Elementary School Design Theory and Renovation of the "C. Orsini" Elementary School

ABSTRACT

The birth of the Italian elementary school education system can be traced back to the 18th century. After the Second World War, primary school buildings gradually changed from absolute private ownership to public. The establishment of design guidelines made school space more practical and reasonable, and many new thoughts on primary school architecture emerged. In modern times, new mode of pedagogy and school space began to rise in the whole world, the traditional teacher-centered mode is being challenged. But at the same time, school buildings began to face problems, such as the damaged structure and the rigid space. In this context, the renovation of the "C. Orsini" elementary should not only stay on the appearance, but also consider its historical value and the architectural space needed for the new pedagogy model. The goal is to create a joyful, student-centered, flexible learning environment that is accessible to the community and nature.

Chapter 1   A General Review of Elementary School Design

1.1 History and Development of Primary School in Italy

1.2 Elementary School Building Attributes

1.3 Trends in Elementary School Design Worldwide

1.4 Case Studies of Elementary School Design

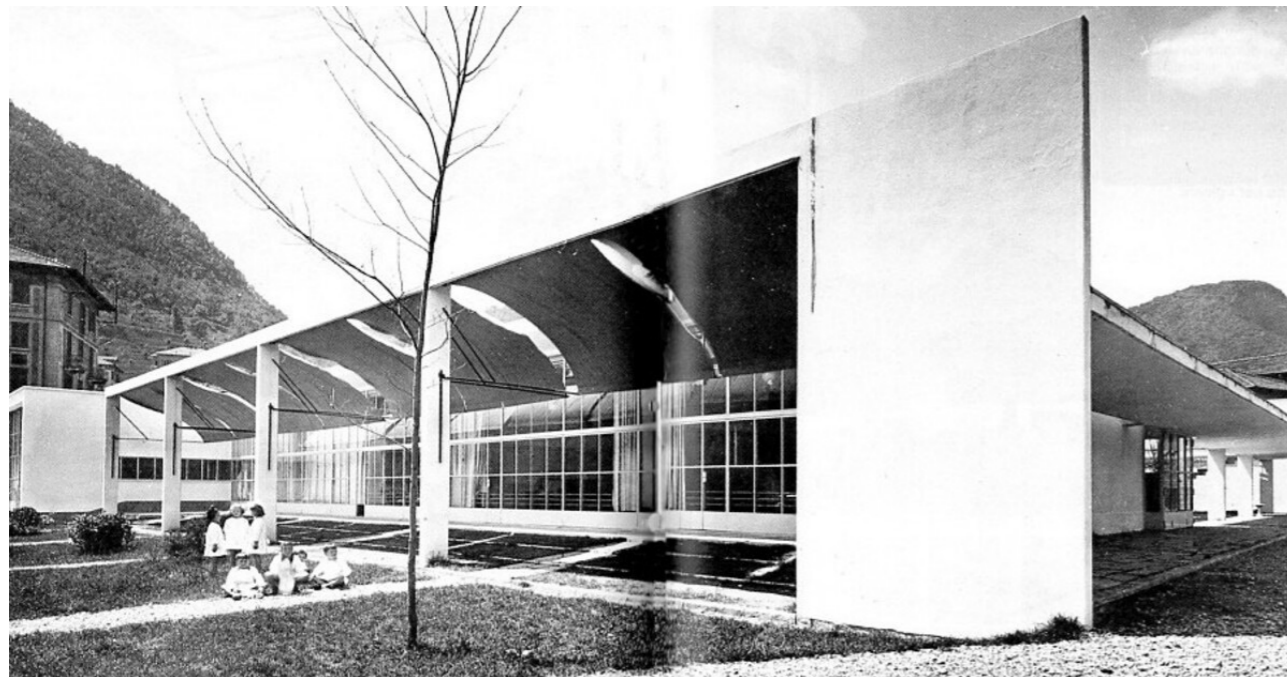# 1.1 HISTORY AND DEVELOPMENT OF ITALIAN PRIMARY SCHOOL

Figure 1: Sant' Elia Elementary School Designed by Giuseppe Terragni in 1935 in Como

1.1.1 Birth of Italian Elementary Education System

In the Italian peninsula of the eighteenth century, elementary education appears to be a direct consequence of private precepts, rather than a public institution. On the contrary, from the second half of the 18th century greater attention was paid to the organization of public schools, especially with the Enlightenment reform projects. [1] In addition to the attempts to reform higher education, a school policy open to the people is set up, in which Lombardy stands out first, followed by the other Italian states. Following the industrial revolution, the diversification of the functions of the elementary school from those of the middle school was born, and the school were becoming livable and interesting. However, the problems that had to be faced were enormous: the miserable conditions of the people, the lack of teachers, tiny state investment and the almost total absence of teaching, combined with a still unclear awareness of the civic function of education. These problems weakened the numerous attempts of the enlightened rulers.

When it comes to the nineteenth century, Italian public education can be traced to 1859 when law 3725, which takes its name from Minister Gabrio Casati (1798-1873). Casati's law mandated four years of free, compulsory elementary education, and gave control of primary education to the single towns. It represents the culminating point of the organizational effort of the Piedmontese kingdom in the school sector. In the period beginning before the unification of Italy, the school was a sort of protection for the territory by the state, which took care of its citizens through education. The buildings of the primary school were those of municipal authority, and took the German model as a reference, with a linear arrangement of the classrooms facing a long corridor, wide enough to allow distribution and activities. [2]

The next important law concerning the Italian education system was the Legge Gentile. 1923 was the year when Benito Mussolini and his national fascist party were in power. In fact, Gentile's mission was to create an education system deemed suitable for the Fascist system. Elementary schooling, which was divided into three lower grades and two upper grades, continued until approximately 1957. In fact, during the period of the fascist regime, the school was seen as a key element in the construction of Italian society, considered as the holder of the values that the regime supported: unity, identity, teamwork, and physical activity as part of developing the spirit. These values will create projects with large spaces and an architectural composition of monumental proportions. [3] In addition, rationalist shapes, fine materials such as marble, and large windows are also considered. (Figure 1)

In conclusion, the birth and initial development process of the Italian public elementary school system is accompanied by intense social changes, such as Italian unification and fascist regime. This has caused a certain degree of instability and vulnerability. On the state of the Italian school there was, as obvious, a convergence of opinions: shortage of schools, a desolating state of many school buildings, poor financial commitment of local authorities, lack of inspections, insufficient educational material, teachers' not specialization and their low wage, large number of students per class, messy and repetitive programs. (2003)

1 Passo, F. Dal. (2003). *Storia Della Scuola Italiana* [Semi-annual studies and researches of geography].

2 Ingaramo, R., & Pascale, L. (2020). *An Interpretative Matrix for an Adaptive Design Approach. Italian School Infrastructure: Safety and Social Restoration* [Article, Department of Architecture and Design, Politecnico di Torino]. Sustainability 2020.

3 Ingaramo, R., & Pascale, L. (2020). *An Interpretative Matrix for an Adaptive Design Approach. Italian School Infrastructure: Safety and Social Restoration* [Article, Department of Architecture and Design, Politecnico di Torino]. Sustainability 2020.

1.1.2 After the World War II

School buildings built before the Second World War consist of buildings of historical interest, which cannot always be adapted to the regulations and spatial needs identified by the new pedagogical models. [4] The years immediately following the World War II can be considered as a real epochal watershed. There were numerous political and institutional changes in Italy, the war destroyed school buildings and equipment on a huge scale, the quality of teaching had rapidly declined, students had to curtail their studies. And a greater difficulty is that, especially in the South, primary education had trouble in reaching age-appropriate population because the economic conditions do not allow families to send their children to school. All of this contributed to a stall stage of education system at that time.

The 50s and 60s saw the booming development of school system worldwide, Italy was resuming its culture contacts with foreign country, thus educators became more aware of the measures to renovate the nation's school system in order to keep with the modern West. These were years of debates on education and various attempts at school reform in Italy. One of the most famous moves was "Gonella Plan", taking the name of the Minister, in order to combat illiteracy, improve elementary and intermediate education. As for school facilities, in the post-war years in Italy, the typical features were repetitive and modular elements in the face of a sudden demand for square meters: courtyards or L-shape buildings, preferably on two floors, with a large or multifunctional classroom and full use of space to increase the number of classrooms as much as possible. [5]

The economic boom of the 1970s led to the lack of classrooms, with an estimated need for over 1,700,000 student places. To solve the problem, Ministerial Decree of 21 March 1970 established certain design parameters on the minimum standard of space and the use of building materials. The classrooms had to accommodate a maximum number of 28 students with large inter-connecting areas so they could be used as recreational space. The materials to be used had to be standardized to reduce construction time, such as with reinforced concrete for the structures and brick for the infill panels. [6] Apart from that, building with reinforced concrete structures had to be implemented with a prefabricated production so as to be qualitatively controlled in all regions. This contributed to school building structure with repeatability and modularity as well as a new vision of the school space to be spread nationwide.

[4] Ingaramo, R., & Pascale, L. (2020). *An Interpretative Matrix for an Adaptive Design Approach. Italian School Infrastructure: Safety and Social Restoration* [Article, Department of Architecture and Design, Politecnico di Torino]. Sustainability 2020.

[5] Volpicelli, L. (1961). *The Italian School System from 1950 to 1960* [Article]. Phi Delta Kappa International.

[6] Ingaramo, R., & Pascale, L. (2020). *An Interpretative Matrix for an Adaptive Design Approach. Italian School Infrastructure: Safety and Social Restoration* [Article, Department of Architecture and Design, Politecnico di Torino]. Sustainability 2020.

1975 is what we could consider the "bible of school buildings". Ministerial Decree of 18 December 1975, introduced some innovative ideas that defined the school building as a continuous education in a larger context. For the first time, the idea of school linked to its territory and integrated with the physical resources of the communities became a consideration. Many schools of all types were designed by their architects imbued with cultural and social values. Schools were conceived to have an influence on the surrounding context well beyond their assigned lot, were to catalyze the energy found in urban centers, the surrounding and the whole country. This consideration was the continuation of a few Italian cases where school buildings had received fresh attention for quality educational environments.

"The school no longer exists as a complex building, but as a set of boxes around a route," said Gino Valle in the late 1970s, "and the buildings' colors are meant to connect with the environs." He uses these principles as the basis for his school design in Chirignano in the Veneto region (Figure 2). The architect Gino Valle, together with Aldo Rossi and Luigi Pellegrini, sought a good-quality standard in repeatability and modularity as well as a new vision of the school space to be spread nationwide.
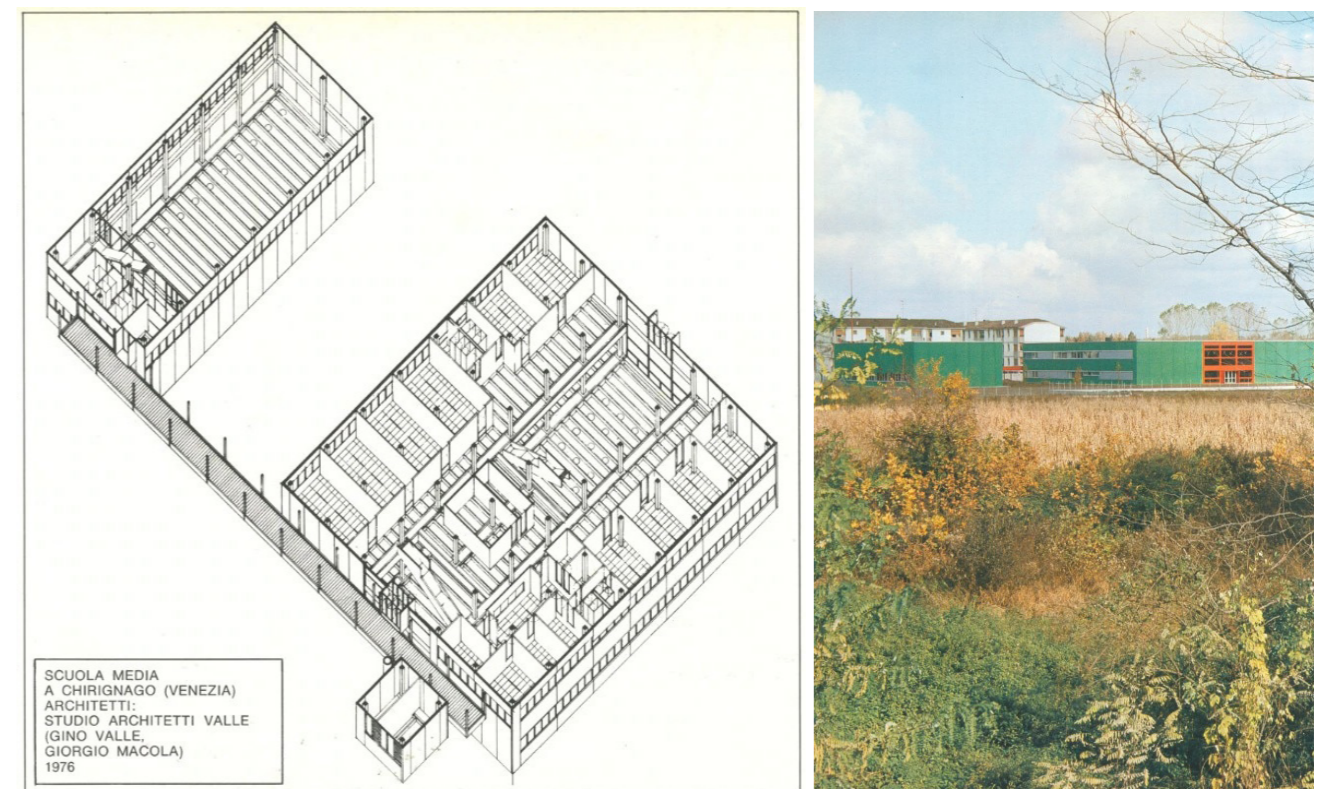

Figure 2: the Chirignano Middle school Designed by Gino Valle in the Late 1970s

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In 1980, accessibility for the disabled were issued. The consequence was a tendency to include external staircases, fireproofing, and external insulation directly in the early stages of the design of new buildings and adaptation of the existing ones. In 1981, after the 1980 Irpinia earthquake, a more comprehensive and rational seismic zonation was undertaken. The quality of concrete, the steel corrosion, the accuracy of slabs and other hidden dangers were taken more seriously. The maintenance standards had been improved. School buildings built after the entry into force of the first anti-seismic law were often prefabricated buildings whose obsolescence is linked to a short period of about 30 years. [7]

[7]   Ingaramo, R., & Pascale, L. (2020). *An Interpretative Matrix for an Adaptive Design Approach. Italian School Infrastructure: Safety and Social Restoration* [Article, Department of Architecture and Design, Politecnico di Torino]. Sustainability 2020.

1.1.3 Contemporary School

Of the 40,151 functional school buildings in Italy, under the control of local authorities, 42% were built before 1971, 30% between 1971 and 1983, and 28% from 1984 onwards (Figure 3). This fact means that with the advent of modern times, most of Italy's school buildings are getting aged and old building codes are no longer suitable for new needs, both in terms of safety and functionality, and this has caused widespread concern. In January 1996, "Standards for school building" governed by law 11 was issued, contains items the old code didn't consider. It aims to ensure school structures a quantitative development and a location on the territory adapted to the constant evolution of educational, cultural, economic and social dynamics. Law 11 also emphasizes the redevelopment of the existing heritage, particularly that having historical value; the availability by each school of basic sports facilities and the full utilization of school structures by the community. Furthermore, the conversion of school buildings to be intended for another type of school and the construction of basic or multi-purpose sports facilities, possibly common to multiple schools, also open to the use by the community. [8]

Figure 3. "Cesare Costa" elementary school, built in 1928.

At the end of year 2000, the Law 30/2000 reorganized a new educational cycle, The Middle School, that involving children between ages 11-13 years old will be integrated with the old Elementary School (ages 6-11) to create the new Primary School. This reform could cause problem related to the primary school building, for example, with this integration the old building can not accommodate the extra pupils. The integration also generates new problems in school designing process that architects should take into consideration. One of the main issues is related to the wider age range in the new primary school system. More flexibility in designing spaces, furniture and environment, as well as other features that reduce the potential for conflict between children of different age ranges will be expected. Later, this reform was proved to be wrong and was abolished in Morrati reform in 2003.

[8]   Passo, F. Dal. (2003). *Storia Della Scuola Italiana* [Semi-annual studies and researches of geography].

As for the more recent school buildings, since 1996, less than 6,500 different school buildings have been built or adapted due to the significant reduction of students. They, in fact, mostly follow the new directives of pedagogy, trying to implement the "constructive thinking activities" with the new functions and new criteria of spaces. The new didactic/educational model is metabolized in a design that considers all the components of the system: from the city to the neighborhood, from the building to the single furnishing element, as a single whole. The benefits of this paradigm change can be seen at both the urban and the building scale, with important influences on the identity sphere of local communities. This kind of spatial setting makes the school identify itself as a real Civic Center with great freedom in the setting of plans and increased value of connecting spaces. [9] Two school renovation cases can be seen as representatives of this period, the Fermi School in Turin, designed by BDRBureau and the Pascoli School in Turin, designed by Archisbang (Figure 4).

[9] Ingaramo, R., & Pascale, L. (2020). *An Interpretative Matrix for an Adaptive Design Approach. Italian School Infrastructure: Safety and Social Restoration* [Article, Department of Architecture and Design, Politecnico di Torino]. Sustainability 2020.

