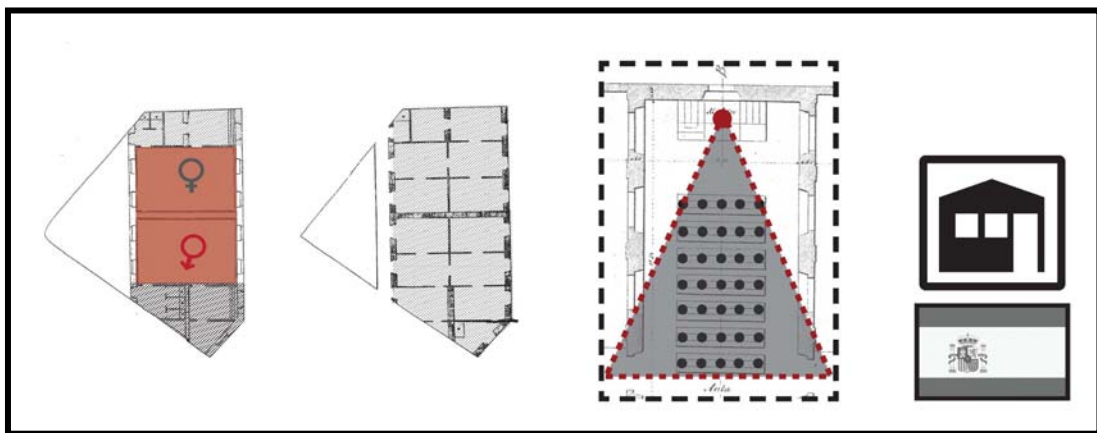


Figure 5: Spanish School Model Diagram (by Author)

¹⁵ Borrero, Angela López. *Mi Escuelita: Educación y arquitectura en Puerto Rico*. San

United States (1898-1952)

When the United States took possession of the island, education became more institutionalized. Victor S. Clark conducted a survey around the island to record the conditions of the schools. From then on, the main goal of the school was assimilation of the culture. Later when the approach to education changed to a grade-based system, the school was divided into primary and secondary schools, and the teacher no longer lived in the school building. It was established that each grade should have a maximum of 50 students per teacher in a 24 by 33 ft classroom. These changes affected the building typology and the organization of the school. The teaching methodology was the same as before but some ideals about the school building began to take shape. The school was intended to be a “gem” in the community, separated from the blight of the city.

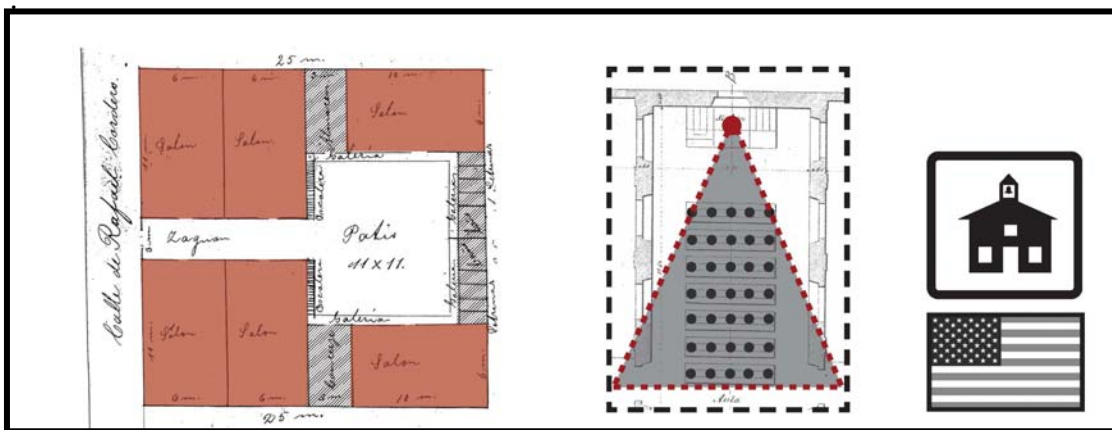


Figure 6: United States School Model (by Author)

Puerto Rico (1952-Present)

When Puerto Rico became a commonwealth, the control of the educational system passed to the local government. The buildings adopted a more industrial character, based on efficiency, and the class sizes were reduced (25-30 students). The school building model was based on the replication of the same squared unit (the classroom) throughout, with a single loaded corridor. When this actual school model came into existence, the schools were divided by grade, age, and subject. To this day, the teaching methodology consists of repeating and memorizing. With the growth of the schools and the system of separation into grades, the learning process has become not only unilateral and dead but also depersonalized.

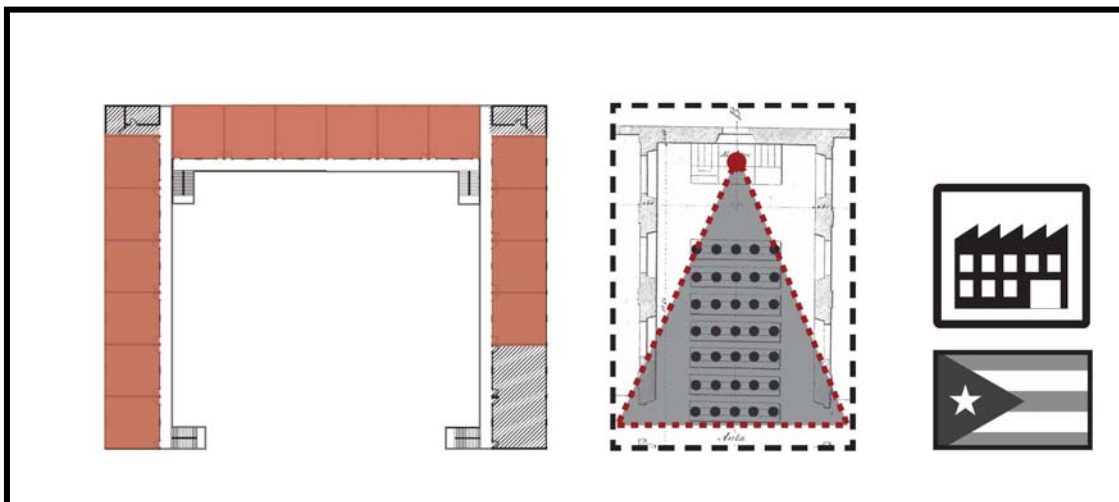


Figure 7: Puerto Rico School Model (by Author)

Chapter 3: Site Selection

How and where a school sits in its surrounding landscape conveys a great deal about its purposes and its priorities. It can evoke connections not only with the past and present uses of its geographical site, but also with the cultures, purposes, and aspirations of the people who gather there for learning.¹⁶

Site location for the school building is really important for success in connecting with the community. Although all the sites are located in San Juan, each is in a different neighborhood and each has its own history. The sites were selected based on the contrasting culture, history, and nature of the zone in which they are rooted.

Site 1: Santurce

Site History

The Tomas Carrión Maduro Elementary School is located in the urban area of Santurce, one of the first and biggest neighborhoods in San Juan. The primary characteristics of this area are the commercial, civic, and cultural activities. Today Santurce is the main arts district with the city museum and performance center at its core. After its boom in the 1950s, the neighborhood went through several decades of decay but in the last few years it has slowly been regaining its strength. This area

¹⁶ Victoria Bergsagel, Tim Best, Kathleen Cushman, Lorne McConachie, Wendy Sauer, David Stephen. *Architecture for Achievement*. Washington: Eagle Chatter Press, 2007.

is in constant renovation (with higher density buildings as a consequence), and activity revolves around the crossing of two main avenues, the Ponce de León and the Fernandez Juncos.

Site Problems and Opportunities

Within the half mile radius of the school, there are 252 students currently attending public elementary school.¹⁷ The Tomas Carrión Maduro School is currently attended by 175 students taught by 19 teachers for an average of 9.2 students per teacher.¹⁸ The actual enrollment and number of teachers in this school could allow a personalized approach if the proper spaces were available. The advantages of this site are the great number of civic and educational opportunities in the area. Some of the civic advantages include the Puerto Rico Museum of Arts and the city's Performing Arts Center. A variety of educational facilities, including Sacred Heart University and Central High School, which specializes in the arts, surround the elementary school, thus creating the potential for integrating the community and the school. The downside of this site is the lack of functional public spaces or community recreation spaces and the absence of public transportation. Another limitation is the size of the site. The school is embedded in the residential part of the area and the site is currently 54 percent built to accommodate the current

¹⁷ Bureau, U.S. Census. *U.S. Census Bureau*. <http://www.census.gov/> (accessed November 2009).

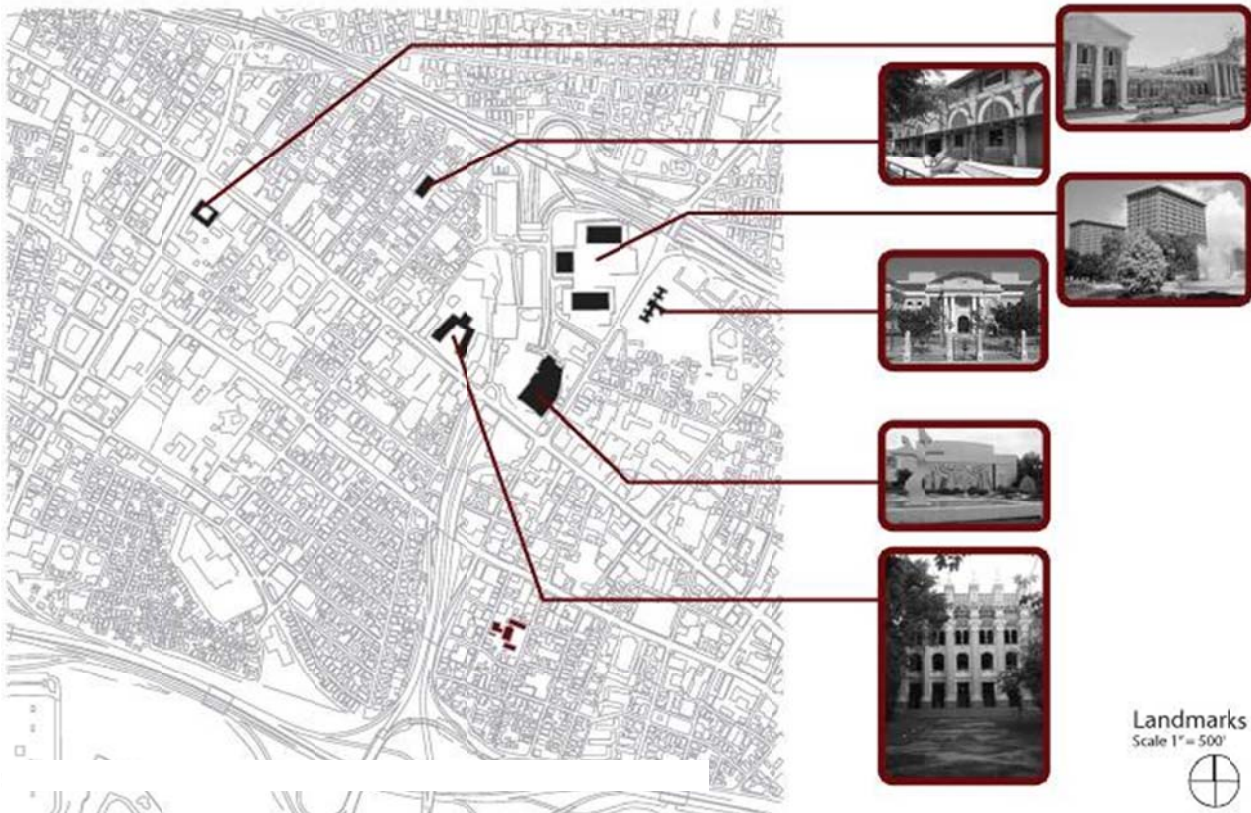
¹⁸ *puerto-rico.schooltree.org*. 2000. <http://puerto-rico.schooltree.org> (accessed November 2009).

enrollment. Because of the diversity of activities that surrounds this site, the school would become an “absorber” of the community amenities instead of a provider.



BUILDING VS OPEN SPACE

GREEN SPACE VS BUILT SPACE



Siting Opportunities

The site has a predominantly north to south orientation, tilted a few degrees to the east. The northern part of the site receives the best light (due to the inclination of the sun), so it is a great place for passive activities, such as reading, that require optimum lighting. The wind comes predominantly from the east-northeast and the building faces the eastern part of the site. To promote natural ventilation and to serve the existing traffic flow, the east side would be optimum for locating communal open spaces such as the courtyard and entrance. Locating the community outreach spaces to the south to define them as part of the community rather than having them available to the general public. Noisy activities could be located on the western side because it is closest to the highway, which would otherwise be detrimental to other activities. Finally, the center of the site is the ideal space for the school core.

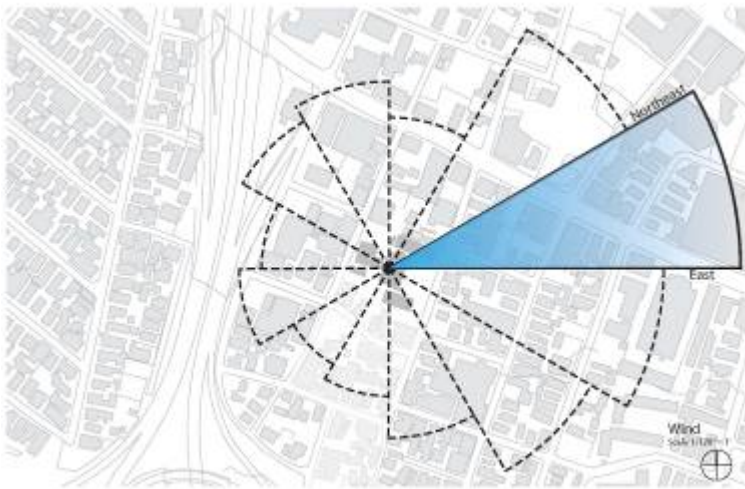


Figure 11: Wind Diagram (by User)

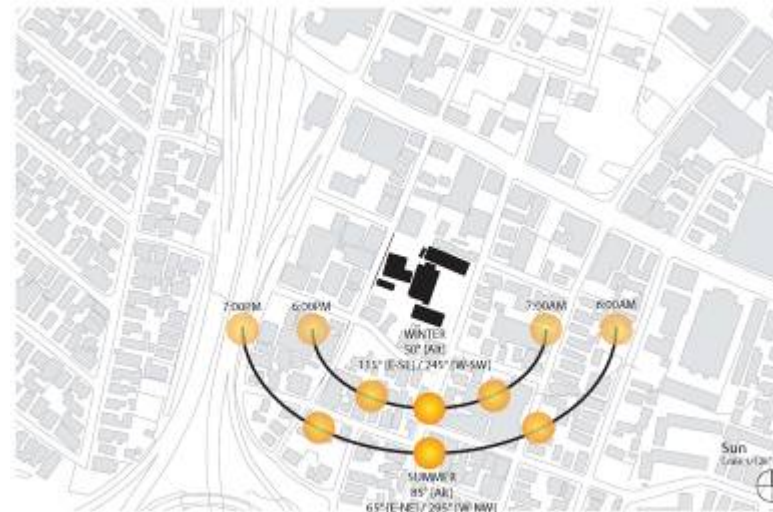


Figure 12: Sun Diagram (by Author)

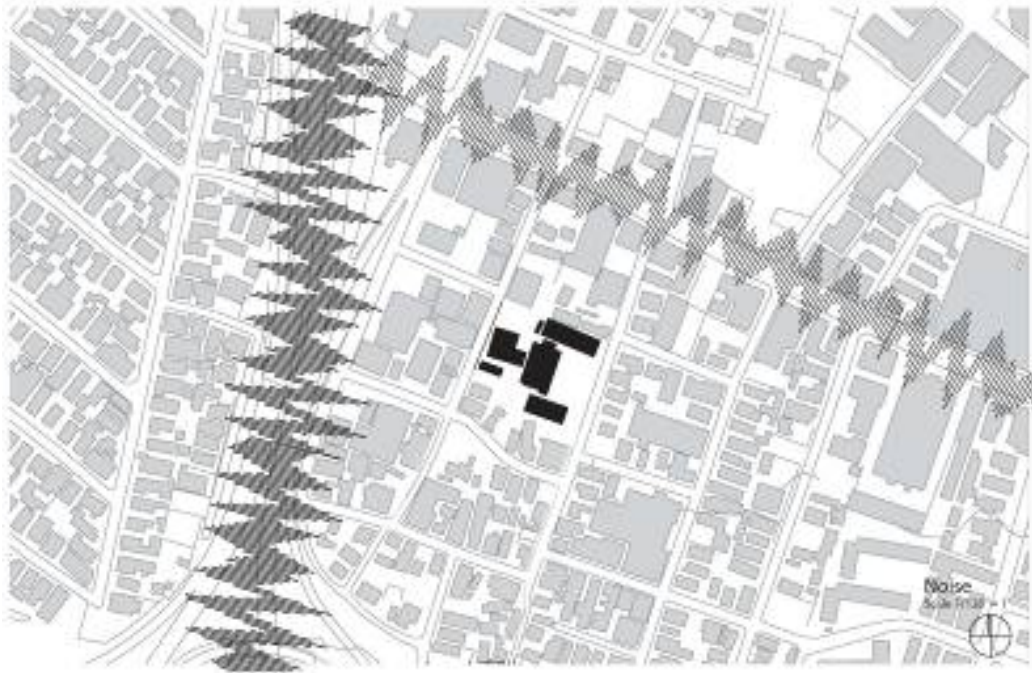


Figure 13: Noise Diagram (by Author)



Figure 14: Site Opportunities Diagram (by Author)

Current Situation

Currently the school is suffering from a low enrollment of approximately 136 students. Although this is a good size for the small facilities and for a personalized education, it is cataloged as a problem by the Department of Education. As a consequence, teachers and personnel have been relocated to other schools and grades have been merged. If the school does not improve its enrollment in the future, the students and faculty might be relocated and the school closed.

TOMAS CARRION MADURO// SANTURCE//SAN JUAN

	Points Earned	Possible Point
PUBLIC SPACES <i>Proximity to public spaces as a possible amenity for the school</i>	1	5
PARKS <i>Proximity to Parks as a possible amenity for the school</i>	2	3
EDUCATIONAL FACILITIES <i>Proximity to existing educational facilities to avoid duplicity of facility and create relationship between learning communities.</i>	10	10
HIGHER EDUCATION <i>Proximity to existing higher educational facility to share resources and participate in university activities</i>	3	5
RECREATIONAL FACILITIES <i>Access to recreational facilities in the community to avoid duplicity of construction. If the community lacks a recreational facility the school can provide one to be a center of community-school engage</i>	1	10
CIVIC USES <i>Proximity to Civic Uses (museum, theaters) to use the whole community as a learning space</i>	5	5
PUBLIC TRANSPORTATION <i>Proximity to public transportation as a sustainable strategy and a possibility of access to other parts of the city</i>	1	5
HIGH TRAFFIC <i>Proximity to traffic is undesirable for security, contamination and noise problems</i>	1	3
HOSPITALS <i>Proximity to Hospitals in case of an emergency</i>	5	5
PERFORMANCE <i>School performance as a possible way to demonstrate improvement</i>	3	3
STUDENT TO TEACHER RATIO <i>Existing teacher to student ration. A lower ratio can improve the possibility of personalized education</i>	3	3
TOTAL	35	57

Table 1: Site Selection Table (by Author)

Site 2: Rio Piedras

Site History

The Luis Muñoz Rivera Elementary School is located in the urban area of Rio Piedras, which currently surrounds the major state university campus. The school is embedded in the urban core of the town and it is surrounded by civic buildings, retail stores, and other educational facilities.

Site Problems and Opportunities

Within the half mile radius, there are 923 students attending public elementary schools.¹⁹ This school is currently attended by 228 students taught by 15 teachers for an average of 15.2 students per teacher.²⁰ The advantages of this site are the proximity to the town core, which provides certain amenities such as other schools, retail stores, and public spaces as well as adjacency to the university campus, which allows the school to use the University Theater and museum. The university also serves as a magnet for cultural activities; libraries surrounding the campus and activities created by the students create an environment of diversity and knowledge that could permeate the school. The school is also next to the University High School, which already promotes a relationship between the schools and the university campus. One of the great advantages of the site is its proximity to public

¹⁹ Bureau, U.S. Census. *U.S. Census Bureau*. <http://www.census.gov/> (accessed November 2009).

²⁰ *puerto-rico.schooltree.org*. 2000. <http://puerto-rico.schooltree.org> (accessed November 2009).

transportation, having a train stop and bus terminal a few blocks away. The recreational facilities of the university are on the other side of the campus and thus impractical for frequent use, but because of the adjacency to the high school the recreational facilities could be shared, thereby minimizing construction. The site is only 41 percent built so there is space for reconfiguration and expansion if needed. The site offers the possibility of sharing facilities among the schools, the university, and the community. The area has good transportation connectivity and great potential for becoming a pedagogical beacon in the city of San Juan.