Since the 21st century, the issue of the safety of school buildings has drawn more and more attention. The collapse of a primary school in San Giuliano in the 2002 Molise earthquake, which killed 27 students and one teacher, caused strong concerns about seismic vulnerability. After that, the Italian Government started a mitigation policy, more specifically, an important national plan was set up with the aim of assessing and mitigating the risk of those buildings and infrastructures designed without earthquake resistant criteria. Apart from that, the aging problem of school building is getting more serious. According to the 21st Ecosystem School report (2020 data) and the Legambiente survey on the quality of school buildings and services, which takes stock of the health status of 7,037 school buildings in 98 provincial capitals, the data confirm the seriousness of the situation: 36.7% of school buildings require urgent maintenance work. The condition of "poor maintenance" of the school building, the critical sanitation conditions, traffic pollution, noise, the almost non-existent adherence to operational protocols for cleaning the classrooms and their environmental remediation, chemicals present in furniture and walls, malfunctioning toilets, all of this leads to real damage to students. Better maintenance of the safety of existing school buildings and reduction of structural risk from earthquakes and unavoidable factors seem to be a priority in Italy right now, rather than building new ones.

Figure 4. Enrico Fermi Secondary School innovation project in Turin.

1.2 ELEMENTARY SCHOOL BUILDING ATTRIBUTES

Figure 5. Children craft lesson in primary school

More than other building types, school facilities have a profound impact on their occupants and the functions of the building, namely teaching and learning. [10] To be more specific, the overall layout of school buildings has a huge influence on many aspects like the pupils' physical development, mental health, knowledge accumulation and the interaction between students. On the other hand, primary school is a special educational stage in the growth of children. Children in various stages of development are stimulated by light, color, the scale of their surroundings, even the navigational aspects of their school. Children can also react negatively to adverse conditions. Therefore, it is of great significance to study the spatial attributes and design theory of primary school buildings.

In general, children need a healthy and stimulating learning environment, regardless of the structure of the school. Primary schools should be comfortable visually, acoustically and thermally; they should have excellent indoor air quality; and they should be safe and secure. In order to meet these goals, we need to first figure out the characteristics of children as special users of architectural space and adapt to their different needs. According to age, primary school students can be divided into three stages. The first stage is similar to kindergarten, especially with students in grade 1 to 2, they prefer painting, crafts and sports to learn rules and increase knowledge in games, and then develop self-management and ability to live independently (Figure 5). For students at this stage, academic performance is not the most important thing, more game facilities should be set up in the spatial layout, such as a slide in the yard. In addition, the way of expression should be more lively, like bright color design, cartoon logo and so on. The second stage covers students in grades 3 to 4, who are generally active and enjoy running, jumping and organized games. They tend to cooperate in competitive activities and gain friendship and knowledge, as a result, the public activity space is more important than game facility. Older pupils fall into the third stage, with a wide range of interests, greater subjective awareness and higher environmental requirements. They begin to have in-depth discussions on different topics, and the study pressure is greater, so public communication spaces and quiet study spaces become important. In short, the primary school building attributes should be designed to meet the diversified needs of children's healthy growth. The following is a detailed analysis of the characteristics of different kinds of spaces in primary school buildings.

1.2.1 Teaching Space

The teaching space is not just a single classroom, but also the physical layout of the learning environment, including corridors connecting the classrooms, equipment supporting the classrooms, etc. It is the primary place where students learn and teachers teach, thus the teaching space plays a big role in the learning process. Primary school teaching space can be divided into two types, the first is the regular classroom, the other is the auxiliary teaching space, such as library, multimedia room, laboratory and so on. The physical environment that a student spends the most amount of time in is the classroom, it is also the main place for teaching activities. The classroom needs to be analyzed so it can be maximized to provide the optimal learning environment. Since the end of the 19th century, the dominant form of education has been the class system, in which students are divided into different classes according to their age and knowledge level and taught for a fixed period. This form has greatly improved teaching efficiency and is still widely used in the world today. The teaching space in which each class is located is the classroom, and its form is always changing. Prior to 1900, primary education was privately owned, most of the pupils were educated in schools attached to the parishes, cathedrals, or abbeys. Due to the plane features of these religious buildings, the layout of primary schools was mostly like this: the eight classrooms on the ground and first floors are clustered around the hall (Figure 6), but such a layout usually made the classroom suffered from noise and poor lighting and ventilation. From 1920 to 1940, the most representative feature of the school building was the "quadrangle" plane (Figure
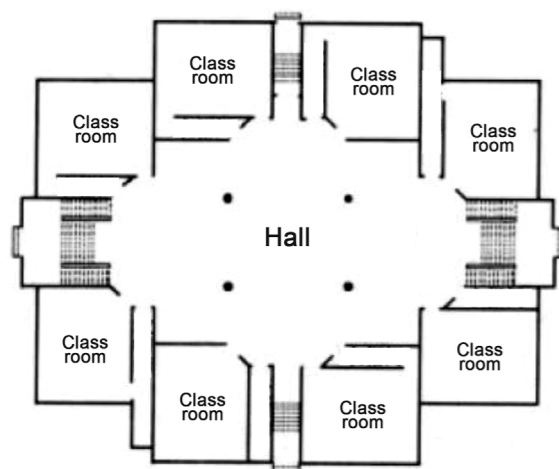

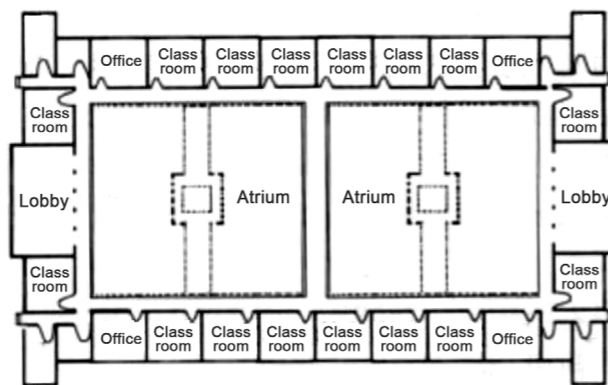Figure 6. Typical primary school plan before 1900

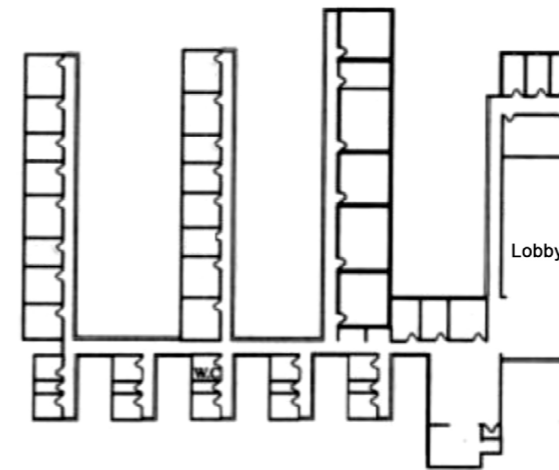Figure 7. Typical primary school plan from 1920-1940

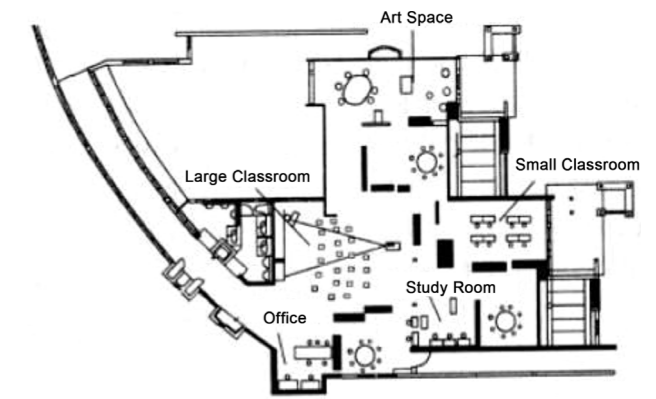

Figure 8. "Exhibition style" primary school plan

Figure 9. Open-plan primary school

7), which was divided into "single quadrangle" and "double quadrangle". Teaching and support Spaces are arranged around the courtyard, this arrangement helps to bring in the natural wind and sunlight, with the advantage of small footprint and easy to care for children. Due to the popularity of the class division system, the teaching space is mostly formed by the classification and accumulation of rectangular classrooms with the same specifications, and then connected with the corridor space. The school architectural form of "exhibition style" is developed on this basis. Linear branches of different functions connect the main traffic spaces (Figure 8), with the advantage that the layout of the school can be divided into several independent parts, can be built in stages and used more reasonable. But this also led to the larger footprint of school buildings during this period. In the 1950s, the economies of various countries were recovering after the war and new educational concepts were also developing. "Open-plan school" first appeared in the United States. The school is designed as a spacious, open and variable space, with great adaptability and can be adjusted at any time according to the changes of the teaching team (Figure 9). However, due to the lag of education concept and the negligence of construction, this type of school had great problems in sound insulation and was not practical. Anyway, the concept of "open-plan school" has been evolving since then. Since 1980s, with the advent of the information age, students' information sources are no longer limited to books, and school building forms have become more diversified. Not only is the school building more integrated with the community, but the school is open to the whole society, taking on social responsibilities and utilizing social resources.

After the entire teaching space layout is completed, the classroom environment should be regulated to play a positive role in students' learning. In Italian elementary school, currently the pedagogical units are grouped into two cycles, the first comprising two classes (first and second) and the second three (third, fourth and fifth). The Ministerial Decree 18 December 1975 updated the technical standards relating to Italian school buildings, it proposes that the elementary classroom spaces must have the following characteristics:

1) they must be suitable for carrying out the various activities and adapt to the possibility of changes in furnishings and equipment;

2) a direct relationship and spatial continuity between units of the same cycle can be envisaged, also by means of movable walls or sliding doors, and through the space to be allocated to intercycle activities;

3) the greatest number of classrooms, and, in any case, in a quantity such as to include at least the first cycle, must be in direct contact with the open space, in which the relative didactic and recreational activities take place;

4) the spaces must be in organic relationship with each other, both within the entire cycle, and with the disengagement spaces and with the common space for intercycle activities;

5) the space reserved for the pedagogical units making up the cycles and that of the corridors, must be in organic and close relationship with the common spaces of the entire school, in a visual and spatial way and in such a way as to eliminate corridor corridors as much as possible. [10]

[10] Educazione & Scuola. (1997, 1). *Decreto Ministeriale 18 dicembre 1975*. https://www. edscuola.it/archivio/ norme/decreti/ dm181275.html.

The Ministerial Decree of 1975 values flexibility within classroom spaces and connectivity with external spaces, and at a more specific level of space design, considering the maximum number of students per Italian class is 25, the following standards are made:

Number of Classes	Number of Pupils	m^2 / class	m^2 / pupil
5	125	153	6.11
10	250	189	7.56
15	375	177	7.08
20	500	171	6.84
25	625	167	6.68

Table 1. Gross Areas by Class, Per Pupil

Educational Activities	m^2 / pupil
Normal Activities	1.80
Intercycle Activities	0.64
Total Area Index Relating to Didactic Activities (max)	2.70
Total Area Index Relating to Didactic Activities (min)	1.44

Table 2. Standard of Area: Elementary School

Type of Space	Minimum Required Height / cm	Note
Spaces for the pedagogical unit (Team work area)	300 (240)	With flat ceiling. In the case of ceiling inclined minimum height 270 cm.
Spaces for specialized teaching (If with steps: in the lower part)	300 (240)	With flat floor and ceiling

Table 3. Standards on Floor Heights (Internal)

In addition to the rational design of space size, other factors should also be considered in the classroom. The shape of the classroom should be designed according to the actual needs, architectural construction and other factors, including rectangular, square and polygon shapes. Rectangular classroom is widely used in the world because of its simple structure and high space utilization. Because the length of the square classroom is shortened, it can improve the audio-visual conditions of the students in the back row. Polygonal classrooms can effectively increase the use area, and the interior space is more lively than rectangular and square spaces, facilitating more flexible arrangement of classroom order. Classroom seating arrangements should facilitate learning activities and communication. More specifically, all seats should be in a good visual range, according to the different teaching content, table and chair layout can be flexibly adjusted to adapt to students' independent thinking or collective discussion activities. The arrangement of teaching facilities such as desks and chairs in the classroom determines the form of the corridor. The corridors in the classroom become more than just a concept of transportation, but also can be used as the boundary of the classroom space to divide learning and communication areas.

As for the furniture in the classroom, a variable and mobile furnishing system is advisable, which can satisfy the diversity of educational needs with easy and fast changes. The furniture should therefore have the following qualities: modularity, lightness, heights accessible to students. The furniture must be of the right height and proportionate to pupils' body. They must also be solid and without sharp and sharp corners or sharp angles, in order to limit the risk of accidents. As far as materials are concerned, natural ones are preferable, that is not covered by paints that can alter the visual and tactile sensation.

Finally, there should be a display area and storage area for students' works. The exhibition area provides students with a unique space to display their works or projects, such as walls, floors or furniture. The storage area provides a private space in the classroom for students to store various learning materials and personal belongings.

If the school changes and renews itself, then the buildings and educational spaces must also change, according to new criteria for the construction of school buildings and a look to the future, to new learning spaces consistent with the innovations brought about by digital technologies and evolutions of teaching. In 2013, New Guidelines for School Building launched at the Unified Conference, published by MIUR, the Ministero istruzione Universita Ricerca. The Guidelines renew the criteria for the design of space and equipment for the school of the new millennium. For this reason, they differ from the prescriptive style of the previous ones, dating back to 1975. The new guidelines offer a broader definition of learning space:

For a long time, the classroom was the unique place of school education. All the school spaces were subjected to the centrality of the classroom… Today the need to see the school emerges as a unique integrated space in which the micro-environments aimed at diversified activities have the same dignity and have habitability and flexibility characteristics able to accommodate people and activities at any time by offering features of functionality, comfort and wellness. The school becomes the result of overlapping different environmental tissues: that of information, relationships, spaces and architectural components, materials… In this environment the teacher does not have a 'fixed' place but moves between the various tables by offering its irreplaceable role of support and facilitation to learning that within each group takes shape. The widespread use of technologies allows and requires a different organization of learning space. Hence the need for an integrated design among the environments we could define, borrowing an expression from the world of online, "interoperable" environments, in which an engaging teaching is practiced that is not afraid of "transparent walls" that allow sharing "Beyond the classroom". [11]

The new guidelines for school building see learning spaces as more than just classrooms for teaching purposes. The modern classroom is still a space designed for frontal interventions but is now one of the many moments of a path of articulated learning and centered on the student. In addition, the learning space also includes group space. The teacher, in this space, does not carry out frontal interventions but assumes the role of facilitator and organizer of the activities, structuring "learning environments" aimed at favoring a positive climate and the participation and contribution of each student at all stages of work. Spaces for group work must therefore be thought, with flexible furnishings in such a way as to allow different configurations consistently with developing and alternating the different phases of teaching activity. An environment of this nature must be able to be sufficiently flexible to allow, for example, carrying out activities in groups of small or media composition, discussion and brainstorming, exposure / introduction / synthesis by the teacher, presentation in plenary of an elaborate by the students, exercises involving the whole class etc. [12] This is to some extent a transition from teaching space to the next type of school building space that we are going to talk about, the common space.

11 Provincia di Cremona. (2013, 4). *Le nuove linee guida per l'edilizia scolastica 2013*. https://www.provincia.cremona.it/patrimonio/?view=Pagina&id=5278patrimonio/?view=Pagina&id=5278.

12 Provincia di Cremona. (2013, 4). *Le nuove linee guida per l'edilizia scolastica 2013*. https://www.provincia.cremona.it/patrimonio/?view=Pagina&id=5278patrimonio/?view=Pagina&id=5278.

1.2.2 Common Space

In addition to spaces relating to pedagogical utility, the Ministerial Decree 18 December 1975 classifies another type of main space used by students as spaces relating to communication, extracurricular and supplementary activities. In physical form, it refers to centralized spaces such as libraries and auditoriums, as well as fragmentary informal spaces for relaxation. This kind of space can also be called common space, which is not limited to the gathering and distribution of recreation and transportation, but more importantly, it has the function of teaching outside the traditional classroom, and students learn through mutual communication. The common space should not only be a physical space, but also accommodate and promote the activities of teachers and students, and be able to attract them to actively participate in the activities. It should be open and flexible, attract students to gather and guide them to learn, think and solve problems on their own initiative.

In terms of common spaces that support informal learning and relaxation, the New Guidelines for School Building defines them as places in which students can detach from structured learning activities and find opportunities to interact informally with other people, to relax, or to have access to resources unrelated with the school subjects. For guidance on design, space must guarantee a certain degree of privacy, defined by a series of physical and non-physical elements. Students must enjoy adequate physical comfort given by furnishings, in particular "soft" furnishings, comfortable seats, poufs and carpets and adequate thermo-hygrometric conditions. Multiple activities can be carried out in this informal area. Range from access to resources (books, videos, websites), rest / pause, informal interactions, group game, small manual work. [13]

The specific design of common spaces should be based on the characteristics of different areas of the campus building, which can be attached to corridors, lobby, staircases, grey spaces and outdoor spaces, etc. By studying the attributes of these different spaces, we can discuss the possibility of putting common space into them.

Firstly, a corridor in a building is an open covered passage, such as a colonnade or portico. Corridors are the passageways that allow circulation to happen throughout the building. They become the glue that binds the school together. They connect the various rooms together and acts as a buffer to other classrooms. The design standards of elementary school building corridors in the Ministerial Decree 18 December 1975 are:

If the spaces for horizontal distribution take on the appearance of corridors of disengagement of rooms for the use of students, they must have a width of no less than 2 m; if the changing rooms are in them, the width must be no less than 2.50 m. [14]

From the perspective of communication space, corridor space is one of the most frequently used indoor communication spaces besides classroom. However, the corridor design of many schools is unable to meet the needs of students to communicate and relax outside the classroom due to the single space function and simple form, resulting in high utilization rate and low educational efficiency.

The combination of corridor classrooms is a design method often adopted in open teaching school to create common spaces (Figure 10). There is no clear boundary between the classroom and the corridor, and the enclosing elements of the space are not simply walls, but separated by movable furniture and partitions. After the partition is opened, the classroom and corridor are integrated to form a common activity space. Examples of this spatial form can be found in Teikyo university elementary school designed by Kengo Kuma (Figure 11), It has many advantages, which is conducive to the interaction between teachers and students of different classes and expands the scope of students' knowledge. However, this type of space also has certain disadvantages, such as chaotic space order, poor sound insulation effect, high construction cost and so on.
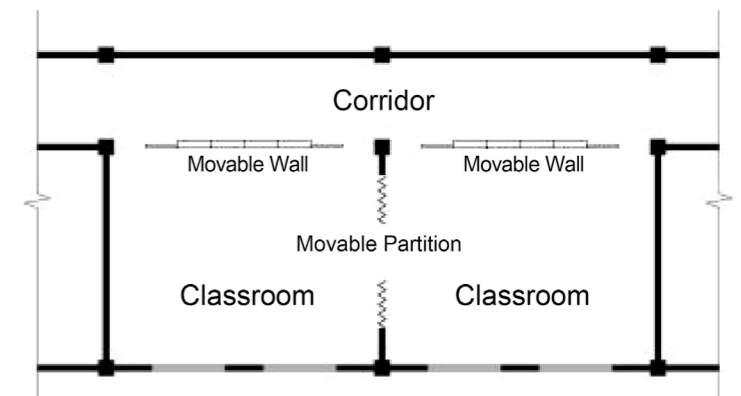
Figure 10. Combination of corridor and classrooms prototype

Figure 11. Corridor and classroom of Teikyo university elementary school

[13] Provincia di Cremona. (2013, 4). *Le nuove linee guida per l'edilizia scolastica 2013*. https://www.provincia.cremona.it/patrimonio/?view=Pagina&id=5278patrimonio/?view=Pagina&id=5278.

[14] Educazione & Scuola. (1997, 1). *Decreto Ministeriale 18 dicembre 1975*. https://www.edscuola.it/archivio/norme/decreti/dm181275.html.

The extended corridor space is also a way to accommodate common space, eliminating the monotony of corridor space in general by combining it in various forms and with other grey spaces in appropriate places (Figure 12). This extension is not limited to the increase of the corridor area, but can also break the conventional space vertically, connecting the upper and lower floors through the ceiling, increasing light and ventilation. The choice of material and furniture was also included to distinguish the extended corridor space from the general corridor space. Overall, the purpose is to increase the interest and comfort of the corridor space and attract students to the common space. It is worth mentioning that the corridor space at the junction of the staircase space can be properly utilized, as the area with the combination of horizontal and vertical traffic tends to be crowded with people (Figure 13). If the area is increased, light is introduced, and furniture is arranged, it can become an effective common space for students to communicate.
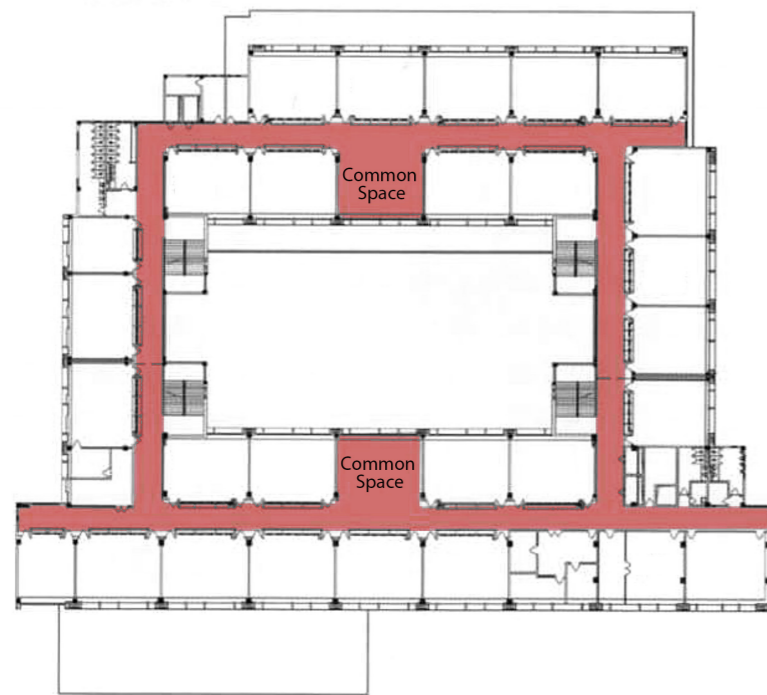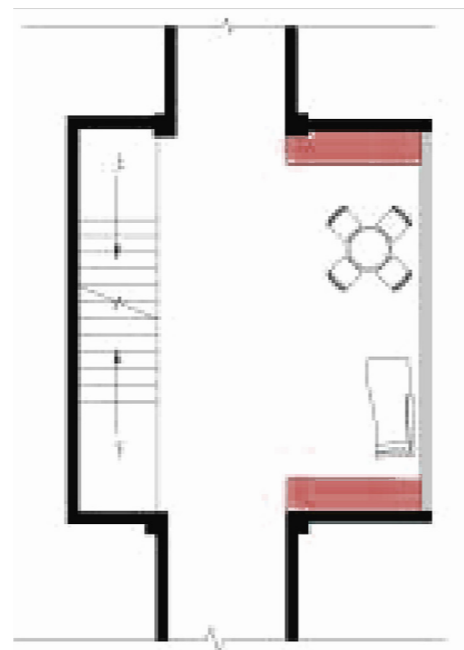
The first active interaction with a building occurs at a doorway. Doorways play an important role in the navigation, safety, and circulation in a structure. The main functions of the common space in doorway are gathering of people, traffic intersection, communication and relaxation. In addition to the common functions in general public buildings, the doorway space in primary schools also has certain learning and display functions. Especially for primary school building design, the proper height difference can be set in the doorway, which will become a temporary stage when needed. Also, a display area can be placed to hold the exhibition of students' work, encouraging pupils to learn from each other. The doorway space should also include small spaces such as leisure area, plant viewing area and waiting area, creating a vibrant interactive space. An excellent case can be found in Centerview Elementary School in the United States (Figure 14). The design of large steps can be used as the auditorium or game space, improving utilization of space.

Atrium space is often used in integral primary school buildings as a transitional space connecting various functional blocks. According to the New Guidelines for School Building, the atrium shall have the following standards and functions:

Figure 14.
Doorway of the Centerview Elementary School in the U.S.

15   Provincia di Cremona. (2013, 4). *Le nuove linee guida per l'edilizia scolastica 2013*. https://www.provincia.cremona.it/patrimonio/?view=Pagina&id=5278patrimonio/?view=Pagina&id=5278.

It is the symbolic meeting place between school and society, an exchange point that in addition to its function of access and filter must communicate its identity, its programs and their relationship with social reality to external. For this reason, it must have reception spaces, waiting zones equipped with communication tools such as panels for paper information, computer stations, screens, projections to update parents and guests on educational programs and daily activities of the school community. The inputs are different and with different functions:
1) Input of the students
2) Entrance of teaching and administrative and auxiliary staff out of school schedule
3) Entrance to the gym, if this is used by the community outside the school time
4) Entrance to refuel the kitchens and administrative offices
5) Entrance for ambulances, maintenance means, for fire brigade
The entrance to the students must be easily controlled by the auxiliary personnel, and in general it must give access in a clear and autonomous way to the administrative offices and spaces for teachers, facilitating security management in reduced size schools and in the school of 'Childhood, where you can accommodate some strollers, the entrance can be usefully controlled directly from the kitchen. To avoid energy dispersions it is advisable to use compasses and cleaning it is necessary to take care of the choice of external and internal doormats. For the dimensions and the sense of opening of the escape routes, reference should be made to the security criteria required in the fire prevention legislation. [15]

Figure 12.
Extending the corridors to create common spaces

Figure 13.
Combination of corridor and staircase

As a common space, the atrium generally has several layers of high space and good lighting condition. In addition, comfortable public settings such as bulletin boards, student homework display boards, chairs and furniture should be set up in the atrium to attract teachers and students to communicate and study here. The design of stairs, corridors and overpasses around the atrium should be more diversified to enhance the vitality of the atrium.

The staircase is a vertical distribution space in the building, connects the traffic between different floors. Vertical distribution in multi-story buildings must be ensured by at least one normal staircase and a safety staircase, located outside the building. For the purposes of the flow of students, the stairs must:

1) be in such a number as to allow each staircase, excluding the safety one, to normally serve no more than 10 classrooms on each floor above the ground floor;
2) have the width of the ramp equal to 0.5 cm for each student who uses it and in any case not less than 1.20 m. and not exceeding 2 m;
3) have the shelves of a width of approximately one and a quarter times that of the ramps themselves;
4) have the steps of a rectangular shape not exceeding 16 cm in height. and tread not less than 30 cm;
5) be provided with every possible precaution in order to avoid accidents.

In order to ensure the indiscriminate use of school premises also for physically handicapped persons, schools with more than one floor must be equipped with a lift capable of containing a wheelchair and a companion, in compliance with ENPI standards. provided for by the circular of the Ministry of Public Works n. 4809 of June 19, 1968, is in this case optional. [16]

[16] Educazione & Scuola. (1997, 1). *Decreto Ministeriale 18 dicembre 1975*. https://www. edscuola.it/archivio/ norme/decreti/ dm181275.html.
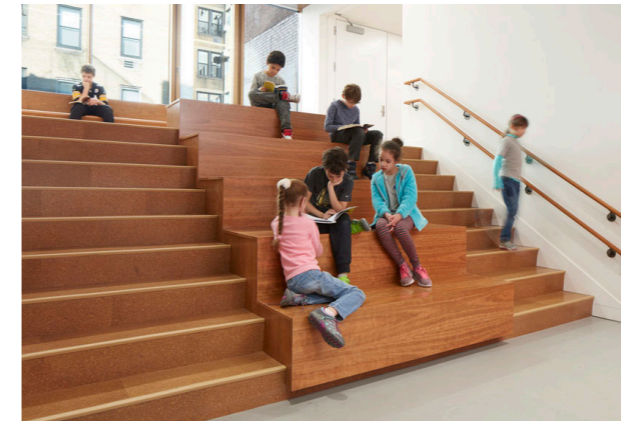
Figure 15. Primary students of Metropolitan Montessori School relaxing on the stairs.

Figure 16. Stair platform of Park Brow Community Primary School in UK transformed in a reading area.

In primary school buildings, the interactivity of staircase space can be designed according to the characteristics of pupils, so that it will obtain common space for students' activities. On the one hand, curves can be used instead of traditional stair forms to create a more vibrant atmosphere. In addition, in the traditional primary school architectural design, the width of the staircase is often considered from the point of view of economy. Only the minimum value of the safe evacuation width is taken, and no stay is allowed on the staircase, which makes it become just an evacuation space for people. Appropriately increase the width of the stairs and steps to make the stairs a common space, so that they can guarantee people's pass, also give students more space to relax and communicate on the stairs (Figure 15). The stair platform and the space under the stairs are also active factors. The platform can broaden and added reading and discussion features to keep pupils stay (Figure 16). Psychologically speaking, the narrow space under the stairs often offers pupils a sense of security and desire to explore. If we can design a common interactive space for children to study and play here, we can improve the utilization of the grey space under the stairs (Figure 17).

Figure 15. Jim and Pam Wells Elementary School designed by IBI Group. Students having group work under the stairs

1.2.3 Features Relating to Habitability Conditions

Each school building as a whole and in each of its spaces or premises must be such as to offer those who occupy it satisfactory conditions of habitability for the entire period of duration and use, despite normal external agents; these conditions of habitability must also guarantee the performance of some functions in the event of abnormal external agents. The habitability conditions, to which certain requirements and levels correspond, can be grouped as follows:

[17]   Educazione & Scuola. (1997, 1). *Decreto Ministeriale 18 dicembre 1975*. https://www. edscuola.it/archivio/ norme/decreti/ dm181275.html.

1) acoustic conditions (sound level, defense against noise, sound transmission, vibrations, etc.);
2) lighting and color conditions: (degree and quality of natural and artificial lighting; excess and defect of light, regularity, quality of color and its relationship with light, etc.);
3) thermohydrometric conditions (purity of the air from heat and cold, humidity, condensation, etc.);
4) safety conditions (statics of buildings, defense of external agents, fires, earthquakes, etc.) [17]

Studies show that children from reverberating classrooms perform lower in a phonological processing task, report a higher burden of indoor noise in the classrooms, and judge the relationships to their peers and teachers less positively than children from classrooms with good acoustics. Therefore, the classroom acoustic environment needs to be designed appropriately. The acoustic insulation and the acoustic requirements must be verified regarding:

[18]   Educazione & Scuola. (1997, 1). *Decreto Ministeriale 18 dicembre 1975*. https://www. edscuola.it/archivio/ norme/decreti/ dm181275.html.

1) soundproofing power of vertical, horizontal, dividing and external structures of fixtures towards the outside, of grilles and air intakes installed towards the outside;
2) acoustic insulation against airborne noise between adjacent and superimposed spaces for educational use and in common areas (room insulation);
3) the normalized footfall noise level of floors;
4) the footfall noise level between two superimposed spaces;
5) the noise of the services: and of the fixed installations;
6) the absorption coefficient and the acoustic insulating materials;
The on-site testing must be requested, performed and presented according to the general rules contained in circular 30 April 1966, n. 1769 part I of the Central Technical Service of the Ministry of Public Works. [18]

Children spend one-third of their day in school performing tasks like reading and writing which are heavily sight dependent. Therefore, the lighting conditions must ensure the pupil's maximum visual comfort. Indoor lighting conditions of primary school buildings include artificial light and natural light, they shall have the following requirements: adequate lighting level; balance of luminance; protection from glare; prevalence of the direct component over the diffused one, especially in the case of artificial lighting.

Natural light is the best and most important light to incorporate in the classroom (Figure 16). Natural sunlight provides physical and physiological benefits to both students and teachers alike. Sun in the classroom can improve the health and concentration of students. Classrooms with more windows or windows that are not covered are inexpensive ways to incorporate natural light in the classroom and to get rid of the use of fluorescent lights. In architecture, a daylight factor (DF) is the ratio of the light level inside a structure to the light level outside the structure. It is defined as:

$$DF = (Ei\ /\ Eo) \times 100\%$$

where, Ei = illuminance due to daylight at a point on the indoors working plane, Eo = simultaneous outdoor illuminance on a horizontal plane from an unobstructed hemisphere of overcast sky. [19] The standard of average daylight factor in different parts of Italian primary school buildings is as follows: environments for educational use (classrooms for lessons, study, reading, laboratories, drawing, etc.), the DF should be no less than 3%; gyms and refectories, 2%; offices, distribution spaces, stairs, toilets, 1%. [20]

[19]   Wikipedia. (2019, 10). *Daylight Factor*. https://en.wikipedia. org/w/index. php?title=Daylight_ factor&oldid=919531010

[20]   Educazione & Scuola. (1997, 1). *Decreto Ministeriale 18 dicembre 1975*. https://www. edscuola.it/archivio/ norme/decreti/ dm181275.html.

Figure 16. The three-storey atrium of Hessenwald School in Germany. Using six VELUX Modular 'Longlights' to provide optimal daylight conditions.

Color is the most important information symbol for human visual stimulation. Children's understanding of things often starts from the more intuitive factors of color and shape. In other words, children have a high sensitivity to color. At the same time, children have rich association ability, and are easy to produce certain emotions and associations psychologically due to the difference in color. Therefore, the design of primary school architectural color environment should apply the color that children like and is beneficial to their intellectual and physical development. For primary school interior color design, there are several types of space with different functions worth discussing. The first is the teaching space, its color atmosphere should be relaxing, while avoiding strong visual stimulation and crowding. Background color should be given priority to warm tones, such as warm white and yellow, they can reduce children's sense of tension to strange environment. In addition,

the classroom can choose bright colors like children to decorate, such as orange, blue, green and so on. Bright colors are conducive to the development of children's creativity, among which blue is conducive to thinking and green can reduce the visual fatigue of pupils. On the other hand. primary school students are characterized by short attention spans, and strong color contrasts with high saturation will distract them. Therefore, the color of high lightness and low saturation is more conducive to teaching space.

Secondly, in the common space, colors that evoke excitement should be considered, especially red and orange. This is because children's activities in common spaces are mainly recreation and group discussions. An example can be seen in the Arlington Elementary School designed by Mahlum Architects (Figure 17). The use of large areas of red in the playground stimulates pupils' creativity and excitement, encouraging them to enjoy the break time.

Figure 17. Playfield of Arlington Elementary School in the United States.

In winter conditions, the temperature of the primary school building interior environment must be ensured. A suitable heating system should be able to ensure an indoor temperature of 20 °C ± 2 °C in all environments, unless other special room for a specific purpose. It is advisable that suitable relative humidity values be ensured in indoor environments used for educational and collective activities in the winter period, by means of an external air humidification treatment carried out by the ventilation system. Normally, the relative humidity of ambient air should be achieved at 45%-55% at an indoor temperature of 20 °C. [21]

The safety conditions mainly concern:
1) the stability of buildings in normal or exceptional conditions (earthquakes, floods, etc.);
2) the safety of the plants, both in use and in management;
3) protection from atmospheric agents;
4) defense against lightning;
5) fire protection;
6) microbiological defense.[22]

These aspects are mainly interfered by codes related to structural construction. Upon handover of the building, the authority that carried out the construction must provide the school with a detailed description of the management of the systems, the levels of practicability, the type and complexity of the maneuvers and the use of the elementary or complex means.

It is believed that comfortable chairs and desks with functional utility matching furniture design (ergonomic design) with the anthropometric measurements (body measurements) of the users will provide a better learning environment. As regards the furniture necessary for the pedagogical unit in the spaces for non-specialized teaching (normal classrooms) of the elementary schools, it must be provided for shape and size suitable for the various age groups of the pupils and the type of school: tables and chairs for the pupils, tables and chairs for the teacher, blackboards, cabinets (or equipped walls containing cabinets) for the class library (in the elementary of 1st grade), for the storage of teaching material for daily use, mobile screen for projections, any overhead projector, apparatus for the projection of slides and filmstrips including the tripod and projector table. [23]

[21] Educazione & Scuola. (1997, 1). *Decreto Ministeriale 18 dicembre 1975.* https://www.edscuola.it/archivio/norme/decreti/dm181275.html.