BUILDING VS. OPEN SPACE

Figure 17: Building vs. Open Space Diagram (by Author)



GREEN SPACE VS. BUILT SPACE

Figure 16: Open Space vs. Built Space (by Author)

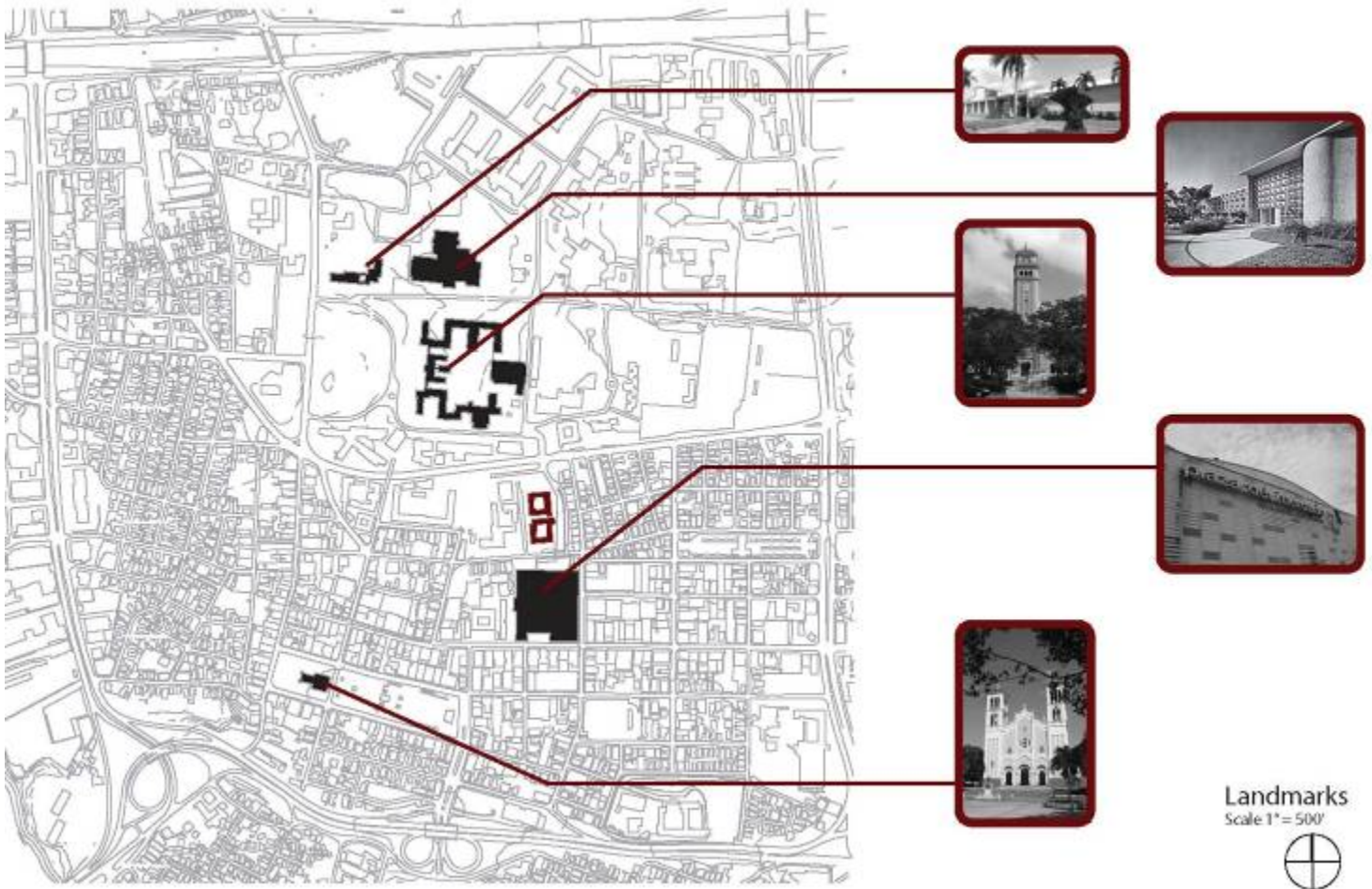


Figure 18: Site Location Diagram (by Author)

Siting Opportunities

The orientation and shape of the Rio Piedras School site is basically north to south. This positioning poses some challenges for the sustainability aspect of the building for which a long east-west façade would be preferable. Although the northern part of the site has the best light, it is closest to the high traffic street which brings noise. The recreation facilities of the adjacent high school are located on the north side, so this would be the best location for that facility if sharing is to be promoted. Because the stronger winds come from the east–northeast and in order to promote some relationship with the high school, the building core could be to the west of the site, thus separating activities from the service alley that borders the east side. Finally, because the south side of the site is across the street from the marketplace, it is ideal for promoting a connection with the community.

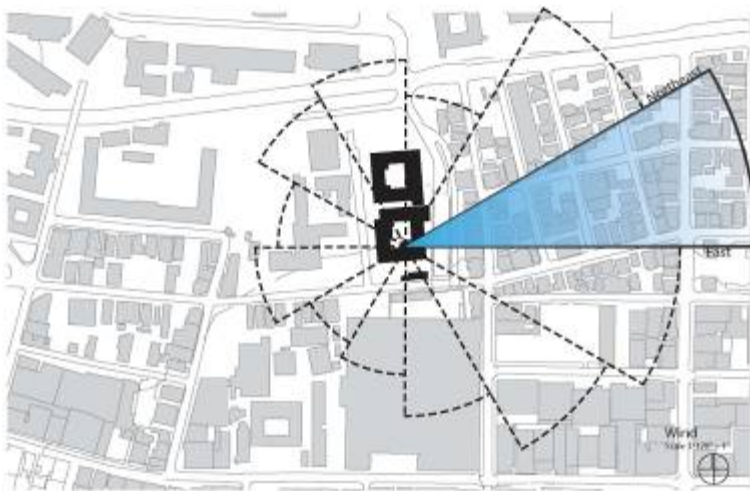


Figure 20: Wind Diagram (by Author)

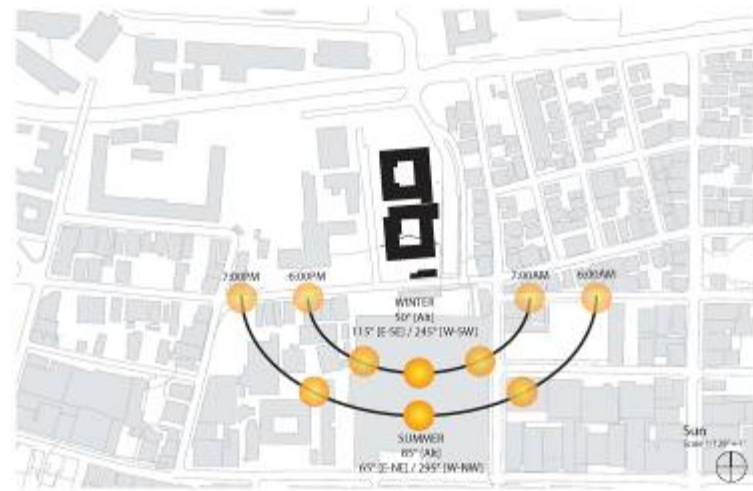


Figure 19: Sun Diagram (by Author)

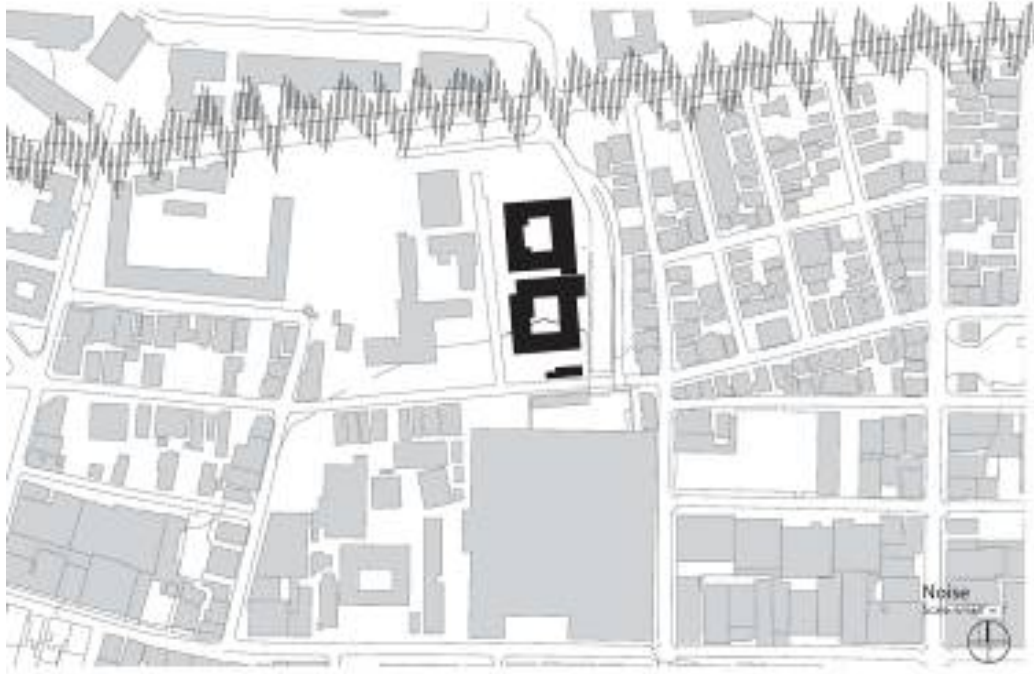


Figure 21: Noise Diagram (by Author)

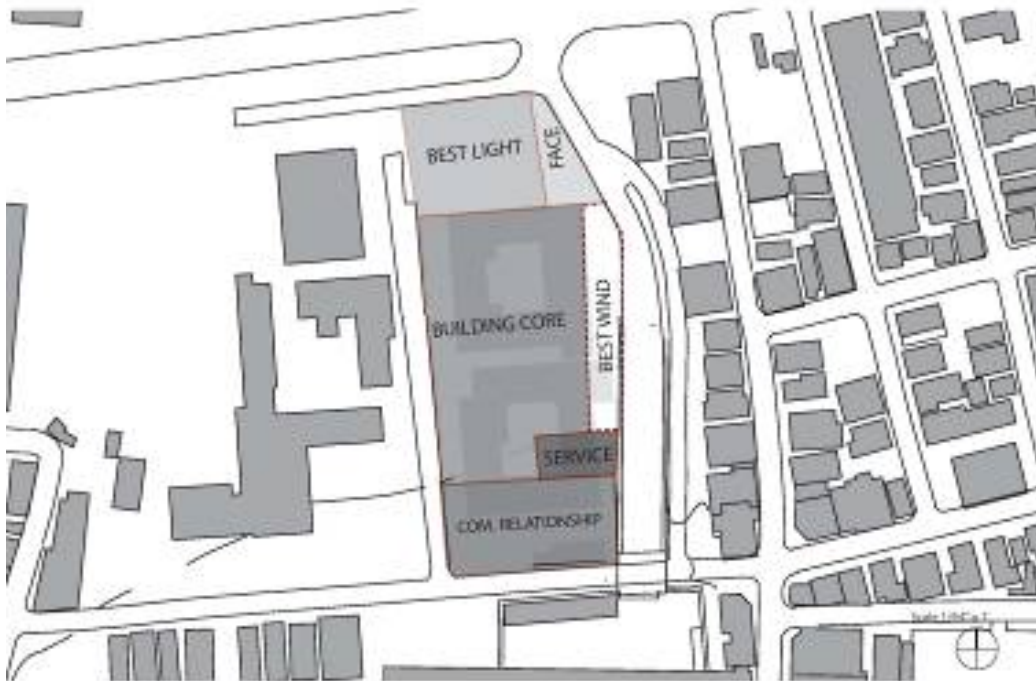


Figure 22: Site Opportunities Diagram (by Author)

Current Situation

The buildings on the site used to serve a single school, but today they have been separated into an elementary school and a middle school. Because of the location and architecture of the schools, the buildings have been declared Historic Patrimony of the State by the Institute of Puerto Rican Culture. Because of this designation, the structure and architecture of the building cannot be altered, but, at the same time, there is no initiative from the government to properly maintain these buildings. Currently the schools are trying to upgrade the current infrastructure to meet curricular necessities. This has rendered some spaces obsolete, and some of the infrastructure additions are inefficient and unaesthetic.

LUIS MUNOZ RIVERA// RIO PIEDRAS//SAN JUAN

	Points Earned	Possible Point
PUBLIC SPACES <i>Proximity to public spaces as a possible amenity for the school</i>	5	5
PARKS <i>Proximity to Parks as a possible amenity for the school</i>	1	3
EDUCATIONAL FACILITIES <i>Proximity to existing educational facilities to avoid duplicity of facility and create relationship between learning communities.</i>	10	10
HIGHER EDUCATION <i>Proximity to existing higher educational facility to share resources and participate in university activities</i>	5	5
RECREATIONAL FACILITIES <i>Access to recreational facilities in the community to avoid duplicity of construction. If the community lacks a recreational facility the school can provide one to be a center of community-school engage</i>	3	10
CIVIC USES <i>Proximity to Civic Uses (museum, theaters) to use the whole community as a learning space</i>	5	5
PUBLIC TRANSPORTATION <i>Proximity to public transportation as a sustainable strategy and a possibility of access to other parts of the city</i>	5	5
HIGH TRAFFIC <i>Proximity to traffic is undesirable for security, contamination and noise problems</i>	2	3
HOSPITALS <i>Proximity to Hospitals in case of an emergency</i>	5	5
PERFORMANCE <i>School performance as a possible way to demonstrate improvement</i>	2	3
STUDENT TO TEACHER RATIO <i>Existing teacher to student ration. A lower ratio can improve the possibility of personalized education</i>	1	3
TOTAL	44	57

Table 2: Site Selection Table (by Author)

Site 3: Puerto Nuevo

Site History

The Antonio S. Pedreira Elementary School is located in the urban (suburban in character) area of Puerto Nuevo. This was the first mass-produced modern suburban area in San Juan. Originally the residential area was isolated from the city activity because the main purpose had been to get people out of the slums. As a result of the great number of people who moved to the area and their need for resources, unplanned commercial activity emerged next to the high traffic streets that connected with the other parts of the city. These days this area resembles an urban-suburban hybrid in that it has urban characteristics on its periphery but a definite suburban atmosphere at its core.

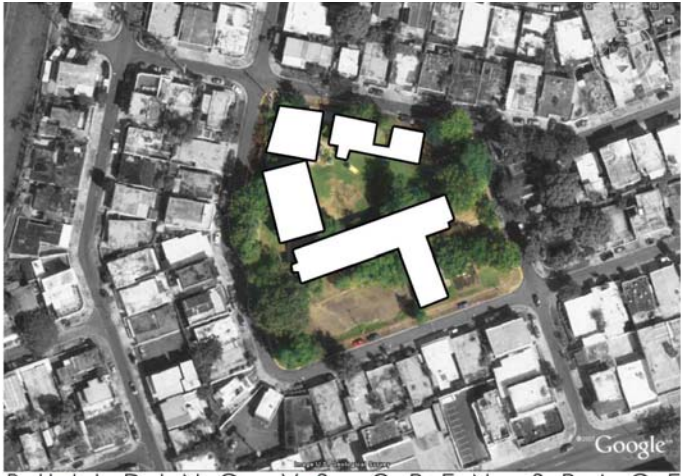
Site Problems and Opportunities

Within the half mile radius of the school, there are 452 students currently attending public elementary school.²¹ The school is currently attended by 343 students taught by 24 teachers for an average of 14.3 students per teacher.²² The school is embedded in the residential part of the area. It is adjacent to a military reserve that acts as a negative barrier inside the community. There are a few public spaces for the use of the community and several educational facilities close to the school site.

²¹ Bureau, U.S. Census. *U.S. Census Bureau*. <http://www.census.gov/> (accessed November 2009).

²² *puerto-rico.schooltree.org*. 2000. <http://puerto-rico.schooltree.org> (accessed November 2009).

The main feature in proximity to the school is the Luis Muñoz Marín Park, but unfortunately this park lacks a pedestrian connection with the residential area. The downside of this site is the absence of civic uses, higher education facilities, and public transportation. The site is an isolated block only 32 percent built so it has the potential to become a school that provides amenities to the area and that serves as a center for the community.



BUILDING VS OPEN SPACE

Figure 24: Building vs. Open Space Diagram (by Author)



GREEN SPACE VS BUILT SPACE

Figure 23: Green vs. Built Space (by Author)

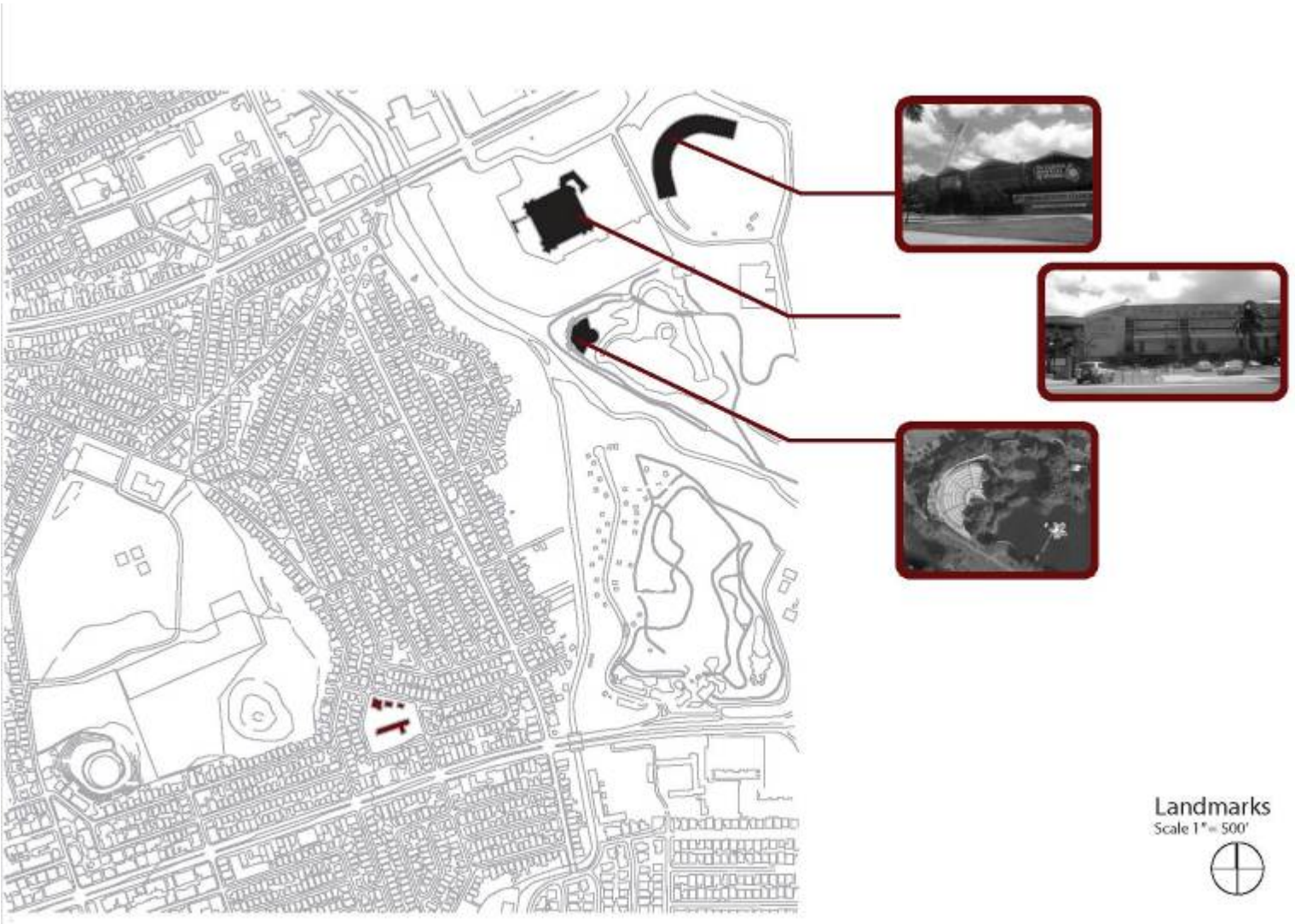


Figure 25: Landmarks Diagrams (by Author)

Siting Opportunities

The school site is pentagonal and is mostly northwest oriented. The surrounding suburban atmosphere makes the site suggestive of an island, which would encourage an object building approach. The north side offers ideal light for reading and is particularly desirable for building because the more highly trafficked street is closer to the south side. The east side of the site could be cleared of buildings to bring some natural ventilation to the building. The southwest corner of the building is completely bound by houses, creating a good space for community-related facilities.

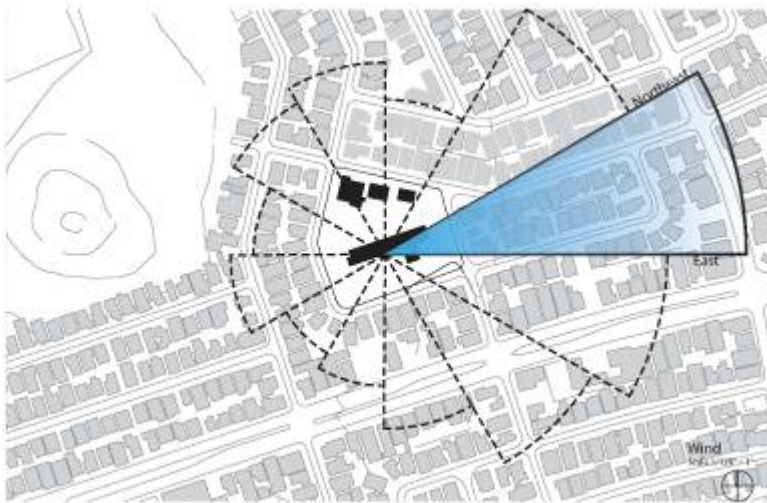


Figure 27: Wind Diagram (by Author)

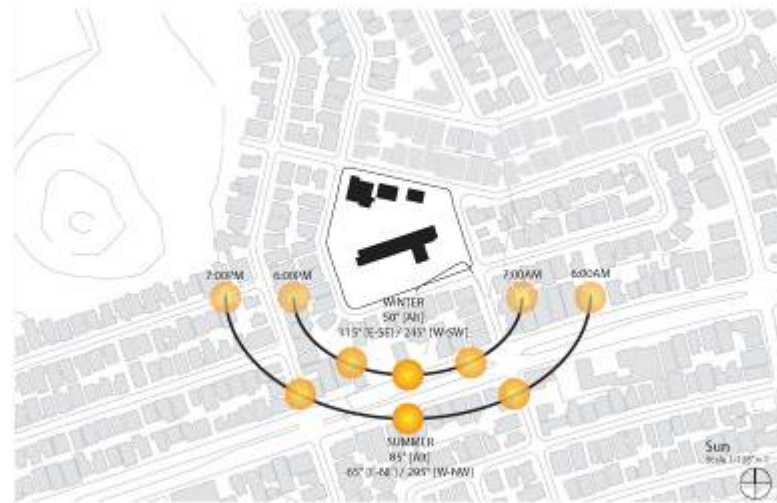


Figure 26: Sun Diagram (by Author)

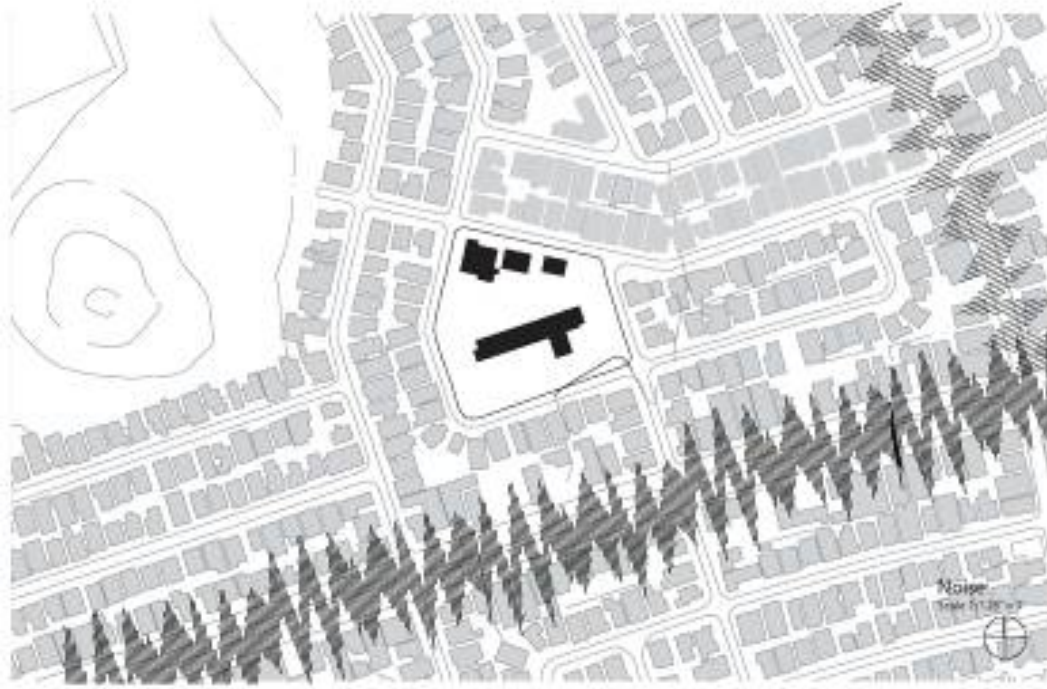


Figure 28: Noise Diagram (by Author)



Figure 29: Site Opportunity Diagram (by Author)

Current Situation

The school recently built a second kindergarten and is building a second structure with additional classrooms and a library. In 1990 the school became part of the Specialized Schools Program of the Department of Education. This school specializes in the development of talents.

“The Specialization in Talent Development was constituted to identify and reinforce academic and artistic skills of students in the elementary level of a poor community.”²³

The school has developed programs and activities to experiment with different pedagogical methodologies like technology-integrated classes and experiential learning. Although the program proposes progressive learning methods, the architecture of the building still promotes the traditional learning experience.

²³ Rico, Departamento de Educacion de Puerto. *Descripción General del Programa Especializado en Desarrollo de Talentos*. San Juan: Departamento de Educacion de Puerto Rico, 2006.

ANTONIO S PEDREIRA// PUERTO NUEVO//SAN JUAN

	Points Earned	Possible Point
PUBLIC SPACES <i>Proximity to public spaces as a possible amenity for the school</i>	5	5
PARKS <i>Proximity to Parks as a possible amenity for the school</i>	3	3
EDUCATIONAL FACILITIES <i>Proximity to existing educational facilities to avoid duplicity of facility and create relationship between learning communities.</i>	10	10
HIGHER EDUCATION <i>Proximity to existing higher educational facility to share resources and participate in university activities</i>	1	5
RECREATIONAL FACILITIES <i>Access to recreational facilities in the community to avoid duplicity of construction. If the community lacks a recreational facility the school can provide one to be a center of community-school engage</i>	1	10
CIVIC USES <i>Proximity to Civic Uses (museum, theaters) to use the whole community as a learning space</i>	1	5
PUBLIC TRANSPORTATION <i>Proximity to public transportation as a sustainable strategy and a possibility of access to other parts of the city</i>	1	5
HIGH TRAFFIC <i>Proximity to traffic is undesirable for security, contamination and noise problems</i>	2	3
HOSPITALS <i>Proximity to Hospitals in case of an emergency</i>	1	5
PERFORMANCE <i>School performance as a possible way to demonstrate improvement</i>	1	3
STUDENT TO TEACHER RATIO <i>Existing teacher to student ration. A lower ratio can improve the possibility of personalized education</i>	2	3
TOTAL	28	57

Zoning

All three sites fall under the ZU-G1 (urban zone-general1) zoning code. The building can only be three stories, which is reasonable for an elementary school. The first floor can have a maximum height of 18 ft and subsequent floors a maximum of 14 ft 9 in. The front yard does not require a setback as long as the road is the minimum width for that type of road. The backyard has to be 3 m or the height of the building divided by five. The latter formula is used only if the building is three stories with maximum ceiling height; otherwise the 3 m minimum applies. Side yards have the same rule as the backyard except the minimum is 2 m. Diagrams illustrating the necessary yards with different building heights for the actual program square footage reveal that all possible numbers of floors are feasible (although the single floor layout proved to be tight for one of the sites. See Figure 38).²⁴

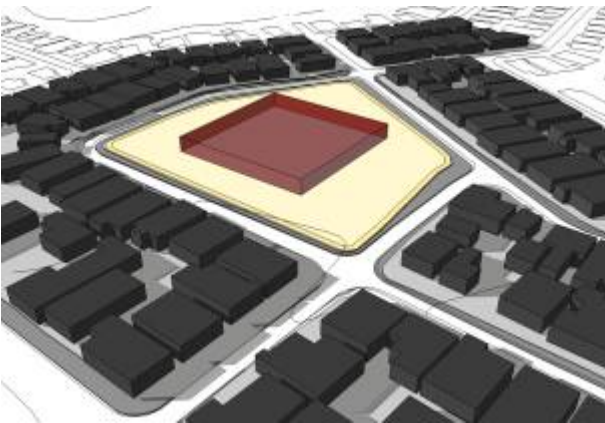


Figure 32: Zoning Puerto Nuevo (by Author)

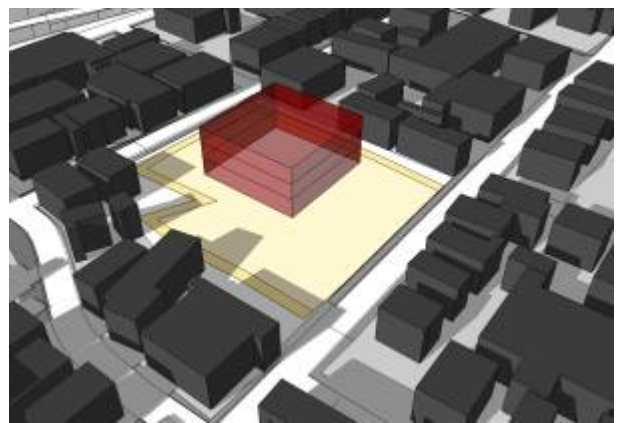


Figure 31: Zoning Santurce (by Author)

²⁴ Permisos, Agencia Reglamentos y. *Reglamento de Zonificación de San Juan*. San Juan: ARPE, 2003.

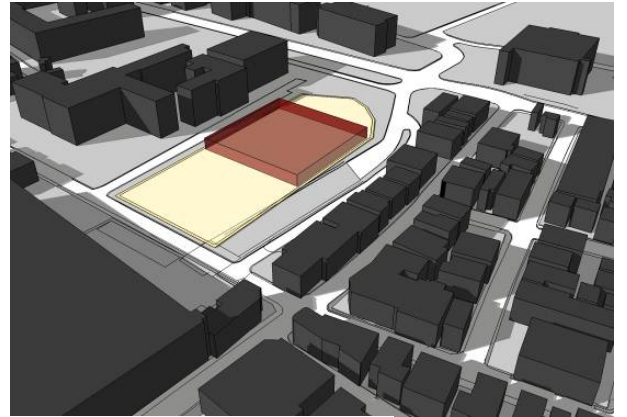
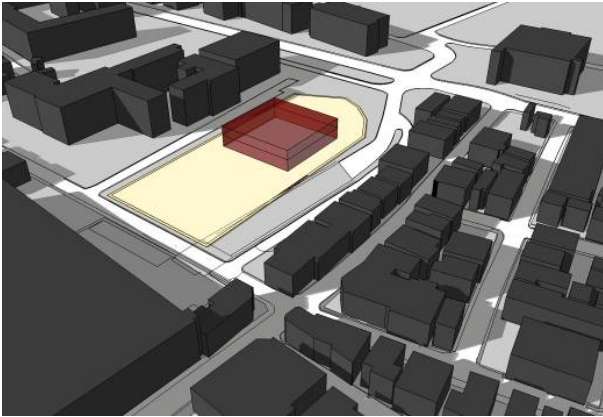


Figure 33: Zoning Rio Piedras (by Author)

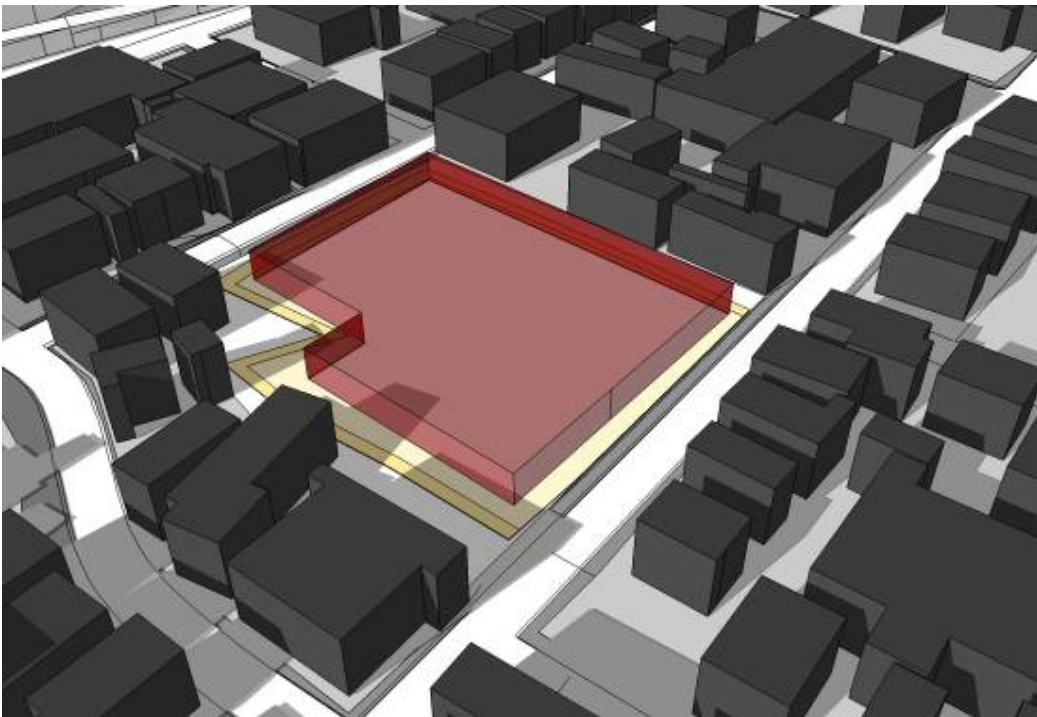


Figure 34: Zoning Santurce (by Author)

According to the zoning regulations, a parking space is required for every 25 seats in an educational facility.²⁵ This requirement is based on a typical school with approximately 25 students in a classroom with one teacher. Assigning a parking spot for every 25 students might be sufficient, although with a new school model there might be more teachers per student.

Building Code

The building code that governs Puerto Rico is the Universal Building Code (UBC) 1997, with some exceptions made by the Regulations and Permits Administration of Puerto Rico.²⁶ Under this code, school facilities fall under the Occupancy Group E division 1 for any building used for educational purposes through the 12th grade by 50 or more persons for more than 12 hours per weeks or four hours in one day.²⁷ The maximum construction height and allowable area depends on the construction method and the fire resistance of the materials. If the typical fireproof concrete construction is used, the height is unlimited, although the aforementioned zoning limits still apply. In the code, there are some considerations specific to school buildings. The school should front a street and have an exit discharge of no less than

²⁵ Permisos, Agencia Reglamentos y. Reglamento de Zonificacion de San Juan. San Juan: ARPE, 2003.

²⁶ Administration, Regulations and Permits. *Puerto Rico Building Code*. San Juan:

²⁷ Council, International Code. *1997 Uniform Building Code, Vol. 1*. International Conference of Building Official, 1997.

20 ft. Preschool, first, and second grades must be on ground level. Laboratories with hazardous materials need to be separated from other rooms by a wall. Means of egress depend on the use of a particular room and the number of occupants, assuming full capacity at all times. Every room that exceeds a capacity of 300 needs an additional means of egress. The code also determines the sanitary facilities, which depend on the population they serve, both their role and gender.

Role of the Institution

In the past schools were an important part of the city fabric and enjoyed a privileged location. In the last few decades, this importance has been lost and the buildings have become secluded and disconnected from their context. Recently, schools have been designed to have a better relationship with the community they serve. Schools should be part of the city network in order to provide an education that relates to the real world and be part of the children's life experience.²⁸ That relationship can work both ways. The school can benefit from nearby civic, cultural, and recreational amenities. The community can benefit from school facilities such as the library, cafeteria, and auditorium, which are spaces that improve the relationship.²⁹

²⁸ VS, OWP/P | Cannon Design and. *The Third Teacher*. December 2009. <http://www.thethirdteacher.com> (accessed January 12, 2010).

²⁹ Victoria Bergsagel, Tim Best, Kathleen Cushman, Lorne McConachie, Wendy Sauer, David Stephen. *Architecture for Achievement*. Washington: Eagle Chatter Press, 2007.

There are three characteristics that can help a school become integrated with its community: location in the heart of the city, ties with the community amenities, and a welcoming school space.³⁰ A school located in the heart of the city can create a sense of belonging for its members as well as for the city's inhabitants. The central location invites members of the community to make use of and take care of the facilities; the students can see the whole city as part of their learning process. Although this relationship can be positive in itself, the architecture of the school plays an important role in its success. The school needs to provide a welcoming entry in which the people from the community do not feel like strangers in the building. The building also needs to portray the culture and history of the area as a way to connect to the lives and aspirations of those who use the facility.³¹ Access to the building facilities after school hours makes it convenient for working members of the community, and this use transforms the space into an active component of the city fabric. It needs to be clear who is responsible for maintaining the different areas of the building when the community shares the facilities. Including the community from the beginning can help alleviate future conflicts. It is also important that the school have its private spaces to create an internal identity for its teachers and students; it is a school building, after all. These spaces also need to be flexible

³⁰Prakash Nair, Randall Fielding, Jeffery Lackney. *The Language of School Design: Design Patterns for 21st Century School*. USA: Designshare, 2005.

³¹Victoria Bergsagel, Tim Best, Kathleen Cushman, Lorne McConachie, Wendy Sauer, David Stephen. *Architecture for Achievement*. Washington: Eagle Chatter Press, 2007.

enough to support different activities, even when the facilities necessary for those activity is in use by another member of the school. If all these elements come together, the successful relationship with the community will enhance the learning experience.

Rationale for Selection

The three sites offer great opportunities that are quite distinctive. The first two, Santurce and Rio Piedras, because they are embedded in dense urban areas surrounded by a diversity of activities, can absorb the city's amenities. Because the Puerto Nuevo site is in a completely residential area, it lacks a variety of cultural activities, but the vast expanse of this site provides great opportunity for this school to become a community node within the community.

The Antonio S. Pedreira became part of the Specialized School Program of the Department of Education in 1990. The program specializes in the development of talents. Throughout the last two decades the school has crafted a really progressive curriculum but the building is the 'traditional' building that has been replicated throughout the city.

Chapter 4: Program

“Every element of a school building can provoke learning for those within it.”³²

In order to provide different learning modalities, different spaces are to be provided in the school building. Every space related to the children’s activities throughout the day has the potential of becoming a pedagogical experience. Spaces should have relationships based not only on use but also on the nature of the experience of the inhabitants. The experience can be spatial, psychological, physiological, or behavioral. Every space has the potential to offer multiple experiences and promote different activities based on them.³³

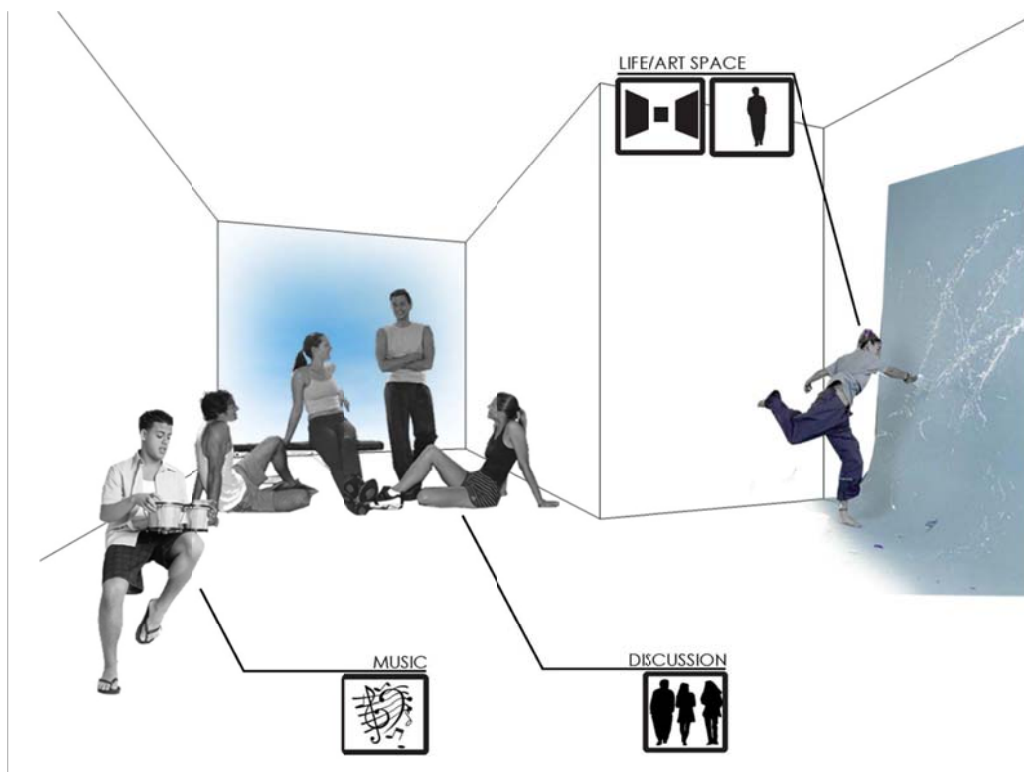
Entry: Threshold between the outside and the school building; also a place of interaction between the parents and the school. The entrance should be covered, welcoming, and homelike.