[22] Educazione & Scuola. (1997, 1). *Decreto Ministeriale 18 dicembre 1975.* https://www.edscuola.it/archivio/norme/decreti/dm181275.html.

[23] Provincia di Cremona. (2013, 4). *Le nuove linee guida per l'edilizia scolastica 2013.* https://www.provincia.cremona.it/patrimonio/?view=Pagina&id=5278patrimonio/?view=Pagina&id=5278.

1.3 TRENDS IN ELEMENTARY SCHOOL DESIGN WORLDWIDE

Architecture, now as spatial and formal research, faces the challenge of overcoming the need to "change the existing environment", as Venturi and Scott Brown pointed out in the 1970s [24], to focus on enhancing what already exists. In recent years, due to the global economic downturn caused by the 2008 financial crisis and new pandemics, reuse, as a means of sustainable design to save energy, has gained popularity, especially in Italy, also considering that the directives in Europe foresee zero soil consumption by 2050, as well as zero net land taking by 2050. Giving the fact that Italian school buildings are generally aging as we discussed above, today, the challenge is "ordinary heritage", such as school buildings that need reconversion, or technical, morphological adaptation that can be conducted by reuse practice, which is considered a sustainable and economic practice. Most Italian school buildings are obsolete and need to be adapted to safety and energy standards, but above all, to new contemporary educational spatial parameters that imply substantial changes in their spaces. [25] In short, today we need to focus more on the necessary for the construction of new spaces in yesterday's buildings, implanting current pedagogical models, leaving open possibilities for future modifications.

24 Venturi, R., Brown, D.S., Izenour, S. (1977). *Learning from Las Vegas*. MIT Press.

25 Samuele, B. (2018). *The Classroom has Broken: Changing School Architecture in Europe and Across the World*. INDIRE.

1.3.1 Rethinking the Learning Space

The traditional school model, in the development of industrial society in the past few centuries, whose functional and symbolic aspects have never been questioned. From spatial organization point of view, the typical feature of this model is the double loaded corridor with classrooms on either side. Each function (teaching, reading, canteen, etc.) is confined to a fixed "box" and connected by a single corridor. The traditional schools can be graphically classified as the "factory model", which can be seen in a various configuration, however they all follow the same design principal (Figure 18). For historical reasons, "factory model" was used as an economical way to conserve resources in order to build school quickly and efficiently. In this context, the reduction of circulation space or un-programmed space is necessary, aimed to create hierarchical relationships based on criteria of order, control, surveillance, discipline, and competition. [26]
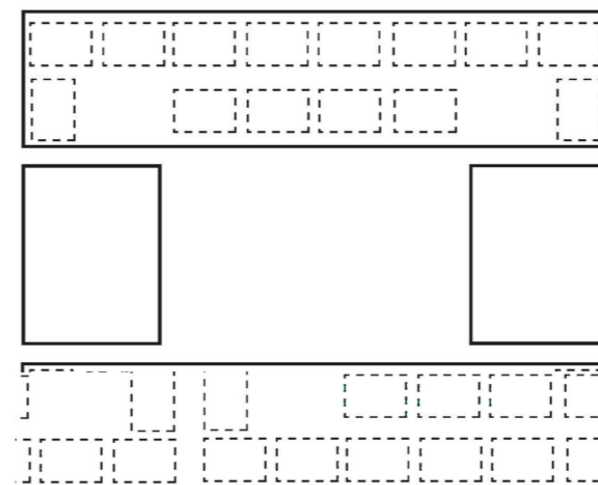
Figure 18. Example of "Factory Model"

26 Samuele, B. (2018). *The Classroom has Broken: Changing School Architecture in Europe and Across the World*. INDIRE.

27 Samuele, B. (2018). *The Classroom has Broken: Changing School Architecture in Europe and Across the World*. INDIRE.

From pedagogical and educational points of view, schools built in this model were based on the concept that the knowledge possessed by the teacher is to be transmitted and acquired by the learner. Students, on the other hand, come to the classroom only as receivers of knowledge, waiting for information to be presented. And it is seen as an advantage that the interactions between students are sufficiently reduced so that they can concentrate exclusively on what is being taught by the teacher. In short, the teacher-centered system is the ruling pedagogical model implemented in the "factory model". The physical learning environments have been designed to support this direct explicit model that utilized one dominant strategy - a "one-to-many" approach. In terms of classroom furnishings, they are geared to highlight the placement of teachers by having the teacher's desk at the center of the classroom allows whoever is teaching to see the whole classroom and therefore to monitor the children's behavior. Until a few years ago, this desk was even raised by a platform to facilitate this task of supervision. This desk is also a "stage" for the teacher, who gives lesson supported by a blackboard, the only "technology" available.[27] As for the students, they are always arranged to sit on fixed desks and chairs in a rectangular classroom, facing the teacher's desk in rows (Figure 19). The curriculum is the core of the teaching activities. The teachers act as a mediation to explain the content of the textbook, and the students act as an individual to receive the knowledge, which all takes place on the blackboard and the lecturing desk. Also, break off areas for small or large group work are not provided in the school floor plan, classrooms are seemed to be the only learning space for pupils.

Figure 18. Traditional classroom with teacher-centered pedagogy

However, the "factory model" has been under discussion in recent years. Someone argue that the teacher-centered learning is an inefficient solution for pupil's education, because students in teacher-centered classroom are passive and respond to environmental stimuli. Critics think it's possible that passive students get more attention than active ones. Also, teacher has the ultimate authority and oversees learning for that reason students do not have adequate opportunities to develop their critical thinking and problem-solving skills, tend to learn rely on supervision rather than collaborate. One of the main goals of modern pedagogy by contrast is to create strong self-directed learners. A teacher- centered learning environment does neither facilitate nor empower a learner's autonomous study-skills and subsequently lifelong learning skills. [28] In terms of architectural aspect, it is not sufficient to conceive of a school building as being a onesize-fits-all model of classrooms lined up either side of a corridor. This is both monotonous and not conducive to the physical and mental health of the lively and active children represented by primary school students. The classroom, or more specifically the blackboard and teacher's desk, are the core carrier of learning function, it is therefore normal that the school equipment and architecture do not play a leading role in this educational scenario.

Since the information era, information and knowledge are greatly diversified, and learning method should change accordingly to adapt to different jobs in society. There has been a continued push for the student to become an active learner, not merely a passive absorber of material. Every student is unique, and therefore learns and absorbs material each in their own way.[29] It needs to promote a student-centered pedagogy, which based on constructivist and democratic principles. Compared to teacher-centered, the student-centered approach supports enquiry, collaboration and personalized learning. That students make sense of what they learn in a classroom environment in which they are stimulated to develop their reflective and critical thinking and sense of responsibility.[30] In a student-centered learning system, there are no classes or lessons. On the same day, the multi-purpose space might accommodate different scales of group work or individual learning. It also can be a canteen, an assembly hall, or be used for physical education. The circulation of children in specific areas occurs only in situations of initiation and transition. Of course, it would be a mistake to ignore the role of teachers in student-centered classroom, students are not entirely self-taught instead teachers help them construct knowledge. The teachers prepare themselves, day after day, to respond to everything it is necessary to give an answer to.

Attempts are being made all over the world to break with the traditional school model of previous centuries. Indeed, often what we see today as an innovative learning environment has been tried before. For example, the School Construction Systems Development project developed by the Educational Facilities Laboratories in the 1960s in the US saw the creation of open-plan schools with large open spaces that could be subdivided. [31] The open-plan school has roots in the Montessori Method, which is similar to the student-centered educational approach. In 1949, Montessori Method holds the view that the child is their own director and chooser, however the facilitator still will lead the child in one overall path. [32] Bennett The shift from a "factory model" to an open-plan school model coincides the pedagogical transformation from teacher-centered to student-centered approach. It reverses the spatial concept from clusters of closed classrooms to a more open spatial assemblage (Figure 19), provides the lack of formal structure which facilitates informal and flexible learning to naturally occur. The classroom environment in which teaching and learning happen must also be responsive to an open-plan school. Flexible furniture shall be given priority, which leads to quick rearrangements of classroom furniture to create either class/group/individual learning experiences. Some of these amenities include: hard seating, soft seating, music or art areas, play fields, computer areas, napping areas, or a reading area.

28 Kompa, J. S. (2014). Disadvantages of Teacher-Centered Learning. *Digital Education & Social Change Blog.* https://joanakompa.com/2012/06/25/the-key-disadvantages-of-teacher-centered-learning/

29 Cole, A. (2014). *Critical Review Of Elementary School Design.* [Masters Theses, Department of Architecture and Design, University of Massachusetts Amherst]. ScholarWorks@ UMass Amherst.

30 Serin, H. (2018). *A Comparison of Teacher-Centered and Student-Centered Approaches in Educational Settings.* [Article, Ishik University]. International Journal of Social Sciences & Educational Studies.
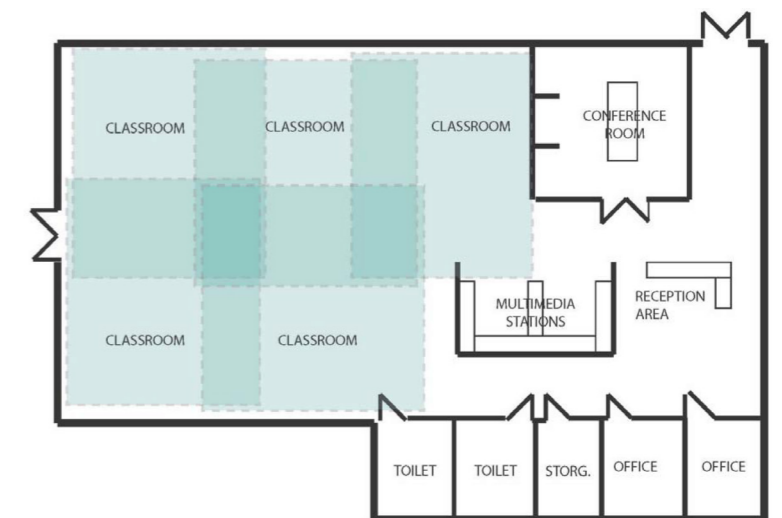
Figure 19. Example of Open Plan School

The trend toward open-plan school first began to emerge in the United States, it is said that between the periods of 1967-69 more than half of all new construction across 43 states had open-plan designs. Rintoul and Thorne in 1975 stated "Open plan design is intended to help teachers plan their work in accordance with the modern trends in primary education, to allow them to experiment and innovate with such practices as the integrated day, team teaching, and vertical grouping. [33]" However, the open-plan school was being built without a complete analysis of the current teaching practices in the United States. Observation found that the use of open-plan classrooms was not as good as expected over a long period of time. Some teachers with traditional ideas were unwilling to give up the old teaching methods and artificially created boundaries in the classroom using bookshelves and blackboards. They argued that it is better for managing students and teaching efficiently. In addition, there was no architectural solution to the problem of noise interference between different activities. Also, due to the limitations of construction technology at the time, the construction quality of the open-plan school was also a concern. All these disadvantages meant that the full potential of the open-plan classrooms of that era was not fully utilized.

In the 21st century, there is a trend to continue to use the open plan classroom as a more traditional classroom, especially in Oceania. Australian schools have adopted innovate learning environments on an enormous scale, with over 11 billion Euro invested to renovate ageing school buildings and reform learning spaces since 2010.[34] The situation is much the same in New Zealand. The common feature of much of this work has centered on providing "innovative learning environments", characterized as schools or learning spaces that contain highly flexible spaces, matched with smart furniture and ubiquitous technology that facilitates collaboration, creative thinking, high levels of communication and development of critical thinking skills. [35] Characteristics of cases below in Australia will help us to understand how departments of education are planning advancements in their design for the next decade of growth.

The renovation project of Caulfield Grammar School in Melbourne used installations to test a wide variety of spatial arrangements, designed to catalyze innovation in teaching and learning practice (Figure 20). As the existing conditions obstructed the pedagogical shift that was needed, a series of highly purposeful and connected learning settings have been created, each designed to support a particular learning activity. The adjacencies, size and connectedness of these settings was devised to ensure the project maximized opportunities for a multi-modal, student-centered pedagogy to be supported (Figure 21). Thus, the whole class gathering spaces, innovation spaces, large group and small group discussion spaces, outdoor working spaces and even isolated relaxing spaces are provided. Like Caulfield Grammar School, the Woodleigh School Homestead project also provide flexible spaces for group meeting, teaching and breakout. It values the influence of the natural environment in which the learning spaces are located (Figure 22). The designer states that "the students are encouraged to learn to 'sail' the buildings, making choices about where and when they inhabit spaces, learning inside or out."

Figure 20. Learning Space of Caulfield Grammar School

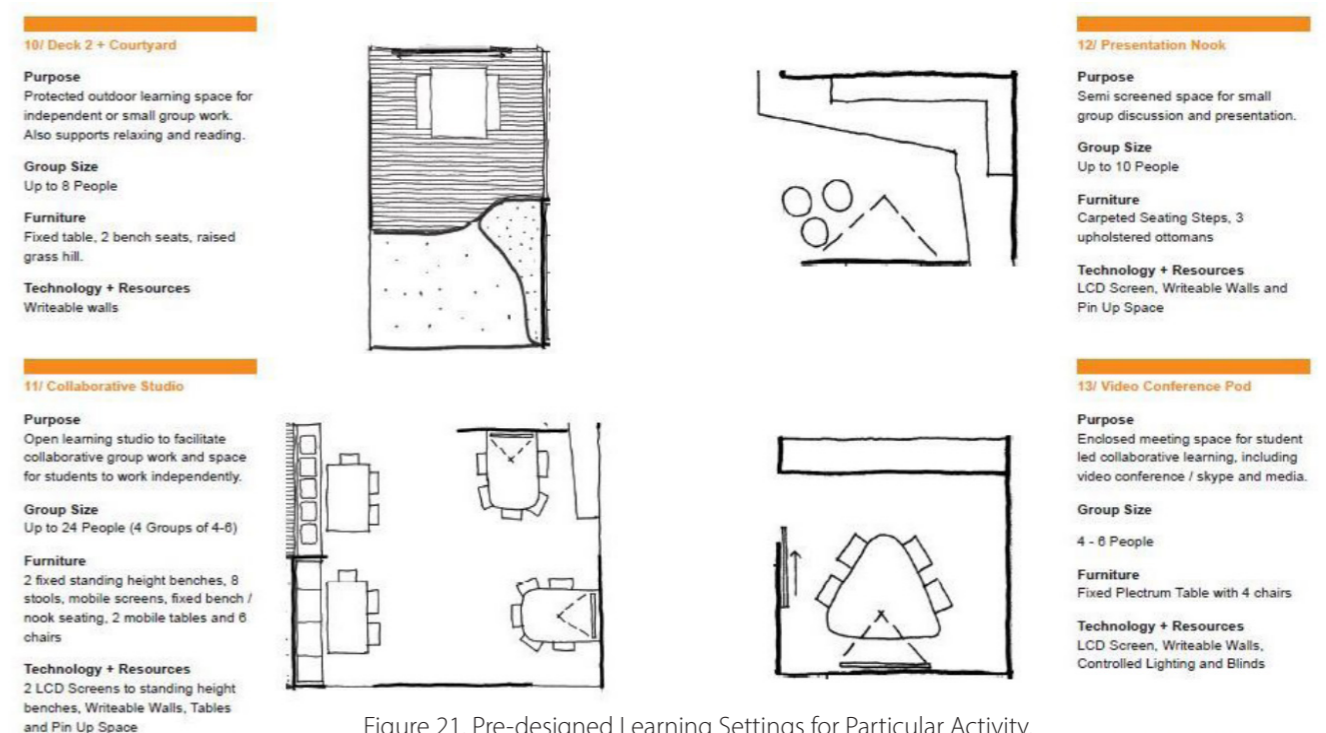Figure 22. Outdoor Learning Space of Woodleigh School Homestead Project

Figure 21. Pre-designed Learning Settings for Particular Activity.

[31] Samuele, B. (2018). *The Classroom has Broken: Changing School Architecture in Europe and Across the World*. INDIRE.

[32] Bennett, N., Andreae, J., Hegarty, P., & Wade, B. (1980). *Open Plan Schools: Teaching, Curriculum, Design*. N.F.E.R. for the Schools Council.

[33] Bennett, N., Andreae, J., Hegarty, P., & Wade, B. (1980). *Open Plan Schools: Teaching, Curriculum, Design*. N.F.E.R. for the Schools Council.

[34] Samuele, B. (2018). *The Classroom has Broken: Changing School Architecture in Europe and Across the World*. INDIRE.

[35] Samuele, B. (2018). *The Classroom has Broken: Changing School Architecture in Europe and Across the World*. INDIRE.
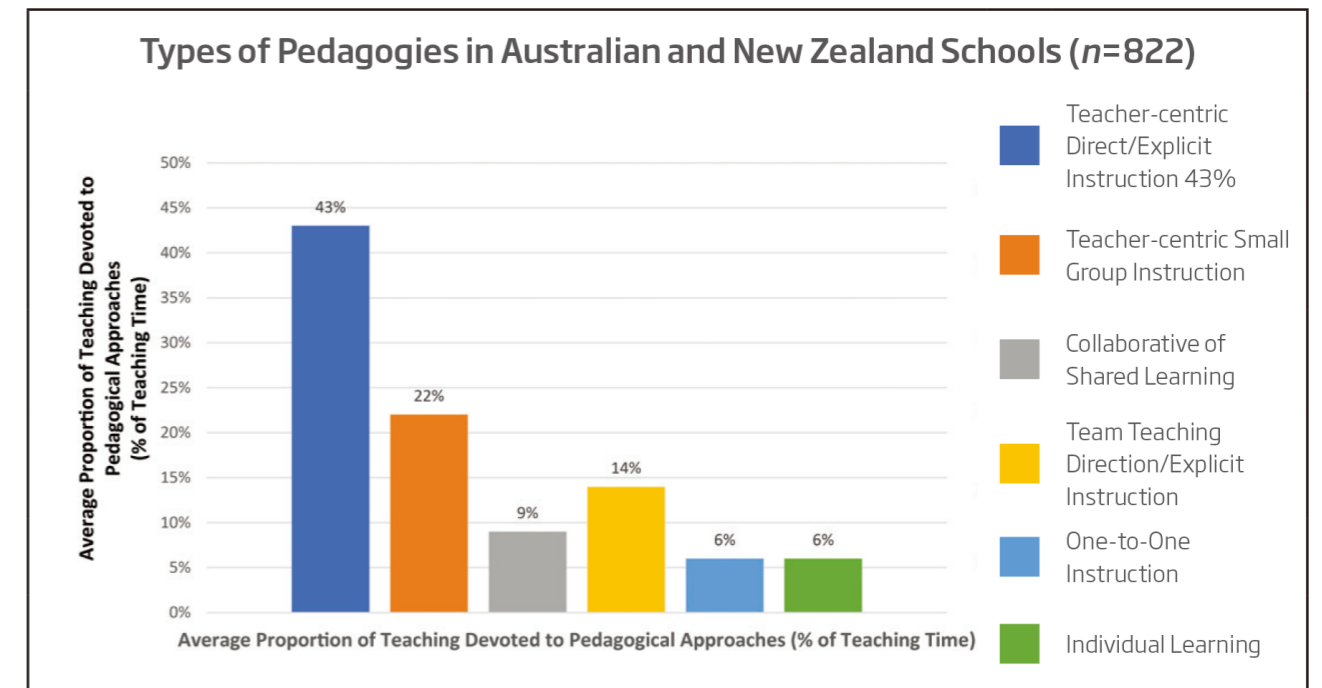
Caulfield School and Woodleigh School demonstrate some features of Australian newest schools. The trends to integrate learning spaces with outdoor environments can be observed, also, learning spaces tend to be variety, rather than one. Dovey and Fisher (2014) provide a typology of the types of spaces being utilized in the shifting process of Australian schools (Figure 23). According to the graph, spatially, the traditional enclosed classroom is gradually opened by foldable walls, and then replaced by open flow space. Breaking down the walls has freed both pupils and teachers from the rigidity of traditional spaces. More outdoor space is incorporated into the whole plan. From a functional point of view, the proportion of common space has grown from scratch and gradually occupies a dominant position. Traditional classrooms still exist to accommodate different forms of learning when needed. Also, the street-space, which refers to the outdoor space, occupies one of the central positions and brings the surrounding environment into the learning space.

While the Australian and New Zealand schools are increasingly providing the types of flexible and open-plan learning spaces to support collaboration, critical thinking, creativity and communication, the traditional classrooms are still dominating. According to the survey, what concerns us more is that even in an innovative learning environment, many teachers continue to teach using traditional didactic pedagogies (Figure 24). It can be argued that design is outstripping teachers' capacity to fully utilize affordances of those designs in their pedagogy. [36] Therefore, what we can conclude is that the classroom environment should become an equal partner in the optimal learning experience. There should be a correlation of the learning space to the teaching actuality. Regardless of the trend, both student-centered and teacher-centered approaches have their pros and cons under certain circumstances. When redesigning the elementary school, the past, current, and the future correlation of the classroom and teaching pedagogies need to be considered in a whole.

Figure 24. Distribution of Pedagogy Types (Australia and New Zealand, 2017).

1.3.2 From School Building to Learning Environment

In today's connected world, the act of learning is not divorced from place. There is an increasing awareness of the effect of the physical environment on health and well-being and a better understanding of the interaction with the environment that contributes to learning. The idea that the environment is the third teacher situates learning and recognizes that we do not learn by memorizing facts, we learn by interacting with others and with the environment around us. It is not sufficient any more to think of learning as only being done at school, the context in which we learn is complex and multi-dimensional. [37] As mentioned in the previous section, learning spaces, such as classrooms, are one of the aspects of the learning environment that affect learning and teaching methods. The school building contains learning space, and the building itself as a good learning environment is also an important element. However, there is another vital way in which design can impact learning. An approach that recognizes the power of society and nature, that aims to create a school not only permeable to the community and natural context around it, but charged with positive symbolic value. Together, these factors constitute the learning environment.

Figure 23. Dovey and Fisher's (2014) Learning Spaces Typologies.

[36] Samuele, B. (2018). *The Classroom has Broken: Changing School Architecture in Europe and Across the World*. INDIRE.

[37] Samuele, B. (2018). *The Classroom has Broken: Changing School Architecture in Europe and Across the World*. INDIRE.

The New Guidelines for School Building issued by Italian Ministry of Education mentioned the environmental quality of the school area:

General School areas must be chosen in order to become connection elements for their natural possibility of becoming "Civic Center" and contribute to the quality of the surrounding urban fabric. They must be identified in healthy areas, a little noisy, far from important roads, in favorable orographic situations, possibly flat to allow the organization of gaming and sporting equipment and, if the conditions are difficult, the areas must be adequately enlarged. Any exceptions must be reserved for high-density areas or in hilly or mountain hilly environments. In particular conditions, the school plexus can consist of buildings located in areas between them, if they are at a reasonable distance, as a journey time of up to 4-5 minutes or placed at 250-300 meters and connected by a safe route. [38]

The guidelines reflect today's growing awareness of schools as a community center, must functionally coordinate with its urban and nature context. Architects used to take an introverted approach to designing schools in order to create a sense of shared identity for students. However, the extroverted approach that encourages students to interface outward and encourages a certain permeability with the community beyond the school, is also becoming increasingly necessary. Servete Maçi, as a case in point, is a community-oriented primary school located in the capital of Albania, Tirana. It promotes the idea of open access school for students and the rest of the community by enriching architecture and neighborhoods. To be more specific, in order to achieve a smooth transition between being a school during normal teaching hours and a community center after hours, school spaces are divided into three categories based on privacy and security concerns:

1) The first is the space for teaching functions such as classrooms, laboratories and staff rooms, which are only open to campus staff and students.
2) The second category includes spaces serving both the school and the community include gyms, auditoriums, concert halls, gallery spaces, meeting rooms, library and other multipurpose classrooms (Figure 25).
3) The third kind of spaces are those that can always be accessed by the community even during teaching hours. There is a semi-internal/external courtyard enveloped by school building as a dynamic public space (Figure 26). It creates a smooth transition between the school and the main street, serves as the main entrance to the school and can be used as a playground and an open auditorium by both students and public.

38 Provincia di Cremona. (2013, 4). *Le nuove linee guida per l'edilizia scolastica 2013*. https://www.provincia.cremona.it/patrimonio/?view=Pagina&id=5278patrimonio/?view=Pagina&id=5278.

39 Stephanie, C. (1997). *School, Community, Home: Using Architecture and Urban Design in Creating an Integrated Learning Environment*. Massachusetts Institute Of Technology.

Figure 25. Auditorium of Servete Maçi Semi-Open to the Public

Figure 26. Schoolyard Accessible to the Community
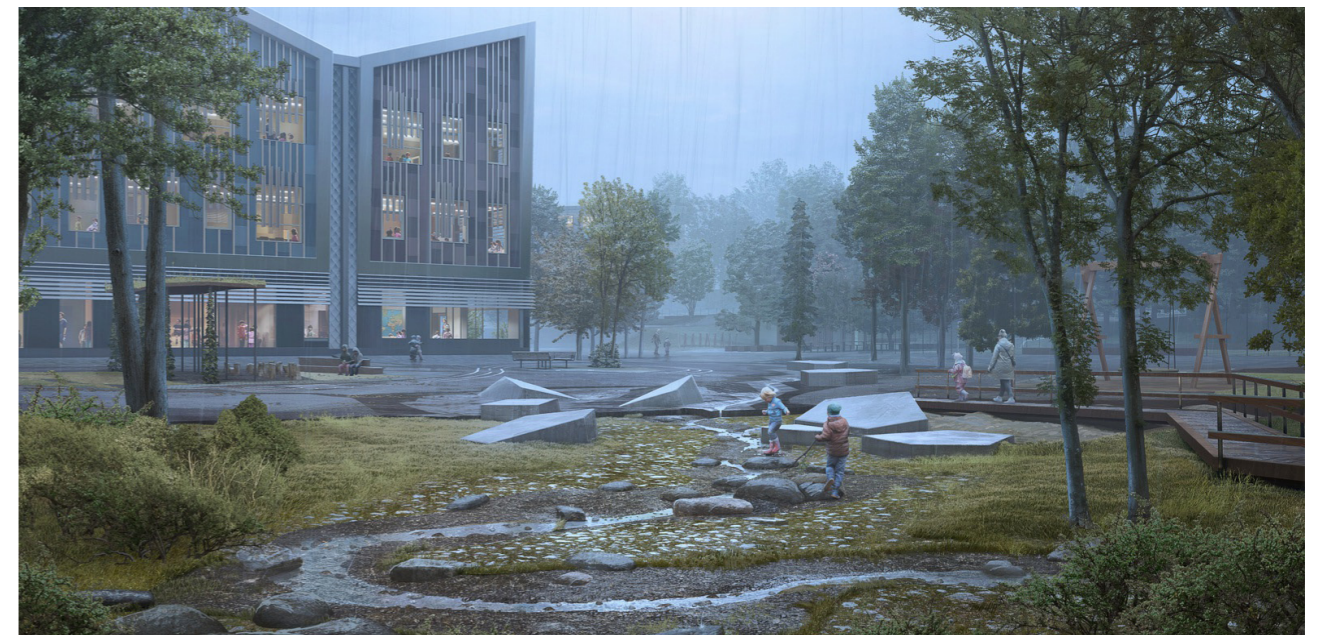
Figure 27. Schoolyard Designed by LINK Arkitektur to Integrate Nature into the Learning Environment.

There is also a trend in school buildings design to integrate the natural environment into the learning process. Located in Gothenburg, Sweden, where it rains almost every day during the school year, LINK Arkitektur has designed a primary school facing the local climate conditions and challenges. Rainwater plays an important role in the design strategy, connecting the building with its natural surroundings. Runoff water from the roof drains into the river in the middle of the schoolyard and becomes part of the landscape (Figure 27). The schoolyard is also a place where education activities can take place. Children are taught universal knowledge and understanding about natural processes by giving them local experiences with the rainwater. For the school building, the ground floor uses open common space around the schoolyard to get children closer to the natural elements, which play an vital role in the learning environment in

In a sense, schools, communities and nature all perform substantive role in the learning environment. For this pedagogical process to be effective, these participants must act in mutual support. [39] In the design of school buildings, various extroverted approaches could be used to integrate learning activities with these external elements, thus create a suitable learning environment as a whole.

# 1.4 CASE STUDIES OF ELEMENTARY SCHOOL RENOVATION

In today's world, especially in Italy, mass construction of new school buildings is out of date. Instead, we should think how to renovate and make better use of existing buildings. In order to adapt to society, the knowledge of each era and the accompanying teaching methods are constantly updated, and the needs for school buildings change accordingly. Our job as architects is to design for different needs, in a sense, the design of a building is never complete, it is a process of constant design and redesign. The flexible school renovation is to allow this to happen. The main structure remains permanent while the interior can be remodelled as the context and requirements change. The following are specific cases of elementary school renovation, which can be divided into four categories according to the type of design method.

1.4.1 Added Furniture

CASE 1. DSSI Elementary School Renovation
South Korea, 2016, 150m²
Key Factors: Maximize space, equal size, sharing activities

equal size for both classrooms

sharing activities

maximize space

EXISTING CONDITION

NEW PROPOSAL
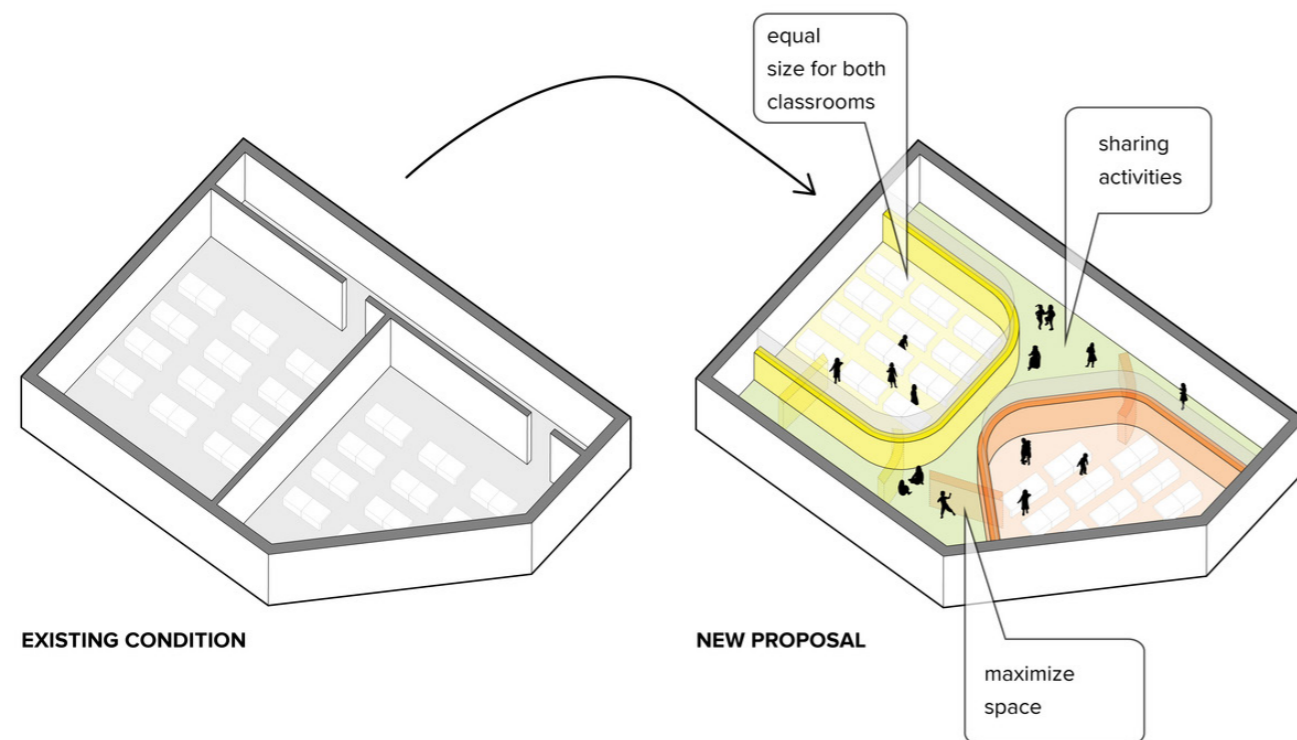
The renovation design of DSSI Elementary School changed the original square classroom plan and replaced it with two curved classrooms of equal area. By doing so, the use of space is maximized, more sharing activities spaces are provided in the corridor to perform new pedagogical practices. Apart from that, a system of rotational walls will allow this reconfiguration of the space from a smaller concentration-like classroom to a bigger playful-like classroom. When rotated, the walls create more gathering Spaces for children to play in when there are no classes. The inside of classroom's wall will be storage space as well. This will free the main space in the classrooms from obstacles.

Activities before Wall's Rotation

Activities after Wall's Rotation
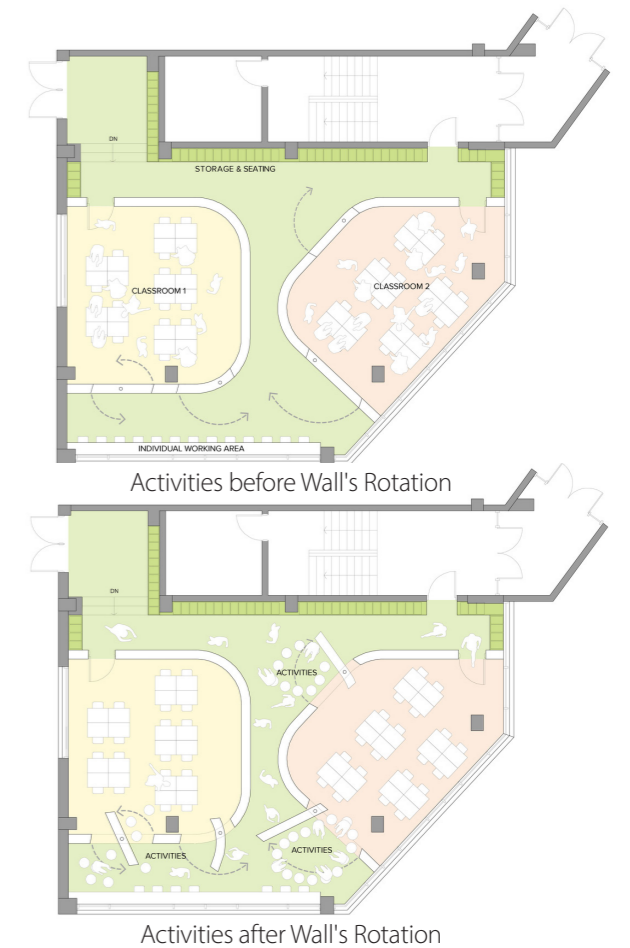
Walls before Rotation

Walls after Rotation

CASE 2. Lan-Tian Elementary School
China, 2020, 99m²
Key Factors: Flexible uses, space reorganization, environmental friendliness and renewability