Administration: Main connection between the school and the community. Should be vigilant of the activities in the school and also be the eyes on the streets.

³² Victoria Bergsagel, Tim Best, Kathleen Cushman, Lorne McConachie, Wendy Sauer, David Stephen. *Architecture for Achievement*. Washington: Eagle Chatter Press, 2007.

³³ Prakash Nair, Randall Fielding, Jeffery Lackney. *The Language of School Design: Design Patterns for 21st Century School*. USA: Designshare, 2005.

Learning Activities: Although the different spaces have to be well defined, the architecture should not be prescriptive of a single activity; on the contrary, each space should encourage multiple learning activities.



Faculty: Integration with the spaces where the learning activities occur is necessary. A space is needed to encourage privacy for the teacher but visibility for the students to avoid the rivalry between the students and the teacher that the more traditional school perpetuates.

The public school in Puerto Rico has to provide both breakfast and lunch to every student so the dining hall is heavily used by the school students. Dining halls, especially the ones with full kitchens, occupy a large part of the school square footage. The typical dining hall is underused between and after mealtimes so there is a waste of square footage and energy most of the day. Redefining the dining hall can create a multipurpose space for the school and the community. For example, introducing the ritual of students sharing breakfast and interacting with teachers, parents, and members of the community would bridge the gap between the school and the larger society.



Figure 36: Dining Hall (by Author)

Technology progresses and daily becomes a more essential part of our lives. With the mobility of technology, there is the possibility of better integration with and enhancement of the classroom, but still the interaction between the student and the computer is isolated. Locating all computers in an enclosed laboratory separated from the learning spaces diminishes their pedagogical purpose. With the advances in technology, computers can be integrated in the communal spaces to generate discussions and group learning.³⁴

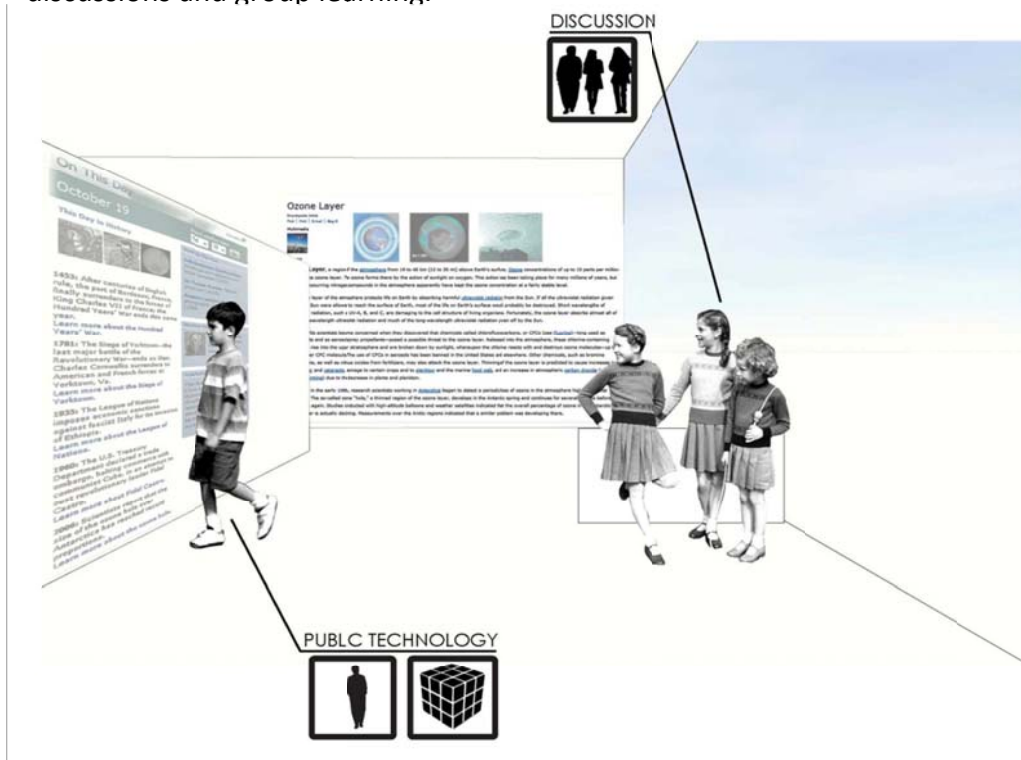


Figure 37: Integrated Technology (by Author)

³⁴ Prakash Nair, Randall Fielding, Jeffery Lackney. *The Language of School Design: Design Patterns for 21st Century School*. USA: Designshare, 2005.

The typical hallway only serves as a channel to move between different school spaces. It barely promotes socialization among the students and its main purpose is to be efficient and a factor for controlling students' activities. A "circulation space" can become a "learning street" in which interaction between and among students can occur. It can also promote different activities that range from group discussion spaces to more private learning spaces. Student work should be displayed in both the public and learning spaces. Posting pedagogical material created by students can promote discussions and might encourage other students to produce work for exhibition.³⁶

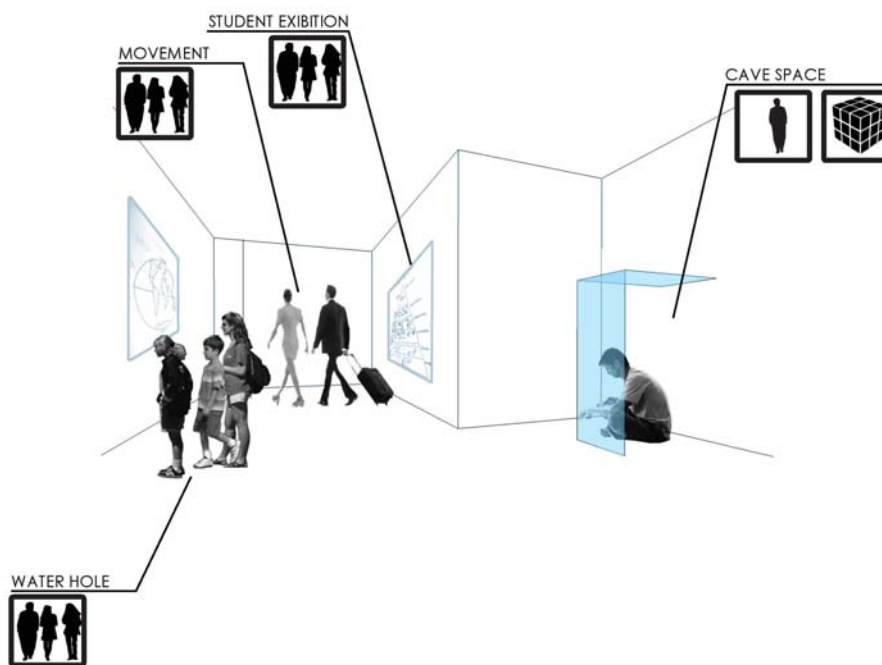


Figure 39: Public Circulation Space (by Author)

³⁶ Prakash Nair, Randall Fielding, Jeffery Lackney. *The Language of School Design: Design Patterns for 21st Century School*. USA: Designshare, 2005.

“Sharing resources within the building establishes norms of mutual support that strengthen the bonds among those who work and learn there.”³⁷

Some programmatic elements of the school building such as the library and IT lab can serve not only the school but also the community. The community could use the recreational facilities and performance space and keep the building in operation outside school hours and on the weekends.

Sustainability

Sustainable strategies should be implemented throughout the building and site. In addition to environmental reasons, the sustainable approach can be a pedagogical tool by itself.³⁸ Passive strategies, such as overhangs on the north and south façades and fins on the east and west façades, mitigate the heat gain and promote natural ventilation throughout the building, thus minimizing (or even eliminating) the need for mechanical conditioning.³⁹ Currently in San Juan, only a small number of elementary schools have mechanical ventilation; culturally, the majority of the inhabitants are accustomed to perform without mechanical conditioning. It is merely a matter of ensuring that the sun and wind are being properly used to create an

³⁸ Prakash Nair, Randall Fielding, Jeffery Lackney. *The Language of School Design: Design Patterns for 21st Century School*. USA: Designshare, 2005.

³⁹ Abuña, Dr. Fernando. *Fresco Gratis*. San Juan: Futures Conceptions LTD, 1980

adequate environment. The importance of an adequate environment is that comfort helps improve performance.

Although sustainability technology might be difficult to grasp, especially for the first grades, there is value in having a sustainable building. In order to instill a sense of respect for nature, the building should be representative of that respect. Even providing and connecting green spaces with the different learning spaces can prove a positive influence on the educational process. Researchers have found that “healthy childhood maturation and development has been correlated with contact with natural features and settings.”⁴⁰ If as a species we expect to live in a healthy relationship with the environment, it is necessary to encourage these values early on to produce a generation that sees sustainability as a norm, not as an exception.

Although it has been done, it might be difficult economically for the Department of Education to incur the initial cost of implementing active sustainable technology, especially during economic hardship. Nevertheless, and ideally, some active sustainability technology, such as solar panels, smart building technology, and water catchment systems, could be implemented.

⁴⁰ Stephen R. Kellert, Judith Heerwagen, Martin Mador. *Biophilic Design: The Theory, Science and Practice of Bringing Buildings to Life*. Wiley, 2008.

The first step in creating awareness of our impact on the planet is to show the systems that support a building.⁴¹ These systems can also have a pedagogical purpose in understanding and applying math and science knowledge. Sustainable strategies like bio-swales and solar panels can also be a source for learning. The learning possibilities do not have to be limited to understanding the systems; there can also be hands-on learning experiences, such as taking care of the plants and growing gardens. An essential part of the process is to involve the students and community in these strategies. The older students can learn how these technologies work and actively participate in their maintenance and function. They can acquire enough understanding of the systems to teach the younger students and members of the community. The Sidwell Friends School in Washington, D.C.⁴², is a good example of a sustainable school in which its members are aware of its significance and actively participate in its processes. Designing a building with systems of sustainable strategies might create an awareness of the place we occupy in the greater ecosystem.

In a diverse learning environment, such as the one proposed, a student might feel that some activity spaces were too public and have difficulty identifying personally.

⁴¹ Victoria Bergsagel, Tim Best, Kathleen Cushman, Lorne McConachie, Wendy Sauer, David Stephen. *Architecture for Achievement*. Washington: Eagle Chatter Press, 2007.

⁴² Architects, American Institute of. *AIA/COTE Top Ten Green Projects*. 2007. <http://www.aiatopten.org> (accessed January 13, 2010).

Therefore, in order to provide a more widespread learning process, some spaces might be student oriented. Informal spaces have the potential to create some sense of ownership and a more relaxed learning experience. This thesis proposes two different types of spaces for these activities: watering hole and cave spaces. These terms were first used by David Thornburg to describe different learning activities. The watering hole concept came from the ancient activity of gathering around water sources for informal conversation in which “we learned from our peers.”⁴³ In this scenario every participant acts as both teacher and learner. The cave concept “where we came in contact with ourselves”⁴⁴ is that introspective learning space for more individual, concentrated learning. Water hole learning could occur anywhere in the school, but providing some breakout or open spaces along the main circulation route could encourage the types of activities that are, to some degree, limited in the traditional school. Cave learning need more specific spatial qualities that provide small spaces that are visible (for security purposes) but private enough to encourage the concentration required for meticulous thinking.

Specific activity spaces should be located to avoid conflict between the nature of the activities. Spaces that promote movement and noise should not interrupt the activities that require silence or concentration. The spaces that are meant for

⁴³ Thornburg, David D. *Campfires in Cyberspace*. Starsong Publications, 1999.

⁴⁴ Thornburg, David D. *Campfires in Cyberspace*. Starsong Publications, 1999.

project-based learning would benefit from access to the exterior to promote its usage and to avoid interfering with more ordered activities. Spaces for group activities and interaction should ideally be connected to all the spaces to promote the collaborative nature of learning.

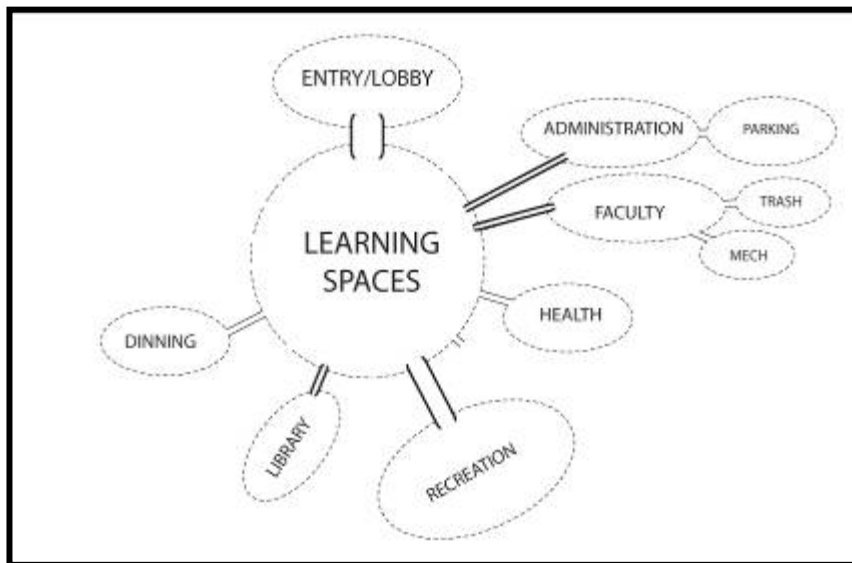


Figure 40: Bubble Diagram (by Author)

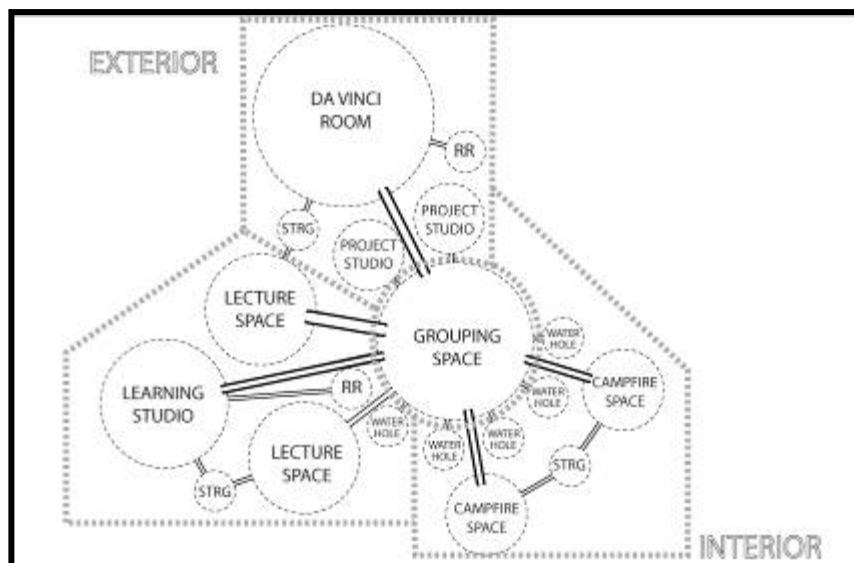


Figure 41: Learning Spaces Bubble Diagram (by Author)

Inside/Out

The human brain coordinates all the processes that our body and mind is capable of, from motor abilities to abstract thinking. Although the brain is one organ with a complex and comprehensive function, particular skills are processed in different parts of the organ. Using the brain as a template, some of the learning spaces can be divided in areas that promote different types of experiences. The brain is divided (not physically) in four parts. The frontal lobes are involved with reasoning, planning, and problem-solving skills; this area of the school could host the intrapersonal and logic-oriented spaces. Activities such as reading, playing computer games of a logical or mathematical nature, and personal learning can be promoted in these spaces. The parietal lobes are in charge of the perception of stimuli and therefore an ideal space for nature and interpersonal learning. Locating open spaces and grouping spaces can promote learning by reaction to the environment and to other students. Student displays and hands-on projects can also stimulate reactions that encourage learning. The occipital lobe is in charge of the visual processing so in the building this area can promote visual-spatial learning and can be used for art and science projects that stimulate the visual sense. The temporal lobe relates to the perception and recognition of auditory stimuli and speech; this space could incorporate the verbal and music oriented spaces. Having spaces for musical performance and campfire learning could promote this type of learning. Next to the brain is the cerebellum,

and although it is not physically a part of the brain its functionality is part of the same system. The cerebellum is in charge of the regulation and coordination of movement, posture, and balance. This could be the ideal space for kinesthetic learning like fitness, dance, and performance.⁴⁵

⁴⁵ Guide, TBI Resource. *Centre for Neuro Skills*. 2009. <http://www.neuroskills.com> (accessed January 20, 2010).

	GROUP	INDIVIDUAL	OPEN	CLOSED	PASSIVE	ACTIVE	QUIET	NOISY	GENERAL ACTIVITY	TASK ORIENTED	ISCHOOL ONLY	COMUNITY SHARE
ENTRY/LOBBY	●		●			●		●	●			●
ADMINISTRATION		●		●	●		●			●	●	
LEARNING SPACES	●	●	●	●	●	●	●	●	●	●	●	
RECREATIONAL SPACES	●		●	●		●		●		●		●
DINNING AREA	●		●			●		●	●			●
LIBRARY	●		●		●		●			●		●
IT LAB	●			●	●		●			●		●
HEALTH CENTER	●			●	●		●			●		●
FACULTY SPACE		●		●	●		●			●	●	
RESTROOM		●		●	●		●			●	●	●
PARKING	●		●		●			●		●		●
SERVICE		●		●	●			●		●	●	
STORAGE		●		●	●		●			●	●	
MECHANICAL		●		●	●			●		●	●	
TRASH/RECYCLING		●	●		●			●		●	●	

Table 4: Spatial Qualities Table (by Author)

ENTRY

1,650

A welcoming sheltered space. This is the space of transition from the house to the school. The transition should be gradual. This space also serve as a community gathering space. Parents/community spaces should be close to the entry.

Sheltered Entry	1	350	350
Parents/Community Room	1	250	250
Lobby	1	1,000	1,000
Storage	1	50	50

ADMINISTRATION

1,835

Main connection between the community and school. Serve as eyes on the street and vigilance on the school.

Director Office	1	150	150
Dean's Office	1	100	100
Secretaries	1	400	400
Common space	1	500	500
Guidance Counselor	1	100	100
Conference Room	1	500	500
Restroom	1	35	35
Storage	1	50	50

LEARNING SPACES

14,500

Multiple learning spaces that satisfy the different learning modalities of the contemporary children. Segregating the groups by type of learning and activity instead of age and subject.

Lecture Space	4	750	3,000	15.45
<i>Traditional Classroom space for the teacher to impart knowledge</i>				
Learning Studio	2	1,000	2,000	17.84
<i>Space for small groups to have different learning experience from break-out sections to active project learning</i>				
Grouping Space	2	1,500	3,000	21.85
<i>Common space for the students to collaborate and fraternize</i>				
Cave Space	10	100	1,000	5.64
<i>Small 'niche' space for a more intrapersonal learning experience. Preferably along the main public space.</i>				
Campfire Space	5	400	2,000	11.28
<i>Space for small groups seminar learning. Preferably along main public space or grouping space.</i>				
Project studio	2	300	600	9.77
<i>Space for hands-on Learning and project making. Optimum lighting and ventilation are required</i>				

Mechanical	1	200	200	
Trash/ Recycling	1	150	150	
SUB-TOTAL				37,292
GROSSING FACTOR				5,594
PARKING	1	7,500		7,500
TOTAL				50,385

Table 5: Program Tabulation

Chapter 5: Precedents

Nueva School Hillside Learning Complex

Hillsborough, CA

Leddy Maytum Stacy Architects

Overview

Building type(s): K-12 education

New construction

27,000 ft² (2,510 m²)

Suburban setting

Completed September 2007

Rating: U.S. Green Building Council LEED-NC, v.2.2--Level: Gold (45 points)

The Nueva School mission is to “inspire passion for lifelong learning, foster social acuity, and develop each child's imaginative mind, enabling students to learn how to make choices that will benefit the world.”⁴⁶ The Hillside Learning Complex includes three buildings (a library and media center, a student center, and a classroom building with administrative offices, seven classrooms, and an R&D lab), which are

⁴⁶ Architects, American Institute of. *AIA/COTE Top Ten Green Projects*. 2007. <http://www.aiatopten.org> (accessed January 13, 2010).

organized around an open central plaza. The classroom building serves only the fifth through eighth grades. The student center serves lunch to the same group. The library serves the entire school. The library and media center building and the classroom building face each other across the plaza creating an edge that frames and directs the long axis of the site into the student center. The green spaces that surround the library and classroom building reinforce that movement toward the student center. The steps that form the amphitheater exalt the entrance of this culminating piece. An interesting aspect of the site is that instead of being at a higher point in the topography, the student center is at a lower one, but the level change still helps to reinforce the uniqueness of that building. Also the sun shading devices in the classroom building are well integrated with the overall architecture of the building.