Two idle classrooms were combined and renovated into a new reading space in Lan-Tian Elementary School. Through a simple curved bookshelf, the space is divided into different functions such as reading and discussion. In addition to storing books, the two parts of the space are visually connected by a crack-like design of the shelf. The choice of specific materials allows the shelf surface to become a blackboard for children to scribble on. Also, By classifying objects into individual units, the design team maximize the flexibility of the use of desks and chairs.
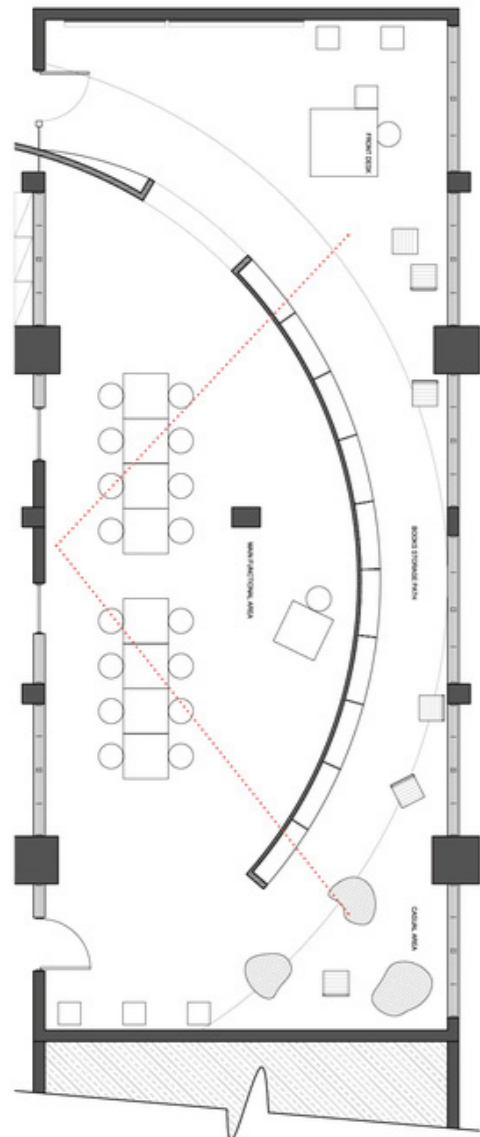
Plan of the Reading Area
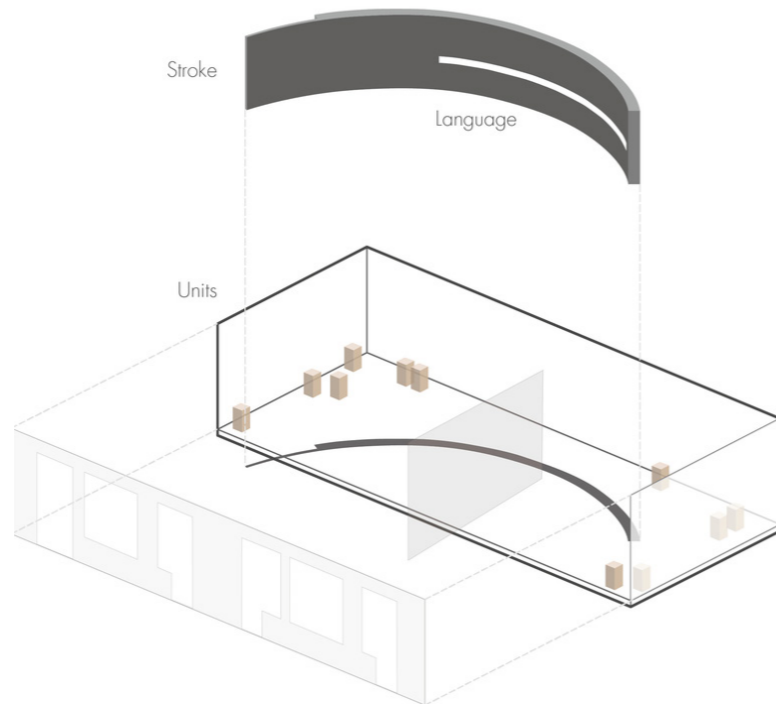
Reorganization of Space

CASE 3. German School Seoul Auditorium Renovation
South Korea, 2020, 150m²
Key Factors: Flexible elements, creative storage system, multifunction

Flexible Seating Area
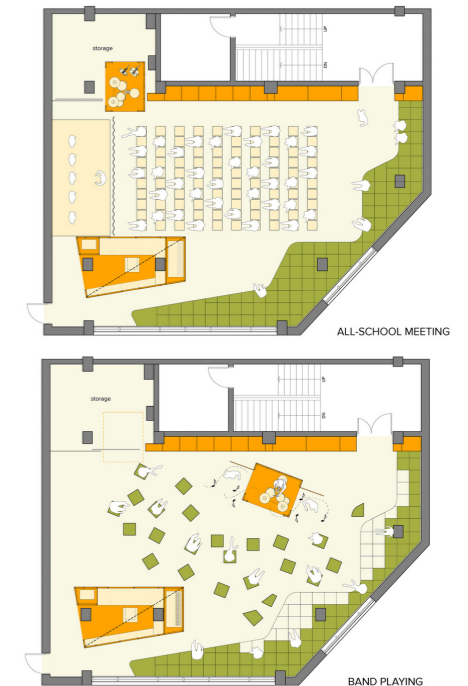
Change the Seating Arrangement According to Different Functions
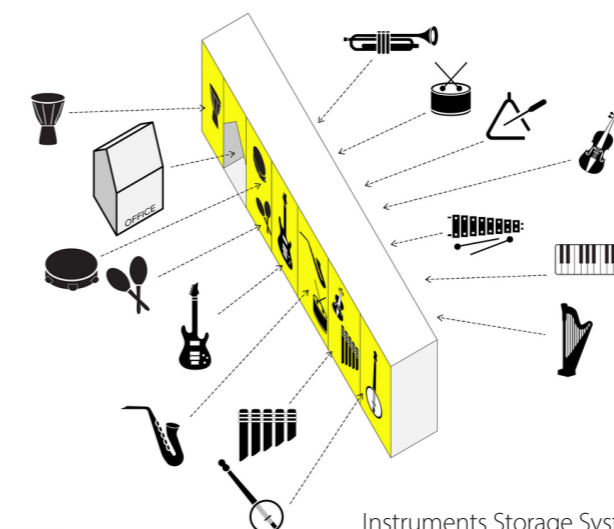
Instruments Storage System

The first idea of this project is a seating area meant to be occupied by students and staff in a casual way, as a lounge area that can be broken into individual units (stools) allowing multiple ways to organize a meeting, game, class, or lecture. The second design feature is a smart, efficient, and creative storage system to house all the musical instruments. Also, there is a small rehearsal room built in the wall that can be pulled out if needed.

1.4.2 Added Space

CASE 4. Chapel School for Special Education
Belgium, HOOTSMANS ARCHITECTUURBUREAU
Key Factors: Keep the chapel recognizable, added storey box, recreate the light condition

In Belgium, a chapel was converted into a special school with indoor sports facilities and a media center. The pillars of the chapel, the arches, all the architectural details, the decorations and the insides of the outer walls remained untouched. The design team inserted a two-storey square box into the heart of the church as a classroom space. It aligns with the structural grid, high above the basement. The classrooms are lighted with circular windows that allow indirect daylight into the building. Also, holes in the floor between ground floor and upstairs ensure natural light on the lower level of the box.

Corridor around the Box

Chapel for Outside

First Floor Space of the Box
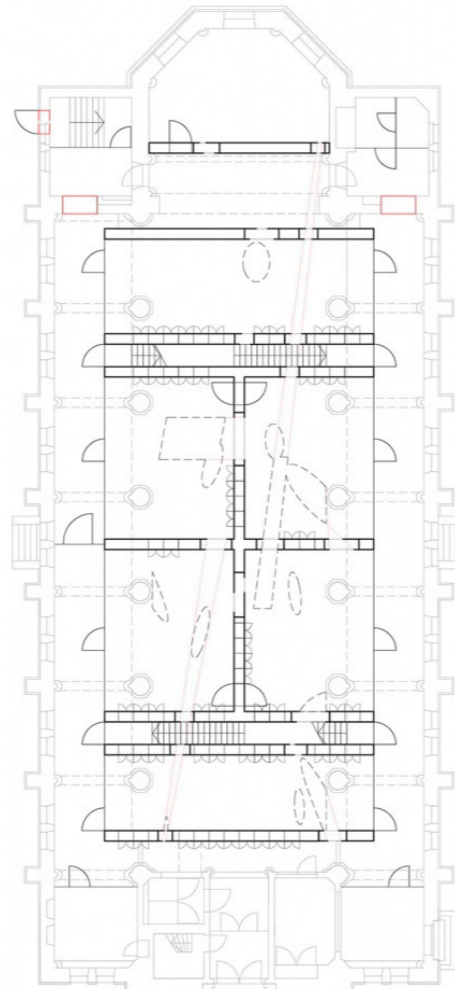
Ground Floor Plan

CASE 5. Bobergskolan School
Sweden, Max Arkitekter, 900 students
Key Factors: Facedes reflecting the existing buildings, complex spaces of high/low, solid/void, transparent/opac, old/new.

The Old Gas Works around the School

The Bobergskolan School is on the site of a 100-year-old gas works. Now the area is part of the urban landscape, and some of the factories have been converted into Bobergskolan School and its facilities. The library was ransfromed from the old workshop building, retaining the old brick facade. The centrally placed bookshelves enclose an independent space. For the main building of the school, it is a complex building full of contrasts; high/low, solid/void, transparent/opac, old/new. Also, the transparency and connectivity between different stories and galleries give children a more open learning environment. Overall, it is a rich experience to move through the Bobergskolan School with its both intimate and flexible spaces.

Holes in the Floor Connect the High/Low Spaces

Transparency between Different Spaces

Bookshelves Serve as an Accessible Space in the Library

Transparency between Different Spaces

1.4.3 Added Volume

CASE 6. E. Fermi Middle School Renovation

Italy, Giulia de Appolonia
Key factors: selective refurbishmen of the pre-existing school, extension aimed to host new offices and auditorium, a complete spatial sequence, a symbolic and representative entrance

The E. Fermi Middle School project is a selective refurbishment concerning some of the pre-existing school zones. The new volumes were extended to host some offices and a new auditorium while preserving the main structure of the old building. The new volume also closed the original U-shape to form a continuous spatial sequence. The choice of new colours and materials and the addition of a new entrance give the school a distinctive identity.

Aerial View
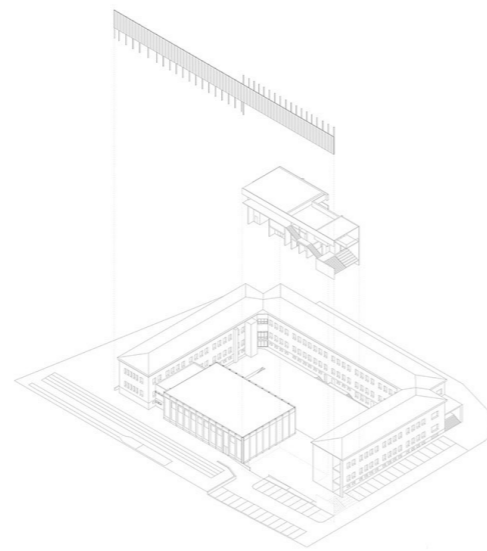
Existing and Added Volume
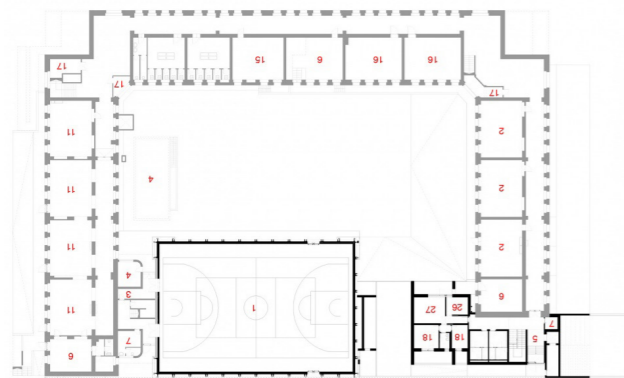
The Floor Plan

New Space in the Added Space

Contrast of Old and New Facades

Symbolic New Entrance

CASE 7. Renovation of Hakka Children's School

China, Rural Urban Framework
Key factors: Plug-in structure introducing new function, New relationship between inside and outside, rethinking the public space

In the hakka minority areas of southwest China, wooden plug-ins are used to transform a traditional residence into primary school. The "stair" plug-in transforms a small window into a new entrance, introducing a public library to the school. The funnel staircase plugs into the enlarged opening, inviting people to sit, read and rest in the shade, while also serving as an open amphitheatre for activities in the exterior courtyard. The "tower" plug-in rethinks the traditional public space by raising up the traditional collective courtyard and connecting each floor through a spiral stairway to the sky. People can sit, read, or even drink tea inside the tower.

Children Sitting and Reading on the "Stair" Plug-in

"Tower" Plug-in
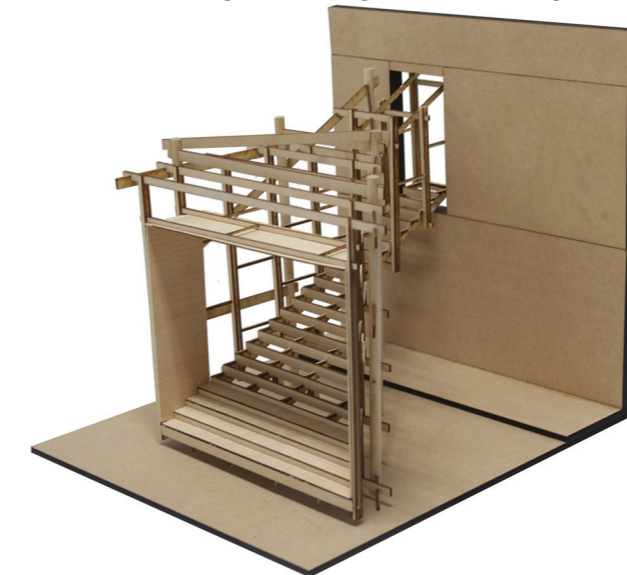
"Stair" Plug-in Model

"Tower" Plug-in Model
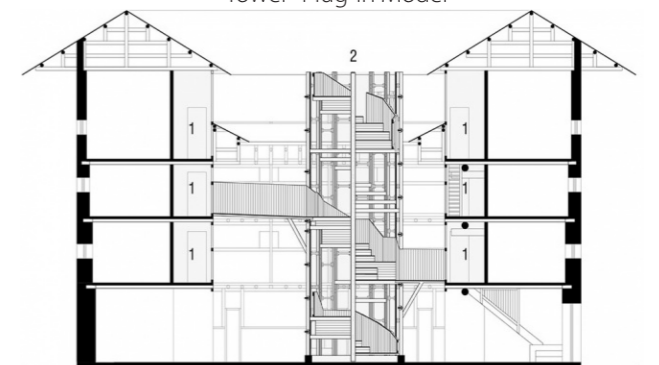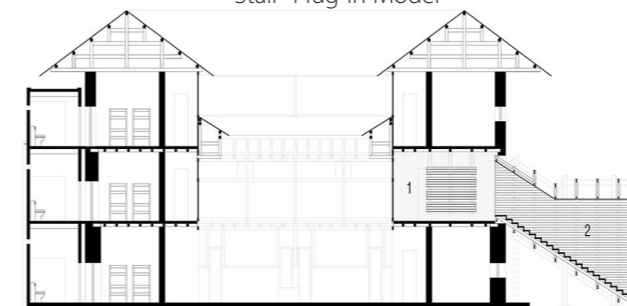
CASE 8. Reconstruction and extension of Elementary School Vřesovicel

Czech Republic, Public Atelier & FUUZE

Key factors: Emphasis on passages and interconnections of the buildings, new possibilities of operation and free movement, playful and colorful interiors for children

The Main School Building

Colorful Cubes as Connection

Copper Plumbing Corridor
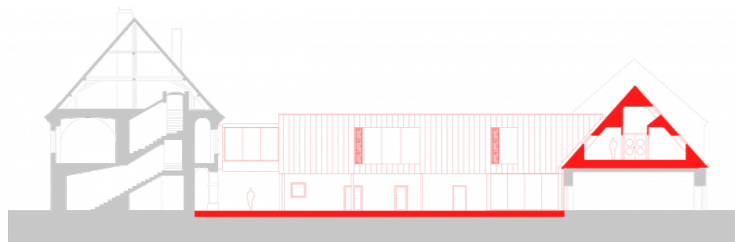
Section
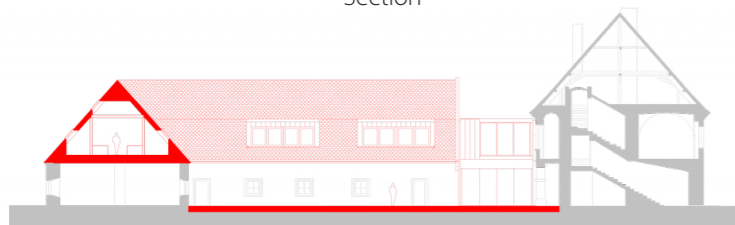
Section

The Elementary School of Vřesovicel is located in a local church and its two building wings. The renovation project proposal emphasized the interconnection of individual parts so that their historical value as a complex should be preserved. The historical parts are united by a classic plaster façade, a red roof of plain tiles, and copper plumbing elements. Also, the simple cubic shape and distinctive colors characterize the new parts.
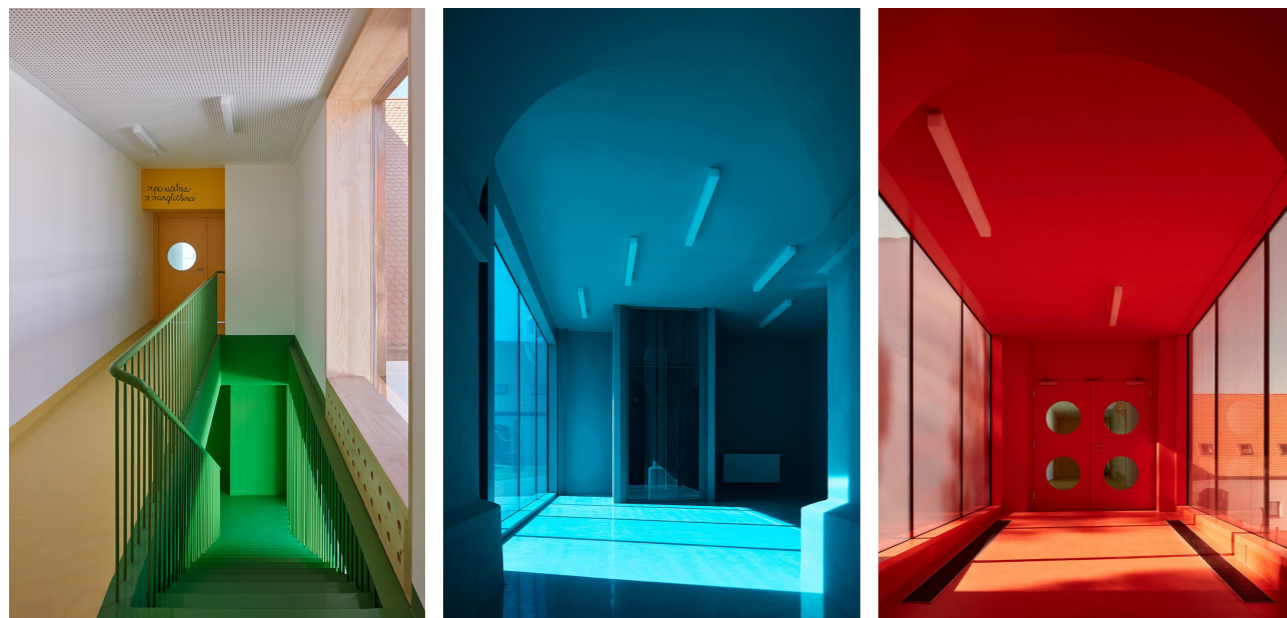
Colorful Traffic Space in the Cubes

1.4.4 Conservation and Redevelopment

CASE 9. Giovanni Pascoli Secondary School

Torino, Archisbang & Areaprogetti

Key factors: More accessible to community, preservation of historical value, new materials and interior spaces

There are some renovation projects that improve the quality of the space without changing the overall structure of the building, reorganizing the layout of the space for new teaching methods or design concepts. The complex which Giovanni Pascoli Secondary School is located was built to house the "Educatorio Duchessa Isabella" boarding school, commissioned by the charitable institution Opere Pie San Paolo in 1893. It was rebuilt for use as a school and residential building in 1960. The aging of the structures, the inadequacy of seismic safety and the poor energy performances are an emergency to face.