Figure 42 School Entrance (Photo by AIA Top Ten Green Buildings)



Figure 43: Aerial View (Photo by AIA Top Ten Green Buildings)



Figure 44: Interior Views (Photo by AIA Top Ten Green Buildings)

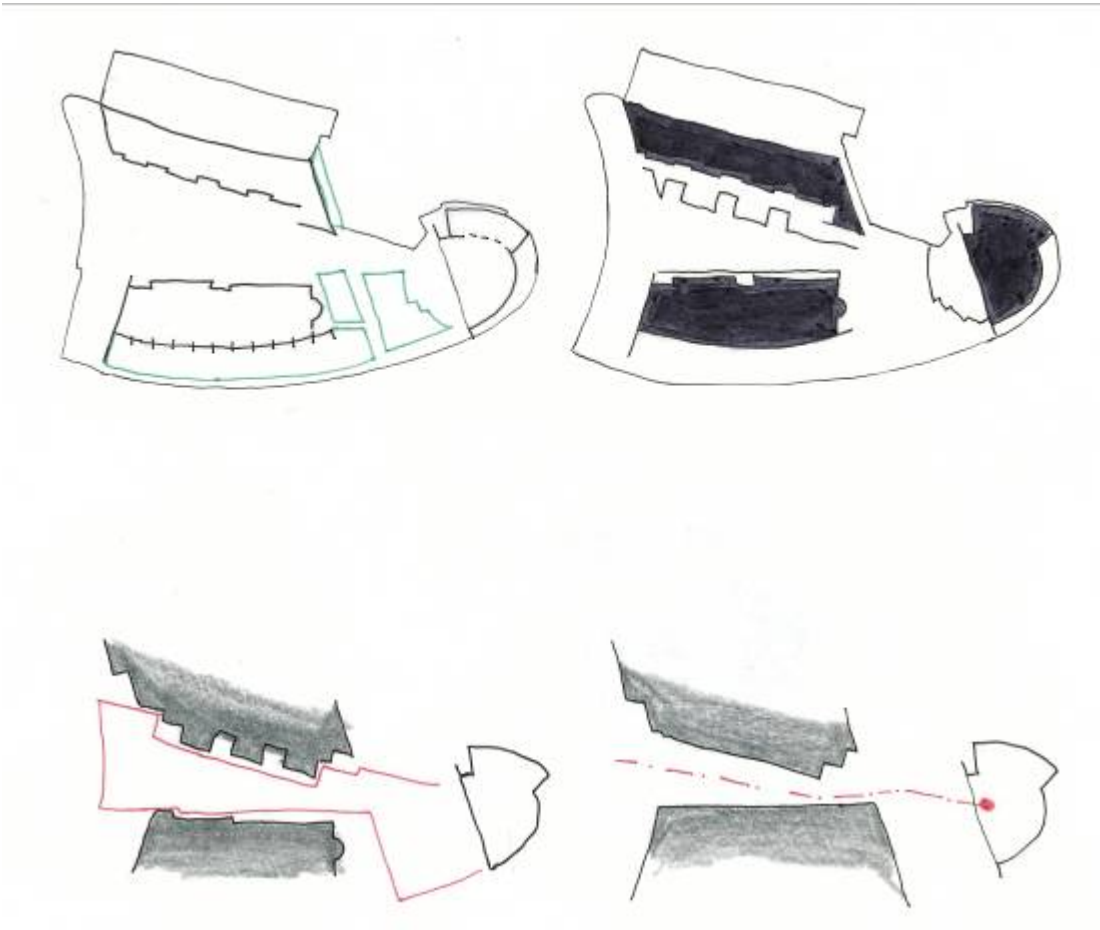


Figure 45: Plan Diagrams (by Author)
 (from top left) Green Spaces, Figure Ground, Public Plaza, Main Axis

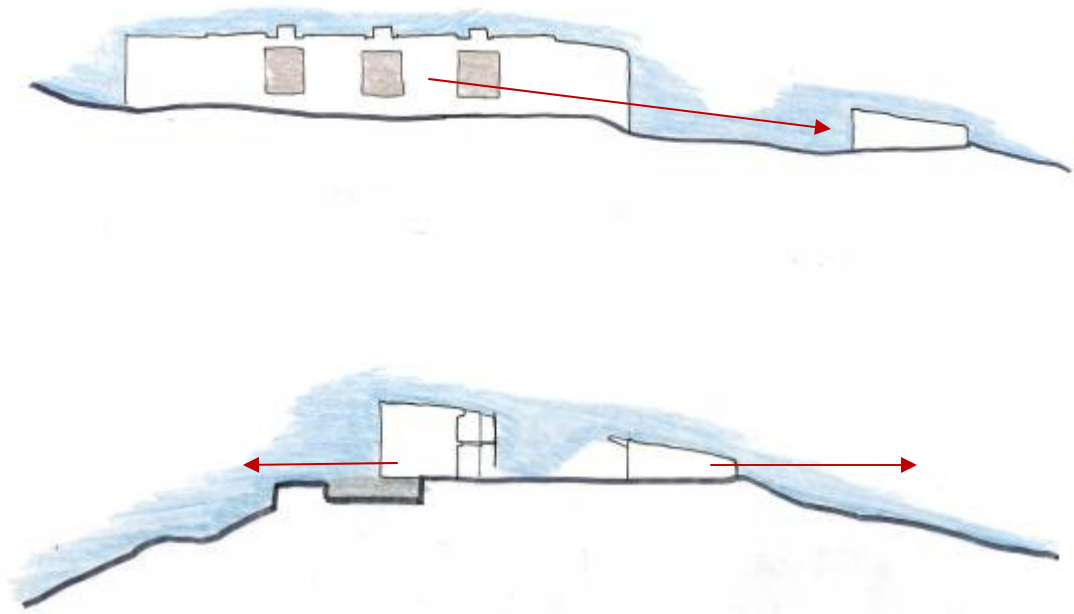


Figure 46: Sections Diagrams (by Author)
 (top) Dining Space as centerpiece (bottom) Uninterrupted Vistas

Yu Neng Primary School

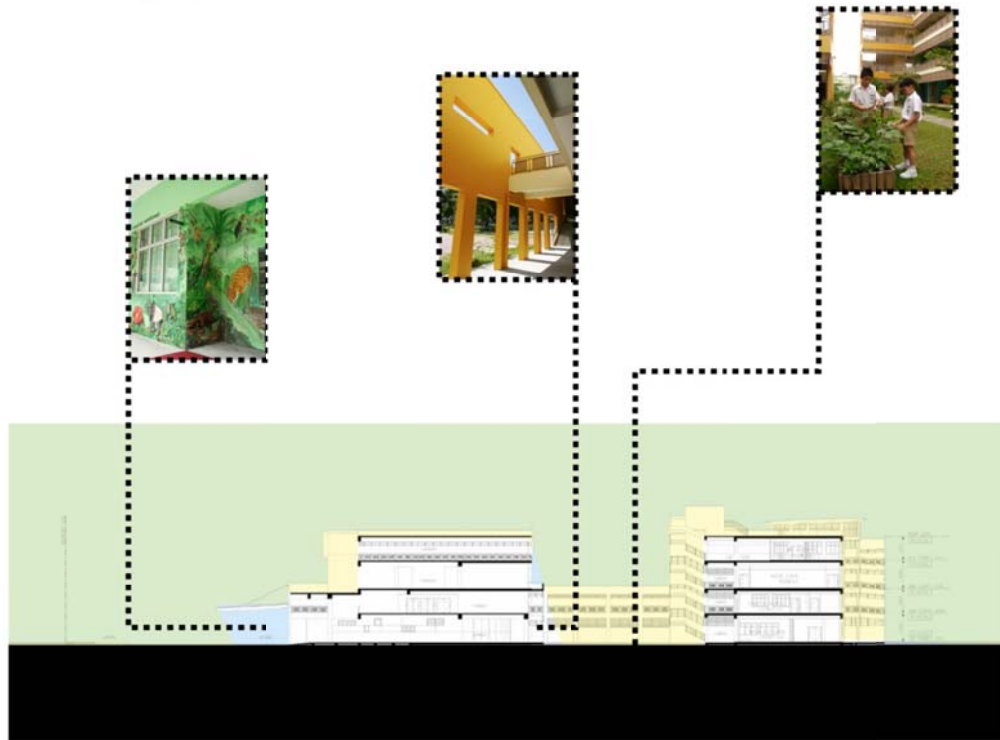
Singapore, Singapore
CPG Consultants Pte Ltd

Footage:	185,700 ft ²
Grades:	Primary 1 - 6
Acreage:	4.45
Completion:	15 September 2004
Capacity:	1,700
Total Cost:	\$ 9,424,372

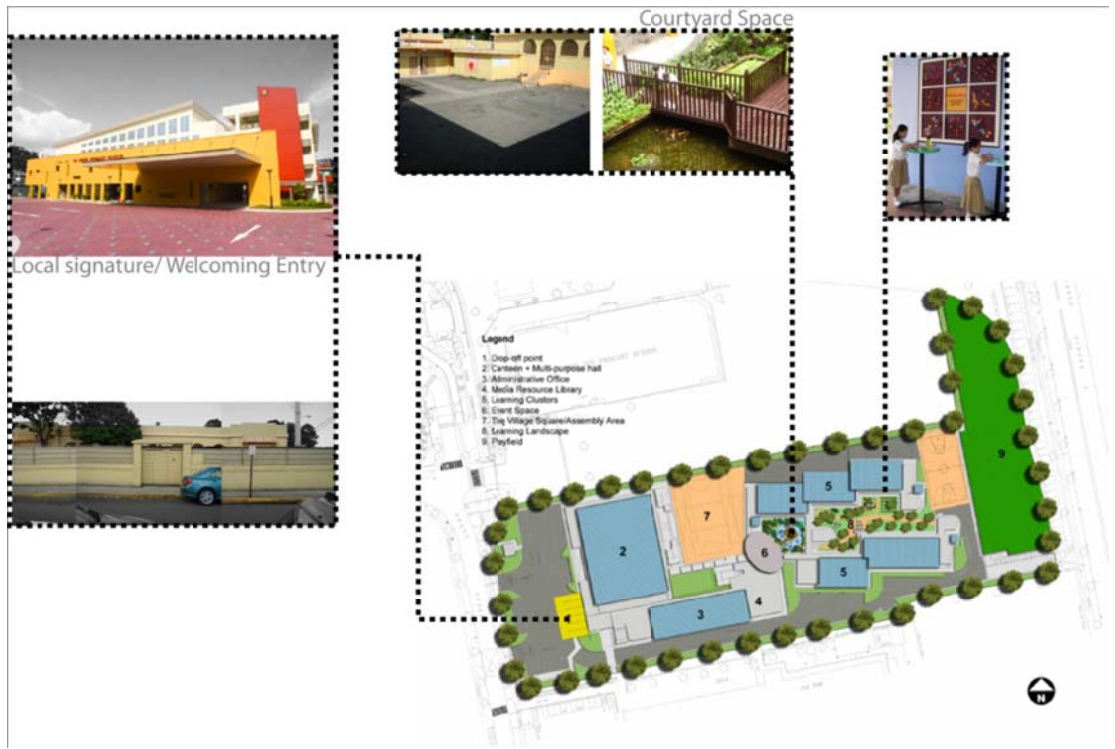
The Yu Neng Primary school tries to preserve the idea of the village school it had in 1935. The school is divided into small clusters of classrooms surrounding the center open space in which community is created within natural features. The climate in Singapore is temperate enough for the classrooms on the lower level to be open to the courtyard space. It is successful in using the whole building to create consciousness of the environment. Using the walls to portray ecosystems, employing explicit sustainable strategies, and setting up math corners with educational games, the school takes the learning process beyond the classroom. The school is located in the core of Singapore and surrounded by high density buildings. The site is long and narrow, bordered by a secondary street on one short side and a high-traffic street

on the other. To respond to the conditions of the site, the playground acts as a buffer for the traffic at one end (next to the avenue) and at the other end the main entrance and parking separate the clusters from the street.⁴⁷

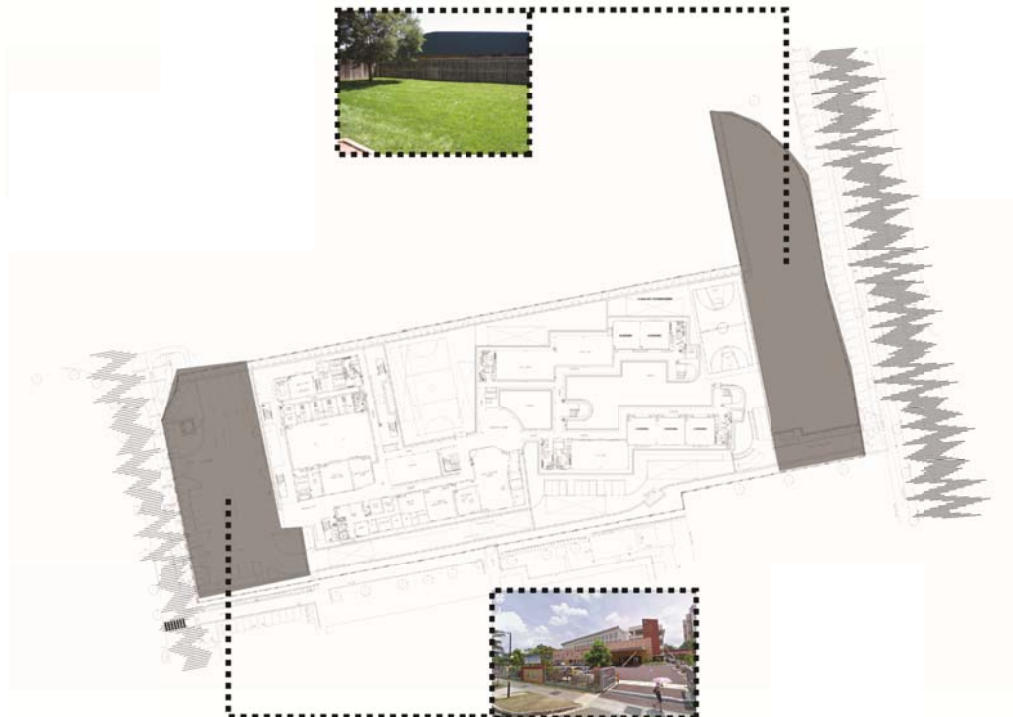
Outdoor Learning Spaces



⁴⁷ Share, Design. *Design Share*. 1998-2009. <http://www.designshare.com> (accessed January 9, 2010).



Buffer Zones





Cedar Primary School

Singapore, Singapore

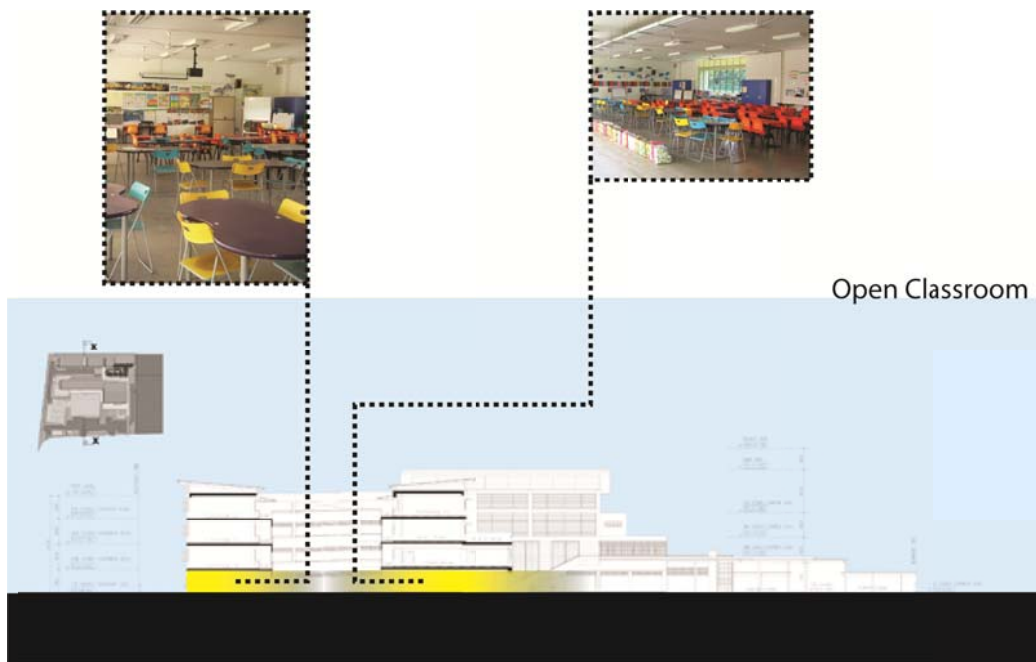
CPG Consultants Pte Ltd

Overview

Type:	Elementary
Footage:	122,200 ft ²
Grades:	Primary 1 - 6
Acreage:	4.695
Completion:	April 2006
Capacity:	920
Total Cost:	\$ 8,230,827

The school is the merger of two schools, following the idea of the “school within a school.” It is located in a low-density residential neighborhood, in an isolated block. The classroom clusters and the outside learning spaces are on the back of the site leaving the communal spaces closer to the residential street. Open spaces are located between teaching blocks, serving both as a contemplative space and as a place where social activities and learning can spread out from the corridors. The layout also creates a strong inside-outside connection. This allows the playground to

infuse elements of play into the mathematics and science curriculum. The favorable climate allows for an open classroom (windowless and doorless architecture) that facilitates interaction among students of different age groups from different classes. This grouping also promotes a sense of responsibility for their learning. The playground also has learning value aside from the fitness aspects, some of the playing additions teach about symmetry, simple machines, and forces.⁴⁸



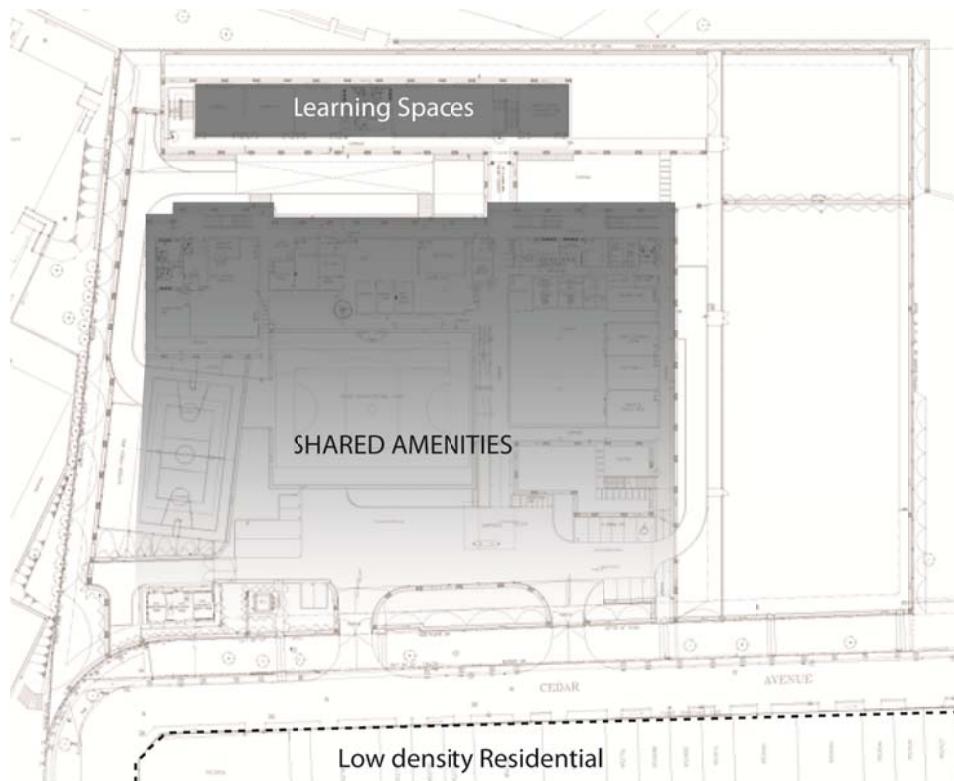
⁴⁸Share, Design. *Design Share*. 1998-2009. <http://www.designshare.com> (accessed January 9, 2010).

Open Space



Legend

- 1. Drop-off point
- 2. Cafeteria + Multi-purpose hall
- 3. Administrative Office
- 4. Media Resource Library
- 5. Learning Clusters
- 6. Parade Square/Assembly Area
- 7. Play Courts
- 8. Outdoor Classroom/Butterfly Garden
- 9. Playfield





Chapter 6: Design Approach

The main goal of each parti is to respond to both the internal issues of the site (including the existing school building) and its connection to the community. Understanding the challenges and opportunities each site offered informed the different parties on how the program is going to be laid out and the connection to the surroundings.

Two or more parties were developed for each site based on contrasting criteria. Some used the existing building, other discarded it. Sometimes the existing site was used; boundaries were broken in others. The purpose was to explore different approaches and possibilities for developing the program and the previously discussed relationships on the selected sites.

One of the programmatic elements that became particularly important during these explorations was the dining hall. At first it was relegated as a service piece, but in the process of laying out the building and in observing the rituals of serving and eating food, the socializing aspect of the dining hall became an essential part of the school building.

Supplemental programmatic elements such as libraries, IT labs, community centers, and recreational facilities were examined for each site and their inclusion depended on the nature of the community in which the site was located. Two sites (Santurce

and Rio Piedras) had a more absorbent relationship with their communities. For those sites the community elements were reduced or eliminated to avoid excess or duplication of uses. At the other site (Puerto Nuevo), because amenities were lacking the school needs to be a provider for the community. Therefore, the community elements were maximized to support both the school and the community.

Site 1: Santurce

The first parti, developed on a clean slate, discarded the existing building. The building opens to the east to facilitate the approach to the site and take advantage of the predominant wind direction. The buildings surround a courtyard that opens to the main entrance and distributes everyone to the different programmatic elements. In the first iteration, the interior learning activities building ended up as a long bar on the northern side of the building. Although this aspect might be useful for receiving northern light, the bar shape lacked the flexibility the program needs. In the second iteration, the footprint of the activities building was minimized by creating a second level, with the resulting shape offering greater flexibility for the programmatic elements. A possible problem with this scheme is the location of the recreational facilities and the disconnection from the main courtyard.



Figure 55: Santurce Part 1 (by Author)

The second parti preserved the main building as a memorial. The courtyard location and rationale is similar to the first parti. In the first iteration, the existing building formed part of the learning activities building, which, because of the structured nature of the original, limited the flexibility of the program. In the second iteration, the administrative and communal elements of the program were located in the existing building with the middle part of the structure serving as a communal space to move around the buildings.



Figure 56: Santurce Part 2 (by Author)

A third parti was developed that took over the southern part of the block. The main achievement of this parti was the expansion of the communal building surrounding a public plaza, an amenity the community lacks. The dining hall is the connecting piece between the community plaza and the school courtyard. The weakness of this scheme is that the recreational facilities are isolated at the northwest part of the site and disconnected from either open space.

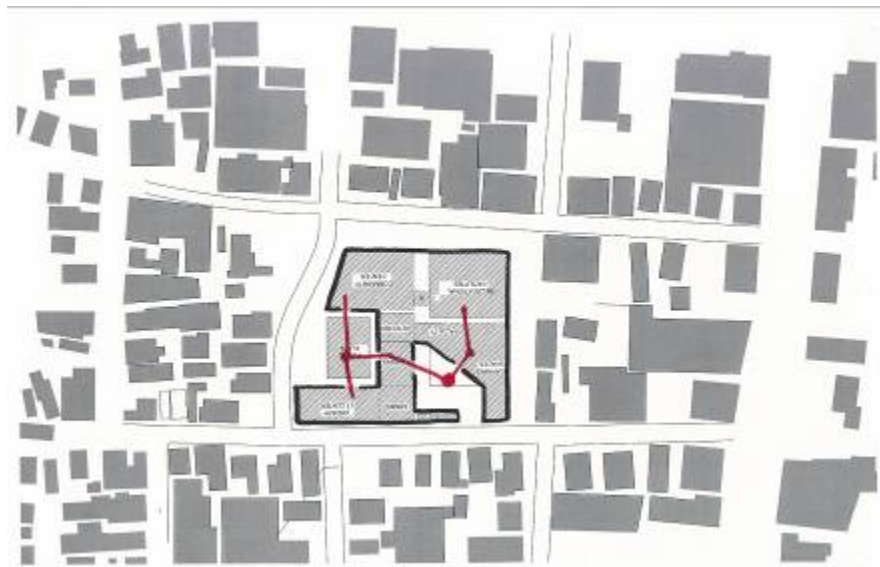


Figure 57: Santurce Part 3 (by Author)

Site 2: Rio Piedras

The first parti discarded the existing building and tried to create a connection between the university campus on the northern side and the marketplace on the south. The recreational facilities were located on the north side to maintain that relationship with the high school facilities and to mitigate the street noise. The dining piece was located in the southern part to establish a relationship with the marketplace and the community. In the first iteration, the entire program was located to the western side of the site to create an edge with the other school and give the school some open space to the western side. The weakness of the scheme is that all the buildings are bar-shaped and in a single row, which limits the diversity and flexibility desired. In the second iteration, the possibility of a dividing road as a possible learning street between the schools was explored. The recreational facility building was connected to the existing high school facilities, creating a culmination to the street. The activities and dining building were more responsive to the high school. The weakness of this scheme is the lack of a defined open space for the school as it opens to the northern part of the site. Also the activities building might still be too inflexible.

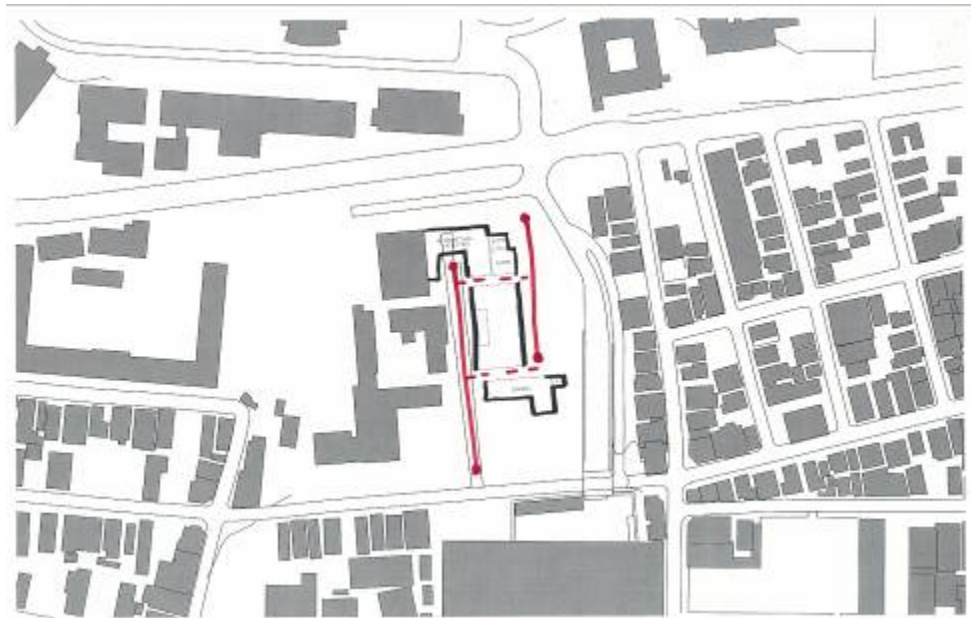


Figure 58: Rio Piedras Parti 1 (by Author)

The second parti tried to use the existing building as a guide for the parti layout. The rationale for the location of the programmatic elements is similar to the first parti. In the first iteration, all of the main building was used and part of the second building for the dining hall. The problem with the scheme is that by using the existing building the possibilities for redefining the activities spaces is minimal. The second iteration was more critical of the amount of existing buildings used. This parti was successful in creating a good open space between the buildings. A possible weakness is that the odd shape of the buildings makes the building look less cohesive.

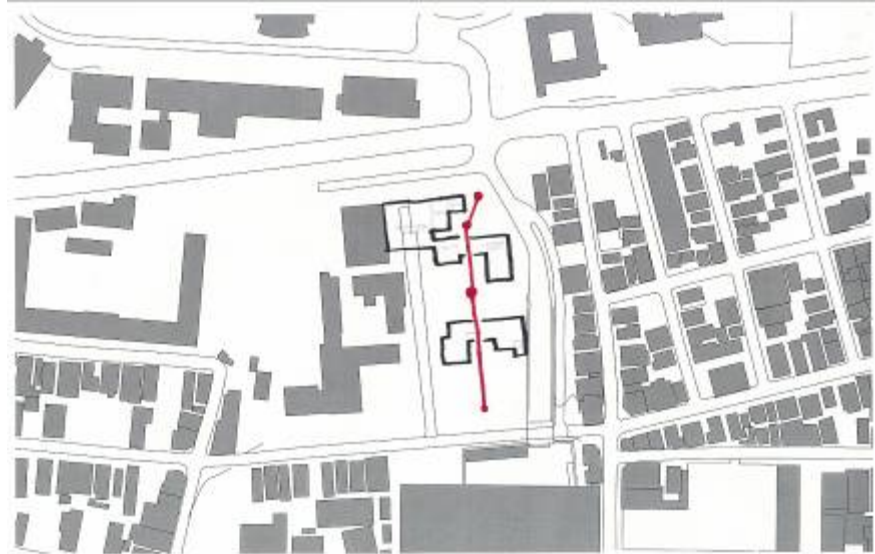


Figure 59: Rio Piedras Part 2 (by Author)

A third parti was designed to explore the possibility of creating a strong connection between the university campus and the marketplace. The buildings shaped around that connecting axis create interesting nodal points along the path and an interesting open space for the school.

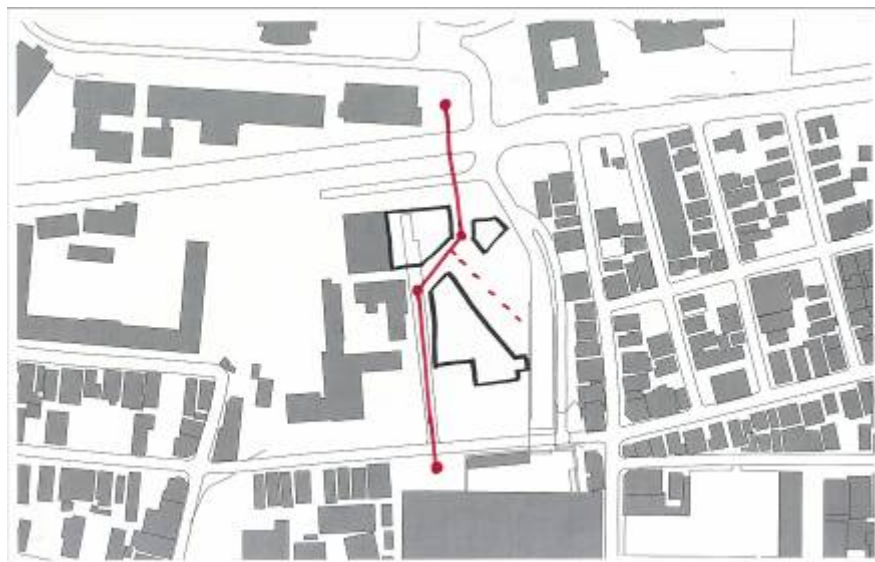


Figure 60: Rio Piedras Part 3 (by Author)

Site 3: Puerto Nuevo

The first parti located the program mostly according to the climatic conditions. Placing the learning activities building on the northern part maximized the use of natural light. The recreational facilities are located on the southwestern part of the site because of the approach and the neighborhood layout. Because the site is vast, landscape will play an important role in giving enclosure and definition to the open spaces. In this arrangement, the open spaces are oriented toward the east-northeast (predominant winds). In the first parti, the entrance and main courtyard act as a node that directs people to the different programmatic areas. A problem with this site is the amount of left over, especially in the northern part. In addition, the dining hall is located far from the main courtyard, a factor that could diminish its socializing role in the school.



Figure 61: Puerto Nuevo Part 1 (by Author)

In the second parti, the existing structure was partially preserved. The program was rearranged so the recreational facilities occupied the northern part of the site. The existing building acts as a distribution node for the other buildings on the site. The dining hall was located closer to the main courtyard to emphasize its importance in the school. A possible weakness might be that the dining building blocks the breeze for the first level of the learning activities building.

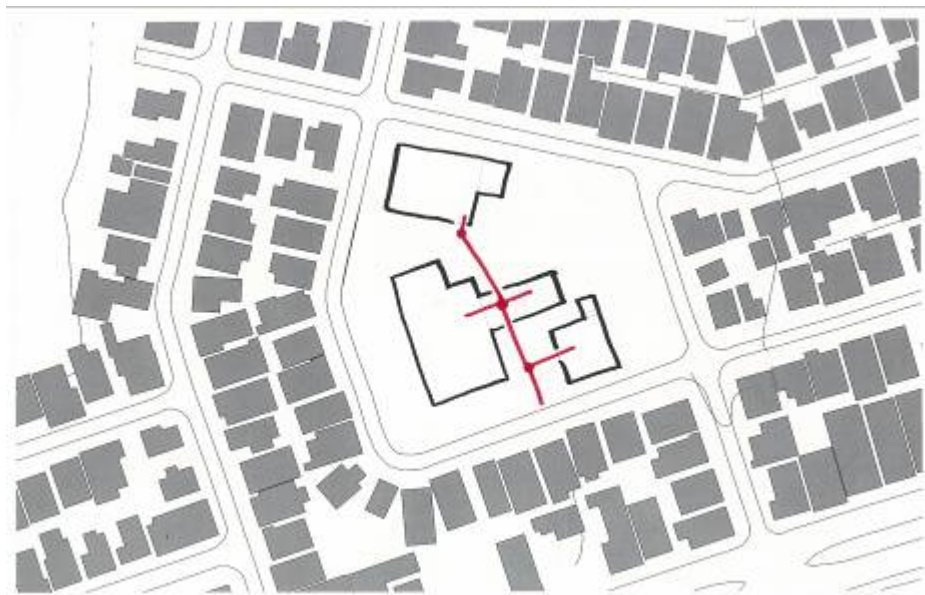


Figure 62: Puerto Nuevo Part 2 (by Author)

Chapter 7: Final Design Proposition

Project Goals

The talent development program that the existing school has adopted encourages students to excel in three different activities: academic, artistic and physical.⁴⁹ The main goal of the project is to provide the appropriate spaces to serve multiple intelligences and ensure a proficient education in these activities. To promote a sense of school community that enhances the learning experience like common spaces for the students to complement the school activities and to promote mentorship between the students. The existing program also includes activities to include the community in the learning process, but the existing school architecture is introverted and does not allow for a healthy relationship with its surrounding community. As part of the design process it will be essential to create an extroverted school that promotes a reciprocal relationship with the school, the parents and the community.

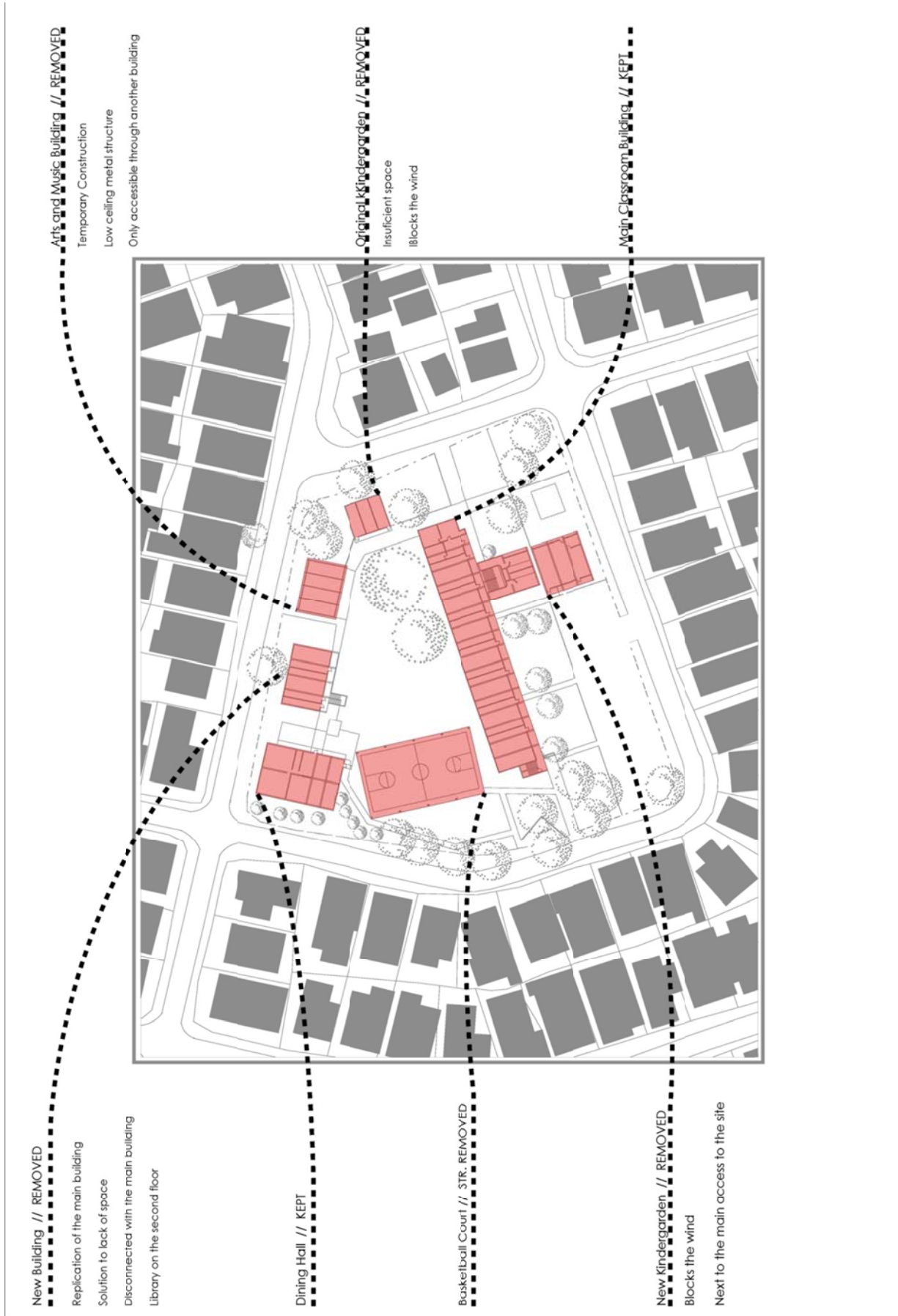
⁴⁹ Rico, Departamento de Educacion de Puerto. *Descripción General del Programa Especializado en Desarrollo de Talentos*. San Juan: Departamento de Educacion de Puerto Rico, 2006.

The existing school

In order to provide an appropriate design intervention it is important to understand the existing conditions, its potentials and shortcomings. As mentioned before sustainability is an important component of both architecture and education. It will be important to reuse as much as the existing elements of the site as possible.

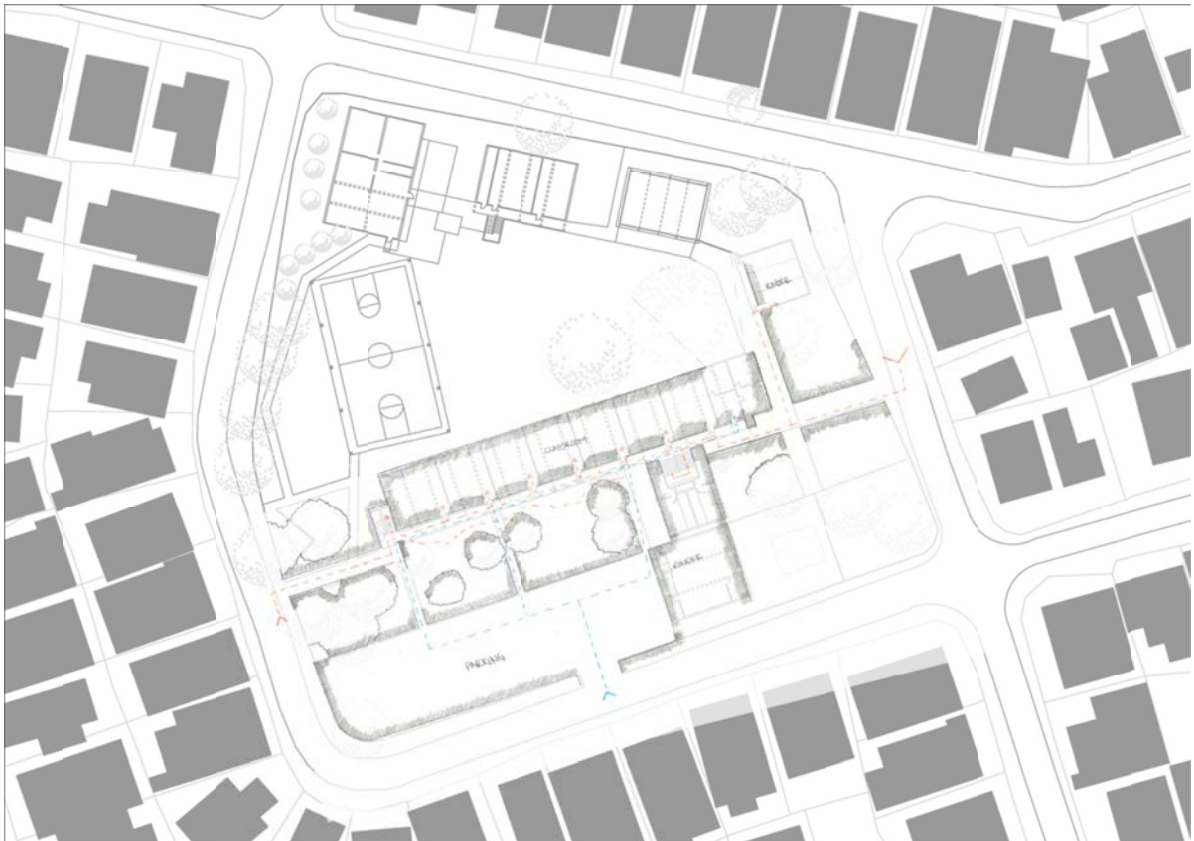
The existing school is composed of a main classroom building, a basketball court, a dining hall, a new classroom building, music and arts building, a kindergarden and a new kindergarden building.