In this project, Archisbang and Areaprogetti imagine a different kind of school which is not only renewed in terms of structures and spaces but also renews its vocation, opening its spaces to the urban community for a form of education based on social life. This is a case that could apply to a large number of buildings in Italy which were built for use as schools but do not meet current seismic regulations and are energy-hungry or merely inadequate for use as schools for reasons such as their acoustic properties. The school is an inclusive space where it is possible to learn by playing and it becomes a reference point for children and the rest of the community.
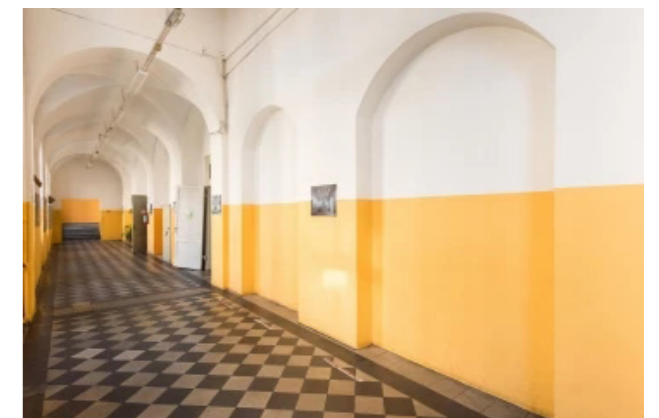

Street Corner of the Building

Back of the Building Before Renovation
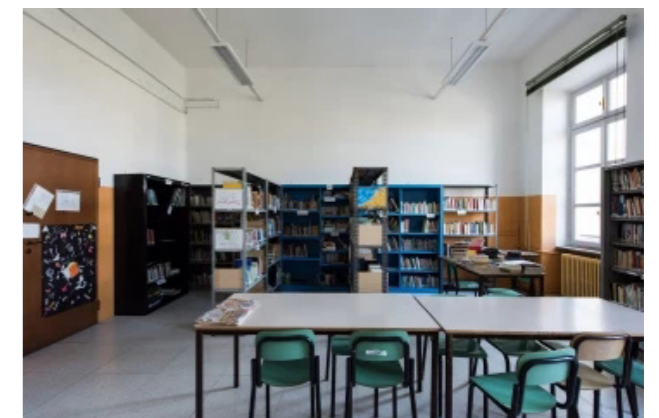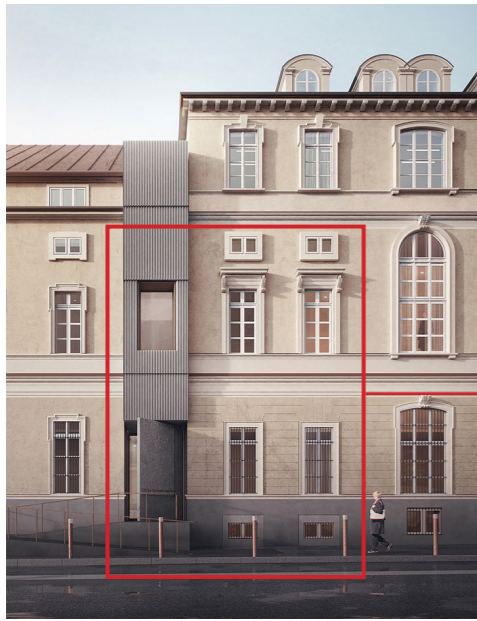

Library Before Renovation

Corridor Before Renovation

Corridor Before Renovation

Entrance

The redevelopment project began by moving the entrance door and completely transforming the foyer. At the end of the wing on Via Duchessa Jolanda, an existing window became a gateway on street level, with a metal frame matching the colour and proportions of the frames around the tall windows on the wall and glass infill. To overcome the difference in level between the foyer and the street, a ramp was added, connected on one side to a staircase.

New Entrance

Original Entrance

Reception and Staircase

The building offers an open, brightly lit reception area adorned with multiple items of furniture, giving a real facelift to the old entrance in which the building was accessed via a dark staircase and an entry cubicle which completely altered the proportions of the corridor.

The ramp of the new entrance, the steps and the hall are paved in Luserna stone, while the atrium is paved in bamboo and houses two low volumes, the reception and the toilets, which detach themselves so as not to interfere with the large vaulted room.
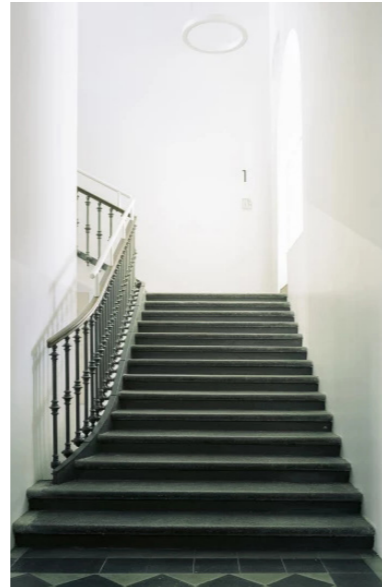
Corridor and Classroom

Eliminating the infill in the arches over the classrooms, which has been replaced by permanent fixtures and glass walls: the historic masonry has been lightened and underlined, while the restoration of the original floors, which had been covered over, maintains continuity in the spaces.

In the classrooms, the false ceiling tiles have been replaced by linear sound-absorbent slabs installed at a distance from the ceilings to leave the historic vaults in view.


Back of the Building After Renovation

Terrace Transformed by Rooftop
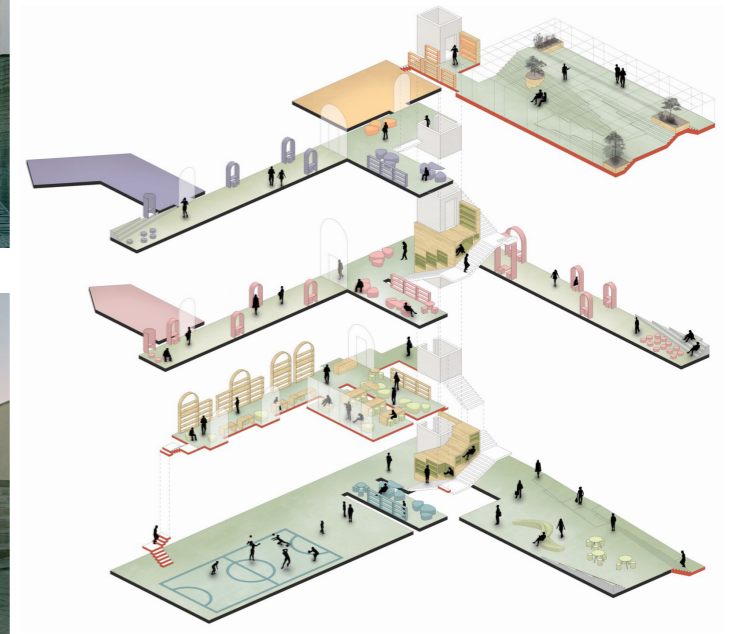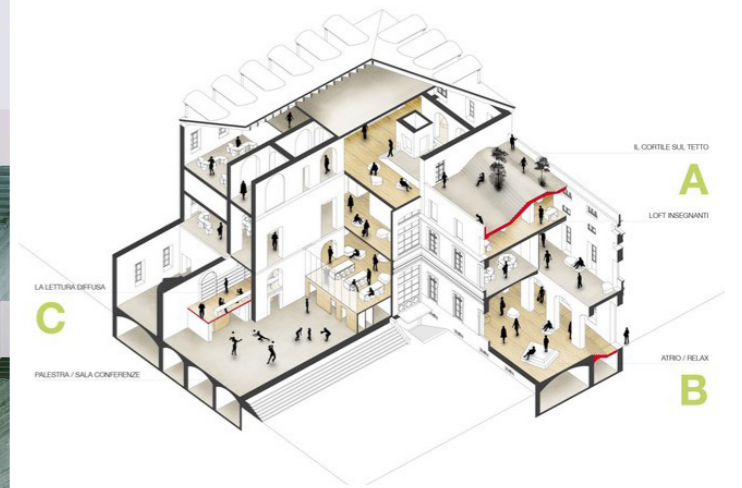
Space Circulation

Design Strategy

The basic principle inspiring the redevelopment project is opening the school to the city around it, beginning precisely with transformation of its entrance foyer and developing a free, open system of pathways on all levels, containing an open library and an auditorium with destructured spaces for aggregation. All this is obtained by revealing the building's original structure, freeing it from the infill added here and there over the years to improve circulation, adding mezzanine levels and transparent surfaces, and transforming the rooftop into a terrace restoring the building's contact with the city around it.
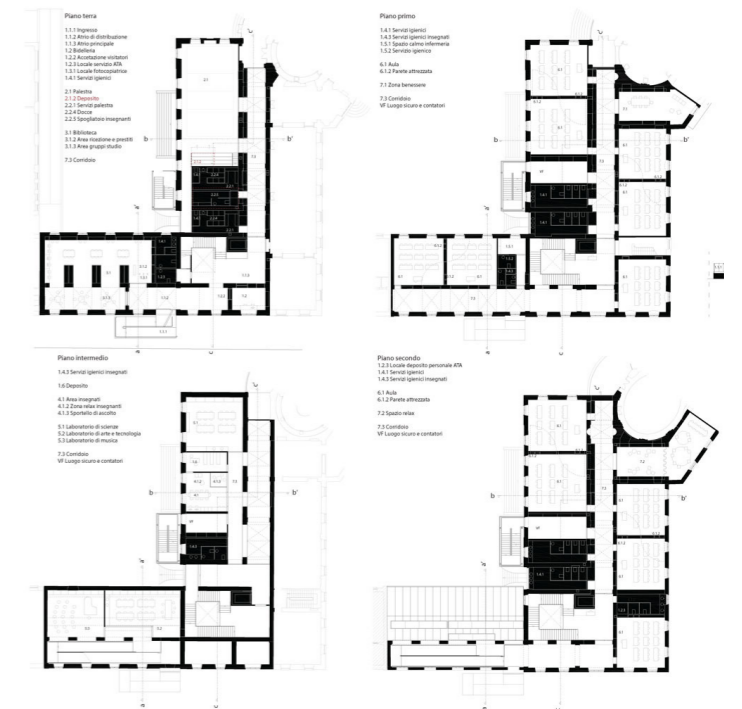
Floor Plans

Chapter 2   The Renovation of Elementary School in Pecetto di Valenza

2.1 HISTORY OF THE "C. ORSINI" ELEMENTARY SCHOOL

The building of the Municipality of Pecetto di Valenza (Figure 28), in-side which the "C. Orsini" Primary School is located, was bought by the municipal administrators from the Levi De-veali family, rabbis of Alessandria for many generations, who had been owning it since 1790 as a summer residence. The building is in neoclassical style and dominates the main square of the town, right in front of the ancient for-tress that crowns a natural tuff spur and makes it the of-ficial headquarter of the Administration, with its registry and civil status offices. In 1912 the structure of the school was built from scratch, in a portion of the plot that originally was occupied by the courtyard of the building. The project, developed by the Engineer Migliore of Turin and properly implemented by the construction manager, the Surveyor Reggiardi, the same one who partially designed the "G. Borsalino" aqueduct, provides for the division into four spacious classrooms, well worthy of a city building. Two located on the ground floor with an access corridor and services and another two on the first floor, reachable by a large stair-case directly accessible from the entrance on Via Ghilini, with other toilets on the mezzanine. In Pecetto, four clas-ses and a multi-class began to function, with as many te-achers, mostly teachers (female) but not lacking, althou-

Figure 28. The building of the Municipality of Pecetto di Valenza

gh occasional, also the presence of a teacher (male). It is worth mentioning the figure of Carlo Orsini, the town's master par excellence who, born in Pecetto, lavished his teaching efforts in over forty years of teaching. The current name of the school was given on Sunday the 11th of June 1967, when on the façade was discovered and blessed the plaque where the Orsini's good-natured pro-file is portrayed in a bronze medallion, work of the fellow countryman Pietro Ferraris who was a pupil of master Orsini (Figure 29). Carlo Orsini was also municipal secretary and ph-lebotomist, that is, a sort of surgeon authorized to inter-vene in particularly serious cases when bloodletting was practiced, believing that it could benefit blood circula-tion. It should be remembered that at first the classrooms were heated through wood-fired stoves that were supplied by the municipal administration and were supplied with fuel by the handyman janitor who was also the municipal attendant. In the mid-20s of the twentieth century, the classrooms were equipped with a radiator

Figure 29. The building of the Municipality of Pecetto di Valenza

system and the set of benches model "Balilla" made in wood by the local awarded carpentry of Ernesto Acuto, which was also a furniture factory, in place of old benches with the seat at-tached to the reclined writing surface, also coming from the same workshop. Even at the end of the Second Wor-ld War, the furniture looked like the one described which was then replaced at the end of the 60s with a more ra-tional and modern one with steel counters and formica top, thanks to the financial contribution of the teacher Cesare Merlo who he donated in memory of his deceased wife the teacher Agostina Orsini, daughter of Carlo to whom, as already mentioned, the building is entitled. In addition to desks and chairs, the classrooms were finally equipped with updated geographical maps and material useful for teaching. In the same years, a classroom was dedicated to the memory of Lieutenant Giorgio Maggi who fell on the Greek front and decorated with the gold medal for military valour for the heroic deed carried out to protect the soldiers placed in his command. In the 80s of the twentieth century, the municipality equipped the school complex with a fifth classroom obtained from an area previously belonging to the municipal building and connected to it with a covered terrace.

2.2 THE SURROUNDING CONTEXT

Figure 30. High view of Pecetto di Valenza

Pecetto di Valenza, where the "C. Orsini" Elementary School is located, is an Italian town of 1 230 inhabitants in the province of Alessandria in Piedmont. Originally it was known as Pecetum Valentinum as it was located near the current Valenza, then an important garrison to guard the crossings on the Po. It was built around a large villa, the typical patrician economic structure of the late Republican period and the early Roman Empire, a combination of country residence, farm and factory. Next to the modern provincial road, made Pecetto di Valenza a place of considerable economic and military importance.

Figure 31. Entrance of "La Rocca"

A castle was built on the top of the cliff overlooking the northern part of the town. All that remains of it are the foundations of a tower and the name "La Rocca" which designates the place, located immediately behind the modern municipal building.

The project of recovery and opening to the public of "La Rocca" (Figure 31) as a botanical garden and astronomical park was set up in 1996 and completed in 2009 as a contribution to the International Year of Astronomy thanks to the contribution of the municipal administration and the "Galileo amateur astronomers' group" of Alexandria (Figure 32). The site of the ancient castle houses a collection of ancient astronomical instruments including sundials, circles, plinths and a large compass rose, as well as positions for installing telescope. It is accessible from the rear courtyard of the municipal building.