Through the analysis of the existing school conditions three main issues were found: The arrival and departure ritual, the play yard space and natural ventilation. Aside from the main pedagogical goals these three conditions are going to be important in the distribution of the building and the experience of the school.



Arrival and Departure Ritual

The current school has multiple entrances none of which is clearly defined as a main entrance to the school. The ritual is aggravated by the lack of a common space in which students, parents and teachers can interact before and after class. The main interaction in the existing condition occurs in the classroom building corridor, which is disassociated visually and physically from the administration. The existing asphalt parking lot becomes an unusable space, even when there are no cars parked.



d

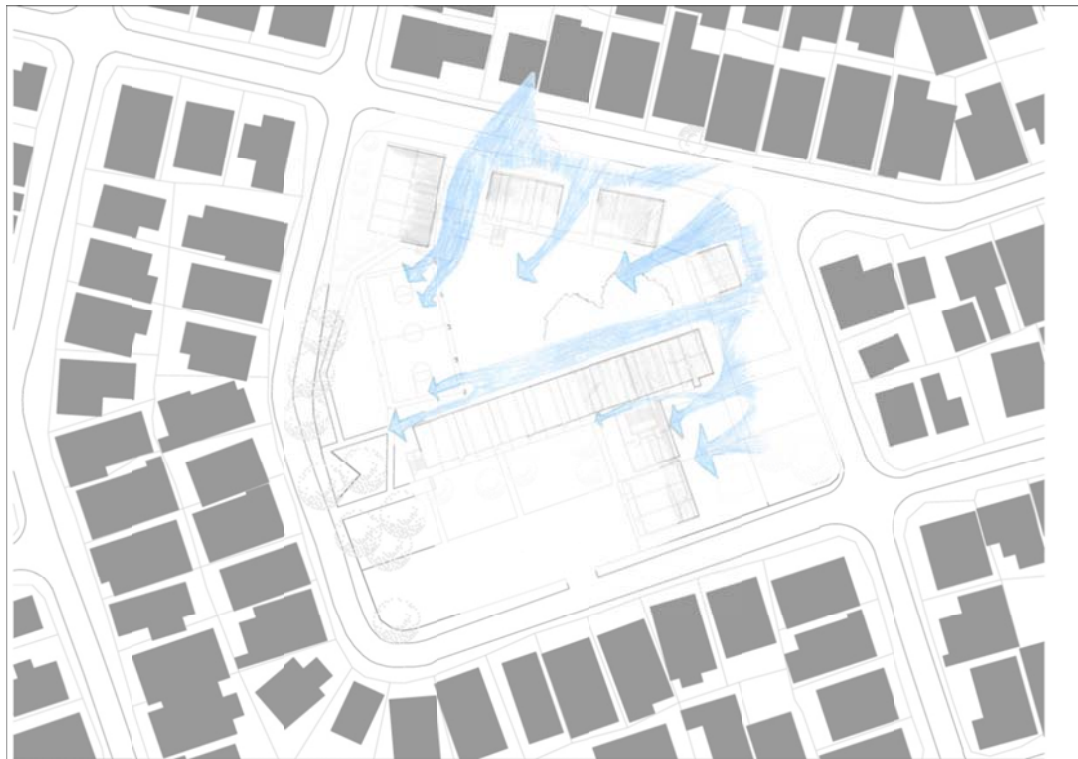
Play yard Space

The existing Play yard is a 'courtyard' like space in the northern part of the site. It is surrounded by the majority of the existing building. The main problem with this green space is that there is no physical connection with the surrounding buildings. This makes the play yard only usable during the recess hour.



Wind

The existing proportion and orientation of the main building impedes the predominant wind currents to ventilate the classroom spaces. This has forced the existing school to artificially condition the spaces. This not only implies a waste of energy and money, but also has blocked any possible visual connection with the exterior. The existing buildings that surround the play yard also block the wind currents coming from the east north-east direction. The ideal location for the building, to take advantage of the wind direction and help on ventilating the existing building, would be the west side of the building. This will be an important factor in the layout of the design.



to

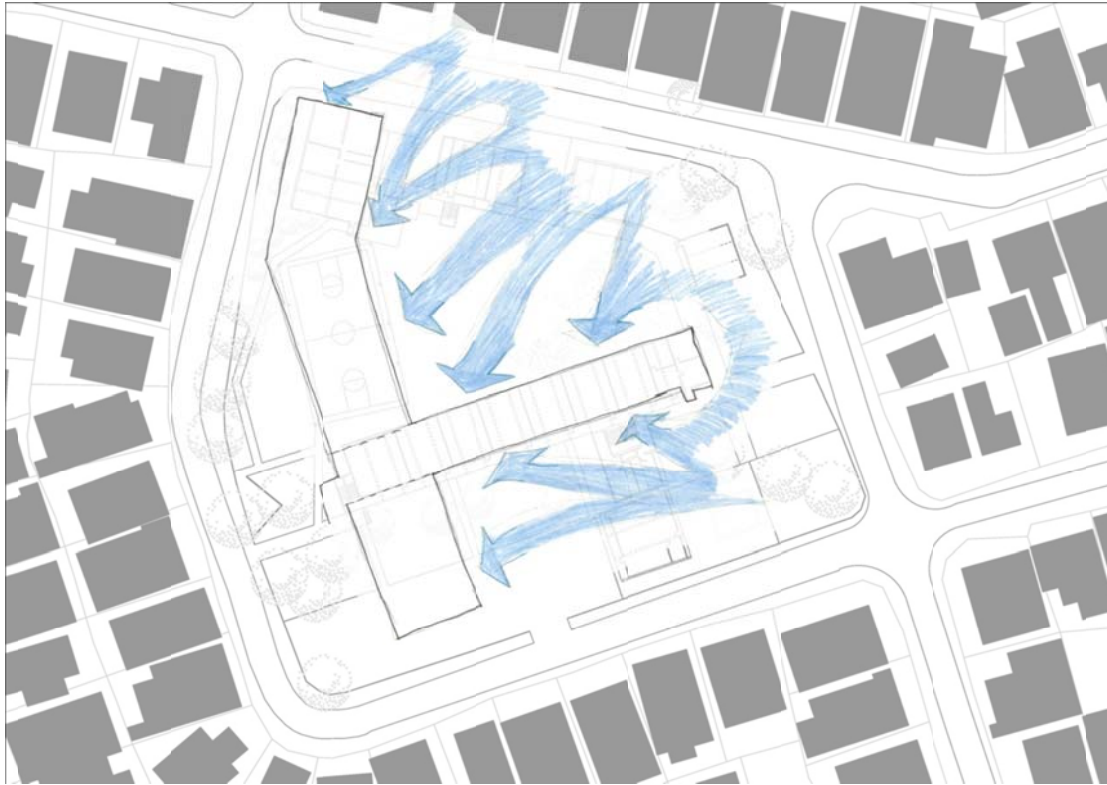
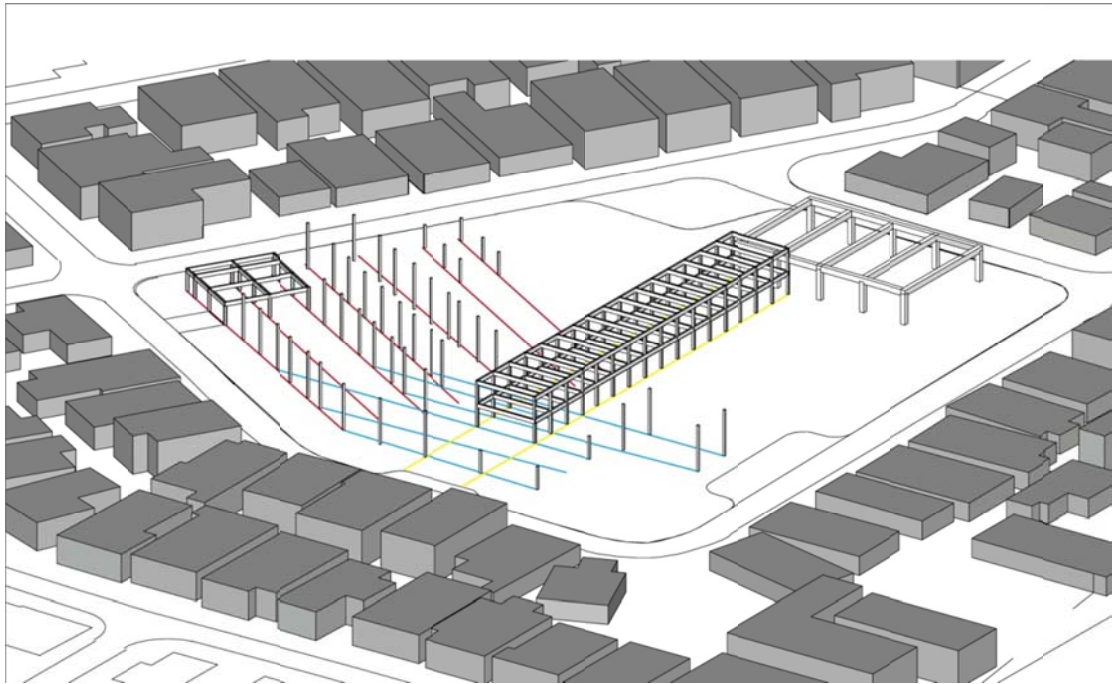


Figure 67: Utopic Wind Diagram. The ideal building location for cross ventilation, this determined the layout of the building design. (Image by author)

Based on the analysis of the existing buildings and the different elements of the site, only the main building and dining hall structure were kept. The other buildings were temporary structures that either blocked the wind, lacked a connection with the play yard or both. An extension of the grid lines of the existing buildings will provide a connection between the existing structures on the west side of the site. A new column grid is located on the extended grid lines.



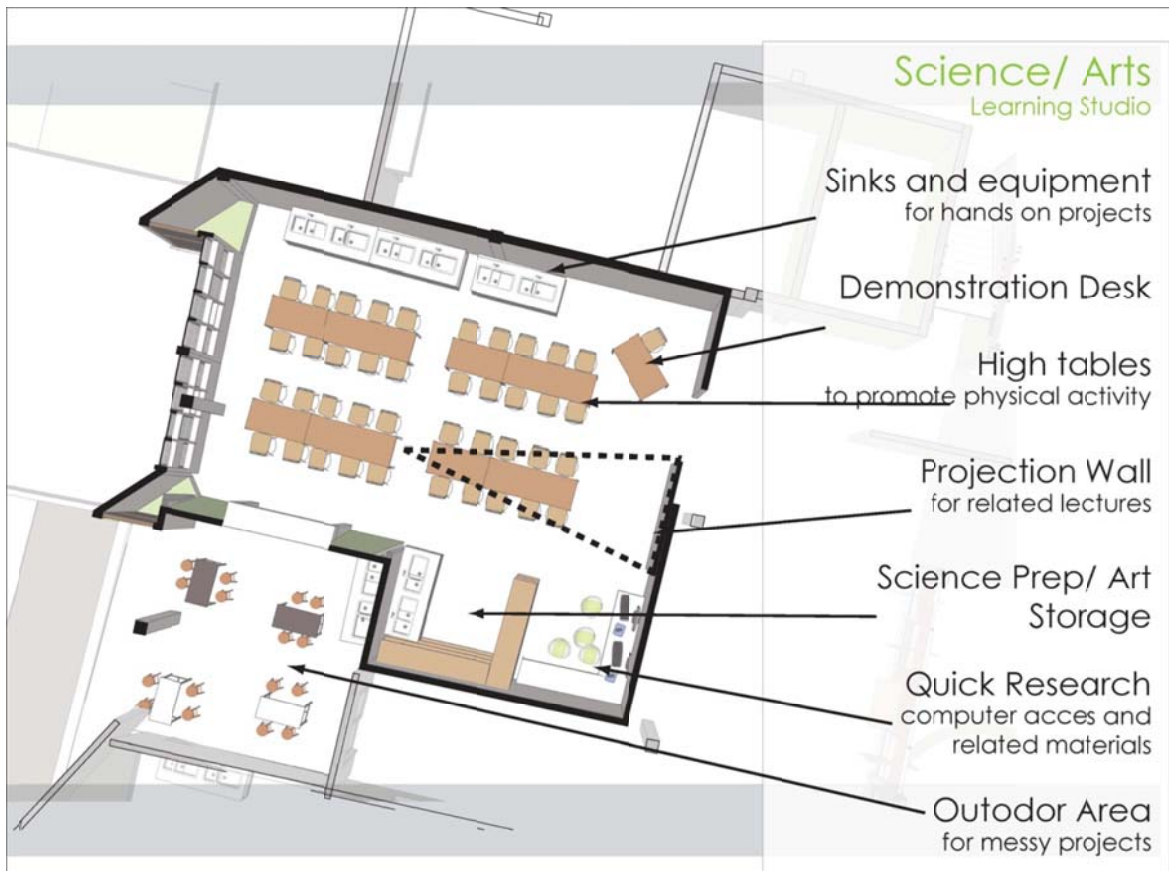
The New School

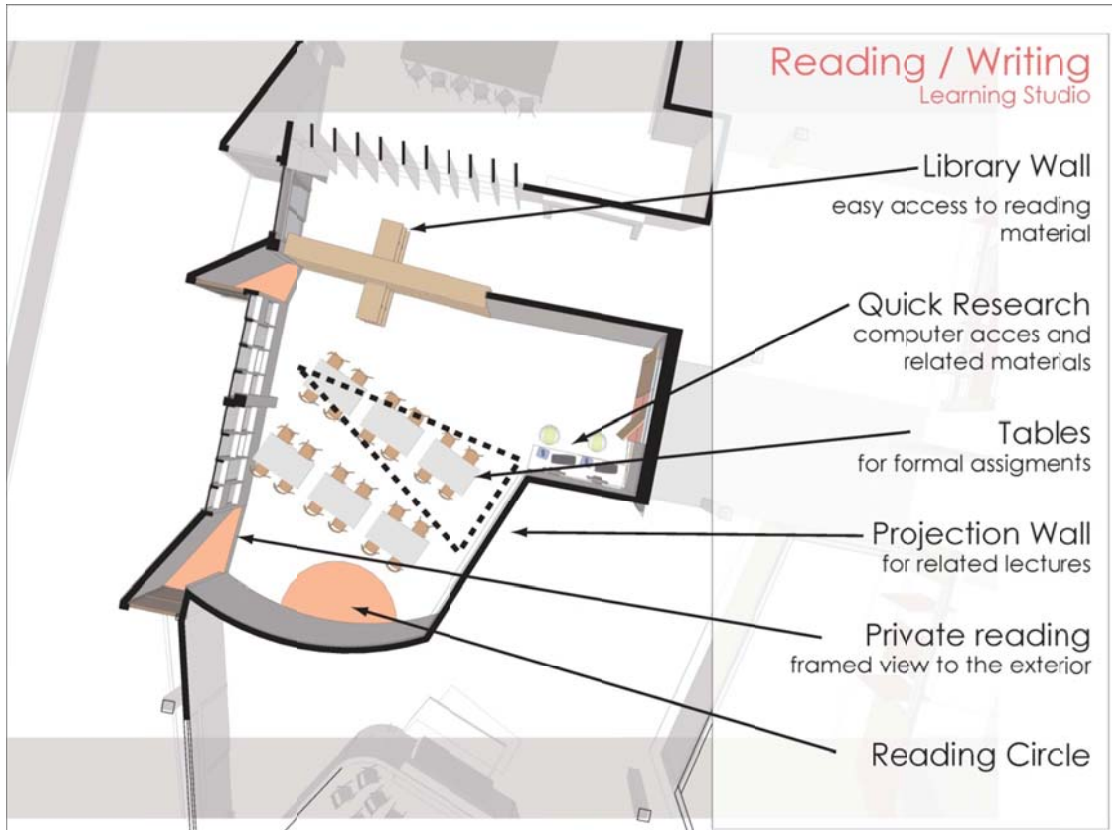
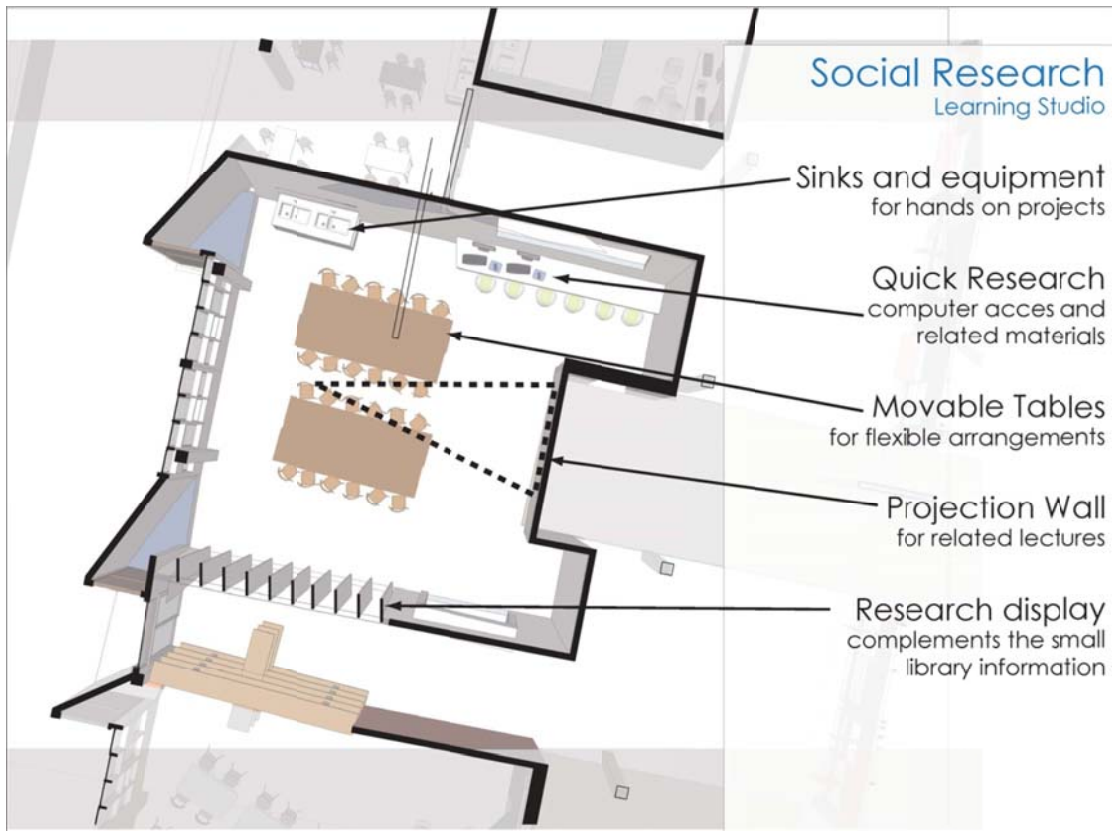
The Curriculum

The current school curriculum is designed with progressive pedagogical strategies, trying to respond to as many types of intelligences as possible.⁵⁰ Currently this goals conflict with the existing facilities which were only designed for a limited number of learning modalities; this creates a tension between the architecture and the learning process. The new learning spaces should allow spaces to be flexible enough to accommodate the different learning experience the school is trying to achieve. The design approach is to create two small learning communities, one for first to third graders, another one for fourth to six graders. The small learning community will be composed of different learning studios which will be designed to support each one of the four major subjects: science and arts, social research, reading and writing and music. Although each of the studios is design for a particular subject the space is flexible enough to allow other types of learning activities. The learning studios are free standing object in the fluid commons space, each of them having access to the flexible common space between the talent road and the studios. Between each of the studios and connected to the green space at the west side of the site are project

⁵⁰Rico, Departamento de Educacion de Puerto. *Descripción General del Programa Especializado en Desarrollo de Talentos*. San Juan: Departamento de Educacion de Puerto Rico, 2006.

oriented common spaces which are equipped for outdoor activities that complement the learning done in the studio.





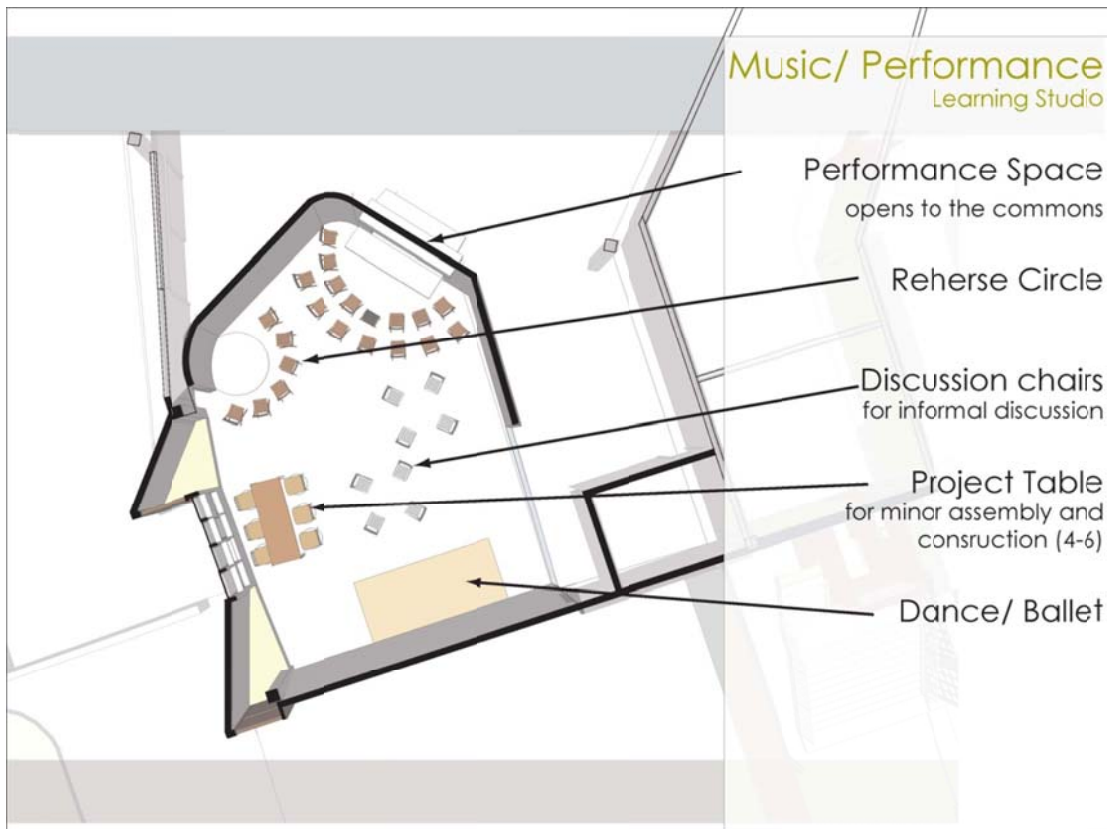


Figure 74: Flexible Common Space View. (Image by Author)



Figure 75: Project Oriented Common Space. (Image by Author)

Flexibility

A free plan approach is used in the design of the new building. This will allow creating free form enclosures independent from the structure which will allow for future interventions in the school layout without affecting the building structure. The free standing objects will also allow creating fluid open spaces that will facilitate the wind flow for natural ventilation.



Figure 76: Axonometric Diagram. The enclosed learning spaces are independent from the column grid (Image by Author)



Figure 77: Dining Hall View. This space acts as a multipurpose space. It serves as a Dining Hall for the school during lunch hour and as a flexible space for both the school and the community. (Image by Author)

Talent Road

“Posting student work, both current and past, up on the walls tracks progress in a visible way.”⁵¹

The existing school curriculum has as a goal the display of the work created by the student as a proof of the development of their talents. To expand on the idea of displaying the student work a linear gallery type of space called the ‘talent road’ became the main driver of the design. The talent road extends across the site north to south connecting the different parts of the building and creating a node between the new and the existing structure. On the south end of the road a drop off is located which direct the students to the main circulation and gathering space. On the north end the dining hall and kitchen are located, which are part of the breakfast ritual the existing school already has. The point in which the talent road and the existing structure meet a double height space is located with the main vertical circulation elements. Immediately after the circulation node a hinge point in the talent road occurs. This place acts as a collector from the different accesses to the school and could become an ideal place for interaction between parents, teachers and students before and after class. The main part of the talent road is bound by one of the learning communities to the left and the play yard to the right. The right edge is porous enough to allow view into the play yard and on the left side an

⁵¹ Design, OWP/P Architects + VS Furniture + Bruce Mau. *The Third Teacher*. New York: Abrams, 2009.

exhibition wall provides privacy to the learning community while allowing natural ventilation and serving as a display space for the students work. The floor pattern in this area marks the access to the learning community and also serves as a pedagogical tool. In between the accesses the floor pattern is design to promote traditional games as a way to bridge the recreational activities and the cultural learning. The talent road is both a learning space during school hours and a community space after hours.





The existing structure

The main classroom building structure is kept both as a sustainable strategy and to honor the existing conditions. The dimensions of this structure was design based on efficiency and an outdated learning model, therefore it becomes unsuited for creating the flexible spaces the school curriculum needs to achieve its goal. Although the learning spaces might not work on this structure other programmatic elements could take advantage of it. The administration, health facility and fitness space occupy the first floor of the structure. The fitness area is located to the right end of the structure connecting with the basketball court, creating a space for physical activities. The administration is located in the left side of the existing structure next to the lobby space and also facing an interior courtyard space as a gate for outside visitors. The administration has a central position to provide access and surveillance to the different areas of the school.

On the second floor of the existing structure a passive garden and a green house is located. This creates a sustainable learning bar that teaches about taking care of nature, growing your own food and the importance of green spaces in an urban space. The south facade part of this garden is angle for future installation of solar technology.



Figure 81: Visitor's Portal View. An interior garden space creates a more formal reception space between the Administration and Health Facility. (Image by Author)

The Play yard

The play yard space has an important role in the new school. Instead of being hidden behind the school buildings the design forms part of the main entrance ritual. The new play yard has different area for different activities; from passive to more active play. The play yard consists of a lawn space to the north which connects to the dining hall, active play yard areas in the middle and a passive play yard space for the smaller children. An open air theater opens to both the play yard and the talent road as a space to display the music and performance talent developed by the students.

The topography of the active play yard area creates small cave spaces and the seating area of the theater.



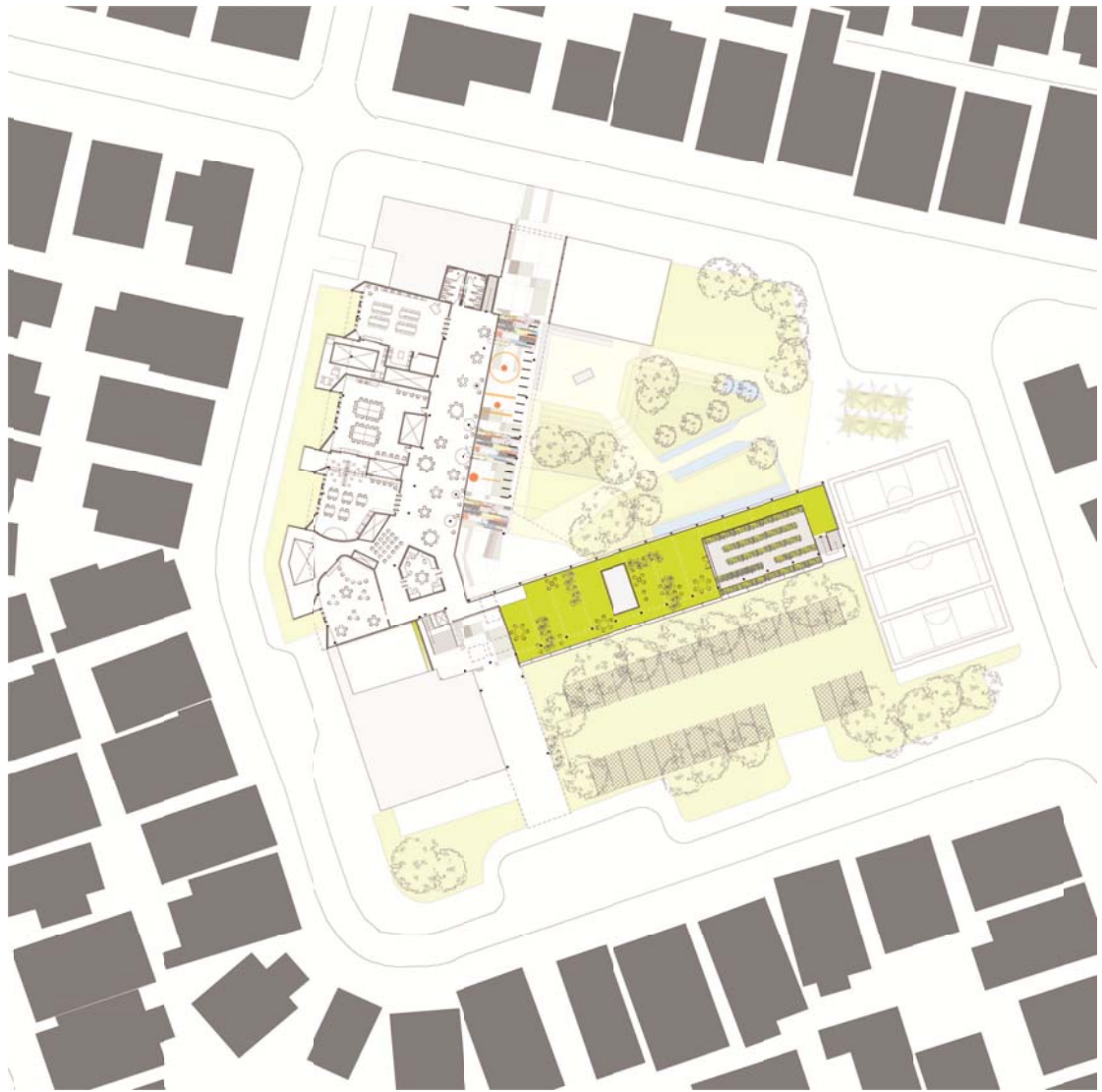
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Figure 83: Open Air Theater View. This space serves as a display area for the performance and music talent. The Dining Hall and the Talent Road open to this space as well. (Image by Author)











Chapter 8: Conclusion

The new design for the Antonio S. Pedreira Elementary School proposes a possible solution for architectural problems the current school building is facing. The thesis achieved in designing spaces that better respond to the contemporary ideals of education and multiple intelligences. The current school already shaped the curriculum based on the ideas of progressive learning and talent display which the design expands on and become central to the design. During the design process other elements came into play that enhanced the project. Elements like the talent road, natural ventilation and preserving the existing structure became an important part of the architecture and the learning process enhancing the idea of the building as a third teacher.

The thesis used the existing school elements, environment and goals as a framework for the design of this project. Although some of the elements are unique to this school, the major elements of the project could serve as a model for future redevelopment of schools around the island. The idea of temporary enclosure independent from the building structure could be used as a strategy to create schools that are updated more easily and sustainably. Working around the existing structure trying to save as much as possible is another sustainable strategy that could save money and time in the process of reconstructing these schools. Natural

ventilation became an influential principle in the design, future school design in Puerto Rico should start taking advantage of its climate and school should be an example of this. Although the origin of the talent road idea was particular to the goals of this school, displaying the student work and using it as a way to connect to the community can be applied to any school.

The thesis proposition could be further developed to take advantage of other advantages the tropical climate offers. The roofs - with the correct form - have the potential of both reflecting natural light into the classroom and to collect rain water. With additional development the project could achieve a good balance between natural lighting and shading, natural ventilation and acoustic privacy, climate protection and openness among others. Another element that has further design potential is the furnishing and detailing of the learning studios. The layout of the learning communities was design to work with the surrounding commons space and to provide a series of learning modalities that respond to the curricular goals the current school has. Although each studio has the goal to serve a particular learning modality to enhance the experience of learning a particular subject, the furniture and arrangement could be further developed to create a more efficient model.

The idea that drove this thesis was the interest in developing a new model for school buildings in order to provide the appropriate spaces for teaching the next generation of citizen. It is important to every country to provide an excellent education that will

take the leadership roles of the country in the near future. The thesis provides a possible solution which is meant to create conscience of the impact the built environment has on our daily lives and activities. Hopefully this thesis will inspire a new wave of rethinking the learning environment in Puerto Rico and provide spaces of excellence for future generations of citizens.

Appendices

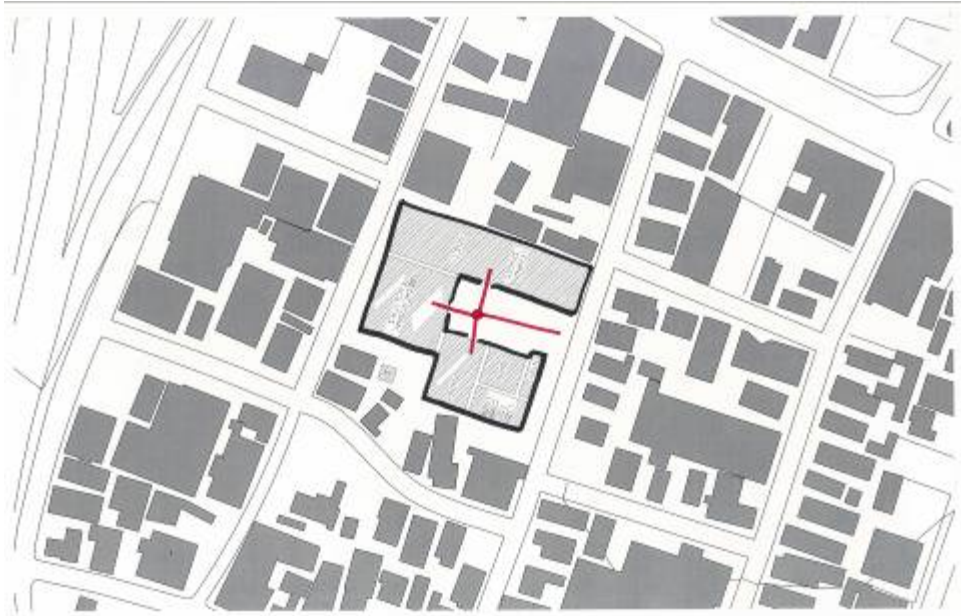


Figure 90: Santurce Parti 1 First Iteration (by Author)

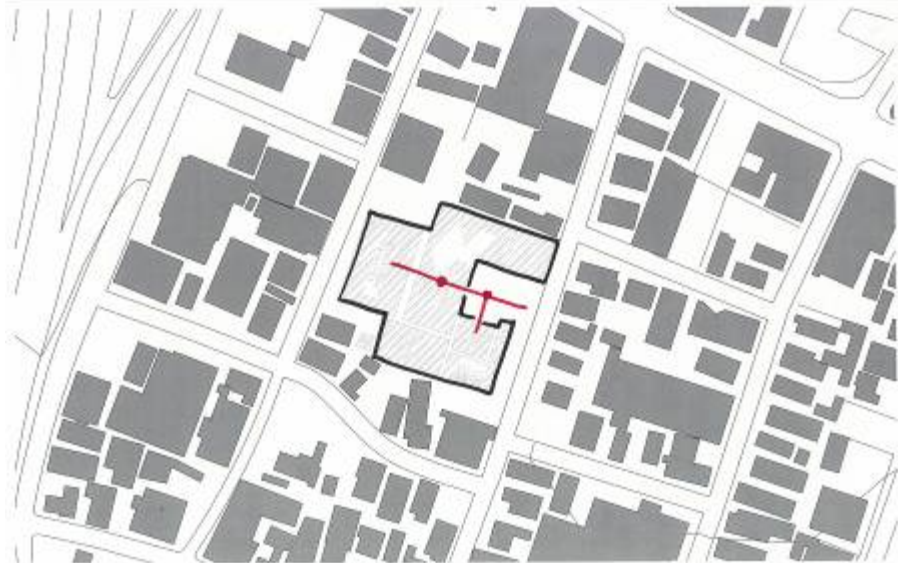


Figure 91: Santurce Parti 2 First Iteration (by Author)

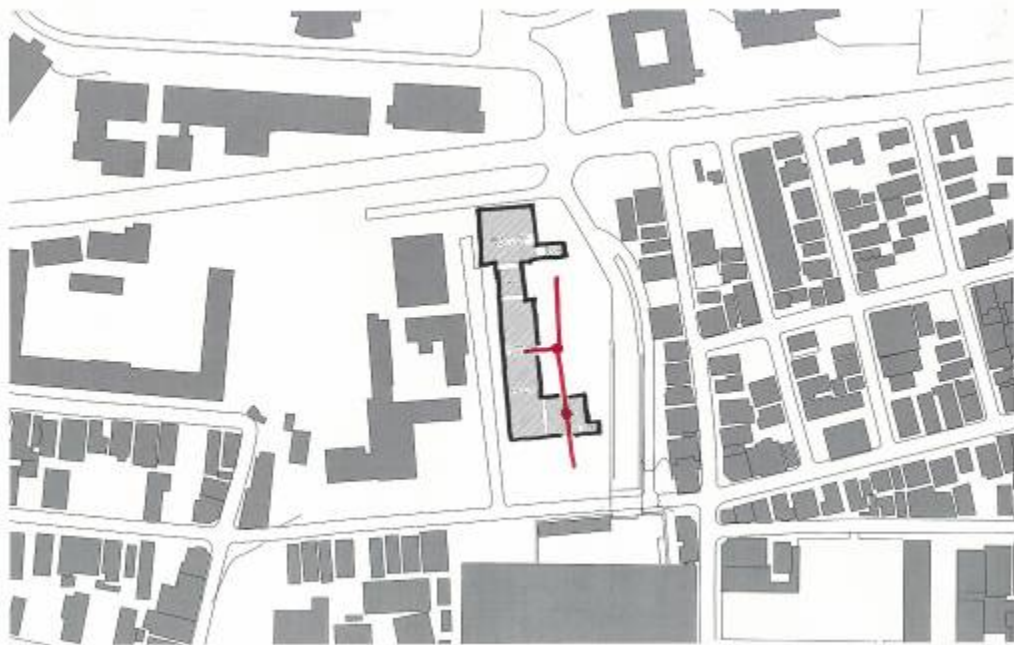


Figure 92: Rio Piedras Part 1 First Iteration (by Author)

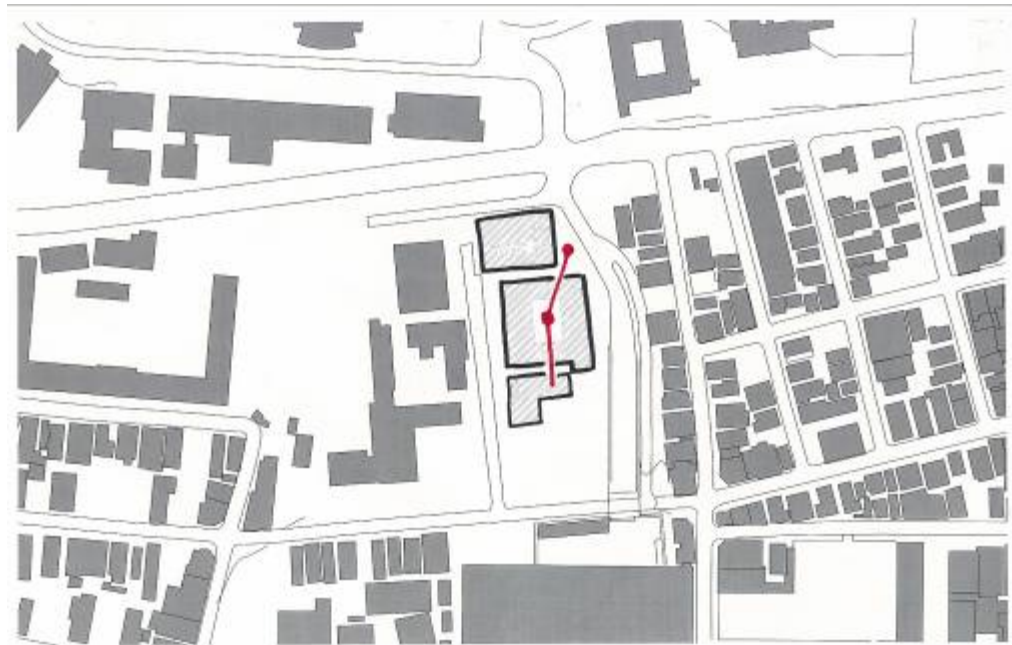


Figure 93: Rio Piedras Part 2 First Iteration (by Author)



Figure 94: Puerto Nuevo Part 1 First Iteration (by Author)



Figure 95: Puerto Nuevo Part 2 First Iteration (by Author)

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