On a larger scale, residents of Valenza were attracted by Pecetto di Valenza's panoramic view to the plain (Figure 30). The location on a long and green hilly prominence oriented from south to north also makes it an ideal destination for cycling tours. Local institutions like Associazione Socio Culturale La Fenice often organize bicycling-related events to attract people from nearby towns.
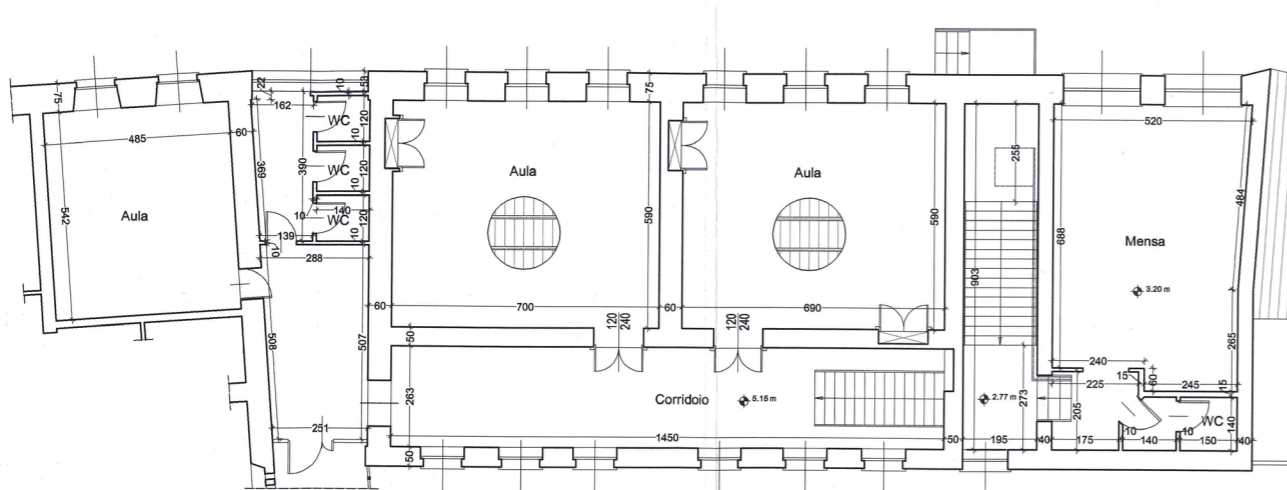

Figure 32. Astronomy park in "La Rocca"

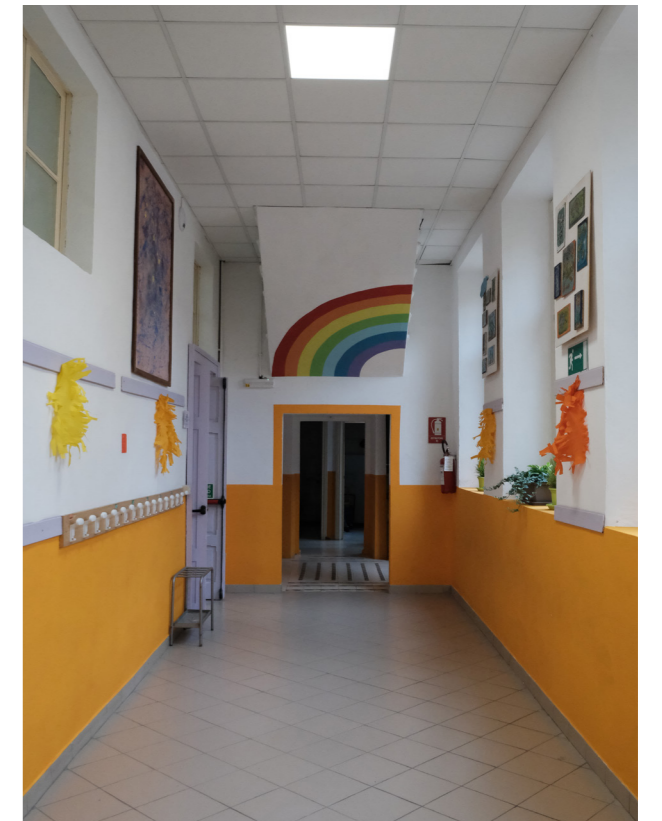# 2.3 CURRENT STATE OF THE SCHOOL BUILDING
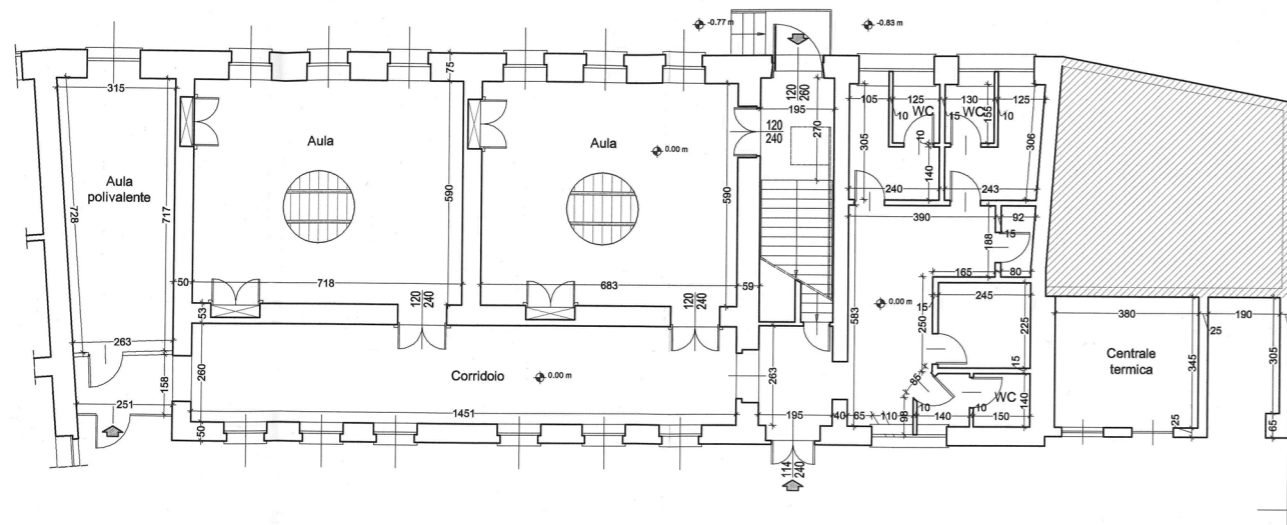
Ground Floor Plan

First Floor Plan

Ground Floor

First Floor

Courtyard

2.4 INDICATIONS OF THE PROJECT OBJECTIVES

The Pecetto di Valenza administration, through the design of the interior spaces of the primary school C. Orsini, aims to reach several goals. The intent certainly ambitious, is to make the school attractive, innovative, modern, welcoming, functional and flexible. Our school is a small reality and to guarantee survival, our Institute must be able to recall students even from neighboring centers.

To succeed in this intent it becomes fundamental that from the entrance, families who come to visit the school to decide the next future of their children, remain well impressed by our equipment and the quality of our spaces. It is necessary, in accordance with the Plusteria school manager, to ensure that our school is a unicum in the area. The Administration has therefore decided to give a turn to the usual way of operating in the management of the Institute, where, to every need manifested by teachers and schoolchildren, responded from time to time in a punctual manner. A library is needed, you buy a library, etc. This way of operating has, over the years, given life to neglected, disordered and uncomfortable environments. The school is spread over two floors, on the ground floor we find the entrance, two classrooms used to after-school and a space unused today. On the upper floor there are three classrooms for the lessons (which partly take place in multi-mass), a small canteen and a space dedicated to ATA staff. In our intentions, the grounds on the ground floor should be differentiated, one more "traditional", the other instead more flexible; Transformable to a laboratory space for group work, in the AGORÀ classroom, where you can watch movies on the interactive whiteboard, follow small representations or listen to readings. The unused space could become a small library, a space with laboratory equipment or any other environment compatible with the size of the room. The wide entrance corridor is the space that children occupy in the morning before getting into the classrooms, is in fact our real entry. Here it would be interesting to organize a series of sessions with the possibility of storing personal objects and hanging jackets in an orderly and practical way. The transition to the upper floor is one of the sad and inhospitable spaces of the school. The stairs require an intervention that make it a pleasant, welcoming and stimulating path. The upstairs classrooms need furnishings designed for both groups and individual work. All the classrooms are equipped with an interactive whiteboard, however, it is necessary to think of curtains that allow a partial darkening of the classes and maybe even a few mobile furniture element that if necessary it allows to divide the rooms into more spaces, in relation to the fact that Very often within the same are to work children of different classes (eg fifth and first together). In primary schools, very often they are hanging on the walls, sheets, maps and anything else, all with punctures or adhesive tape; It would be useful to imagine a useful piece of furniture for the purpose and able to preserve the walls from degradation. The classrooms also need spaces for storing textbooks, so wardrobes and libraries that may also go to exploit the niches in the walls present in all classes. Obviously, in addition to the desks (possibly prepared to hook the backpacks) for the boys, you have to imagine a post to teach you able to host books, laptops and everything you need to do the teacher's work. It is essential to make the space experienced by welcoming and stimulating children, working as well as on the furniture, even on the colors, the lights and the materials, still keeping the regulations, the maintenance and hygiene appearance. In fact it is necessary to remember that the interiors of the Institute are painted with good regularity and that to operate the cleaning of all the rooms is a single person. As a starting point it would also be interesting to imagine themed classrooms or in any case differentiated between them. The corridor on the upper floor, of service to the classrooms, is today a footprint of furniture and bookstores of each shape, these elements should therefore be rethought, as well as the space occupied by the service to the classrooms, is today a footprint of furniture and bookstores of each shape, these elements should therefore be rethought, as well as the space occupied by the service personnel. Our intent would also be in this case, as a bit for all common and service environments, make these spaces more welcoming and maybe, in some way, ahead of interest and training for small students, always paying a certain attention to the practical and functional aspect of each element. In summary, the furniture can become the same learning tool, a knowledge mediator (think for example at the scales reported) or the floor that conveys math or other pathways (reference images are attached) or walls with coatings which present geometric shapes (to measure the perimeter, calculate the area etc.), scale furnishing elements to understand the concept of "greater and lesser", etc. The school context as an integral part of the educational process, which vessels daily stimuli and reflections ... this would be the optimum.

Chapter 3   Conceptual Design and Practical Application
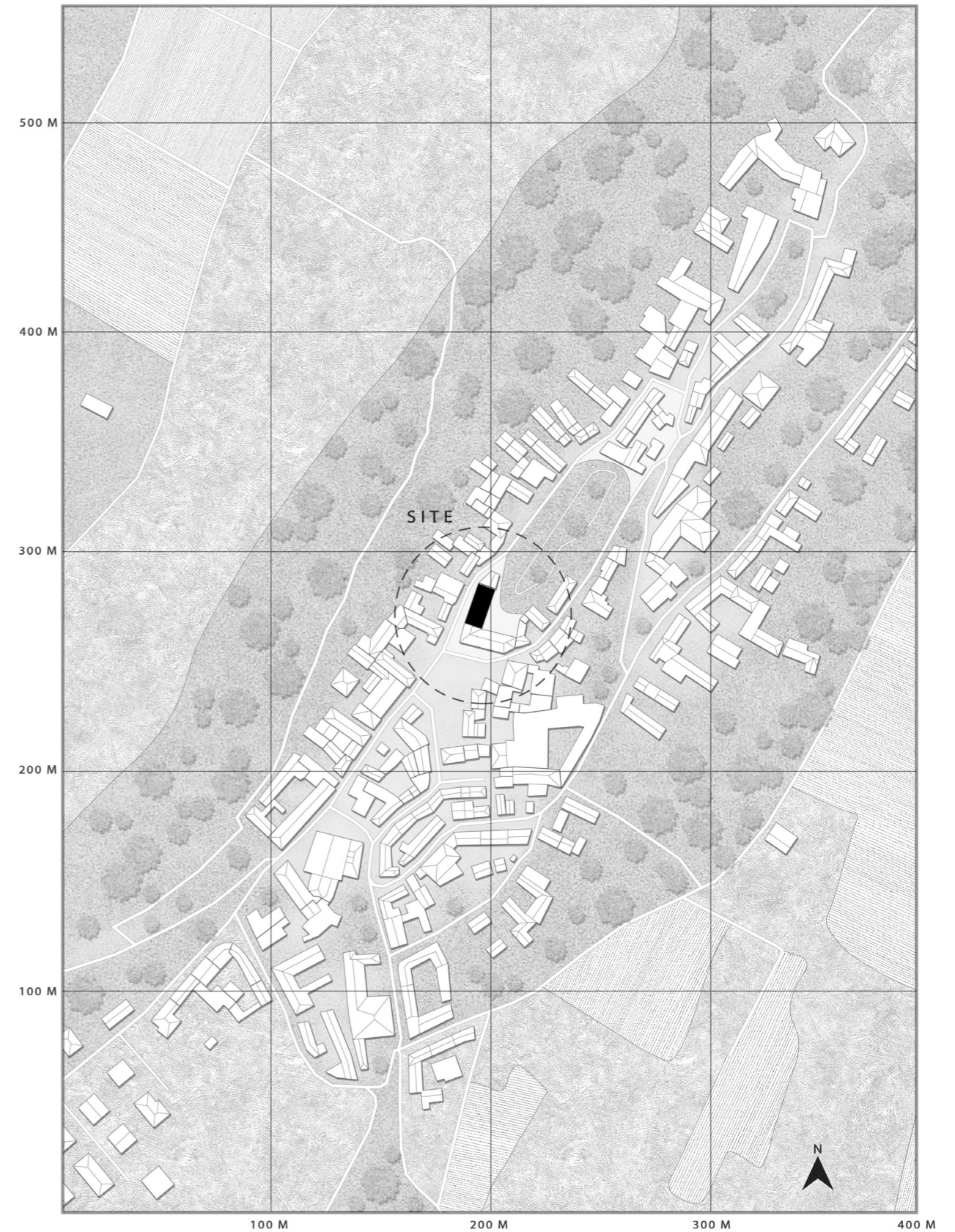
The location of the Pecetto di Valenza is on a long and green hilly prominence oriented from south to north. To the north lies the plain of the Po River, where the Valenza lies, and to the south lies the rolling terrain of hills.

Our site is located in the center of Pecetto di Valenza, attached to the municipio building, next to the main plaza. The whole town is about five hundred metres long, and the school yard leads to the La Rocca, which is the highest point of the town's topography, overlooking the plains to the east and west.

CONTEXT OF THE SCHOOL BUILDING

The school building is attached to the government building and occupies one of the rooms in the building. The east is the school courtyard, leading to La Rocca, the main entrance of the school is also on this side. In the west side face the Via Ghilini, across the streat is the residential building of the town. On the whole, the school building has four volumes, main buildings and three dependent volumes.

CIRCULATION ANALYSIS

OF CURRENT SCHOOL BUILDING
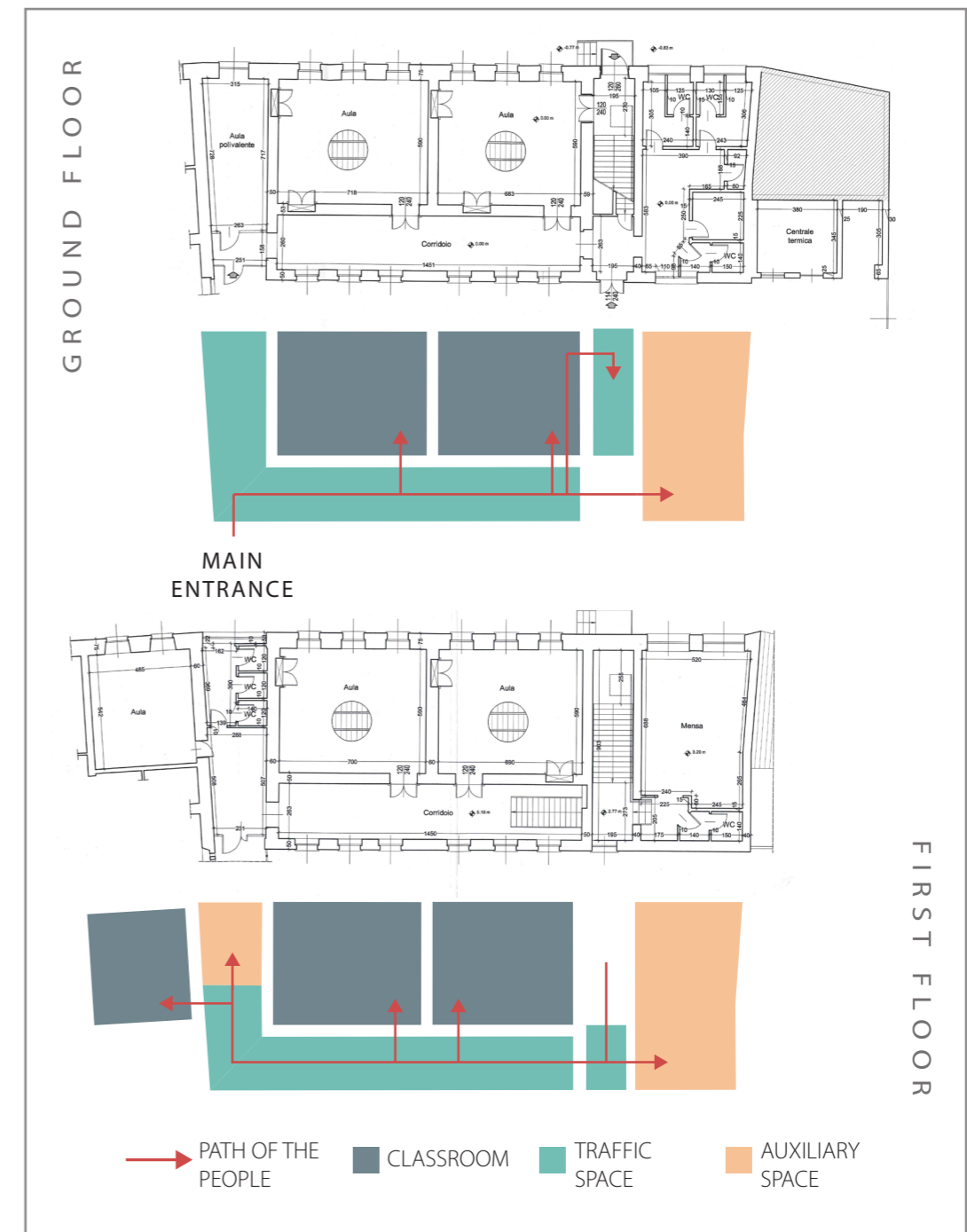
At present, the school building is composed of corridors of the classroom and connecting the classroom, plus auxiliary space. This is a typical "factory model" school plan. But the biggest problem now is that the traffic space design is unreasonable, making the route to the upstairs too comlicated. You will have to go across a classroom to reach the stairs.

SCHOOL

School building as a learning environment should not be isolated

COMMUNITY	SCHOOL	NATURE
Community is the city context, which is also one part of the learning environment.	School building should be integrated with the community and nature environment it located.	Nature environment should be considered as a place where learning can take place.
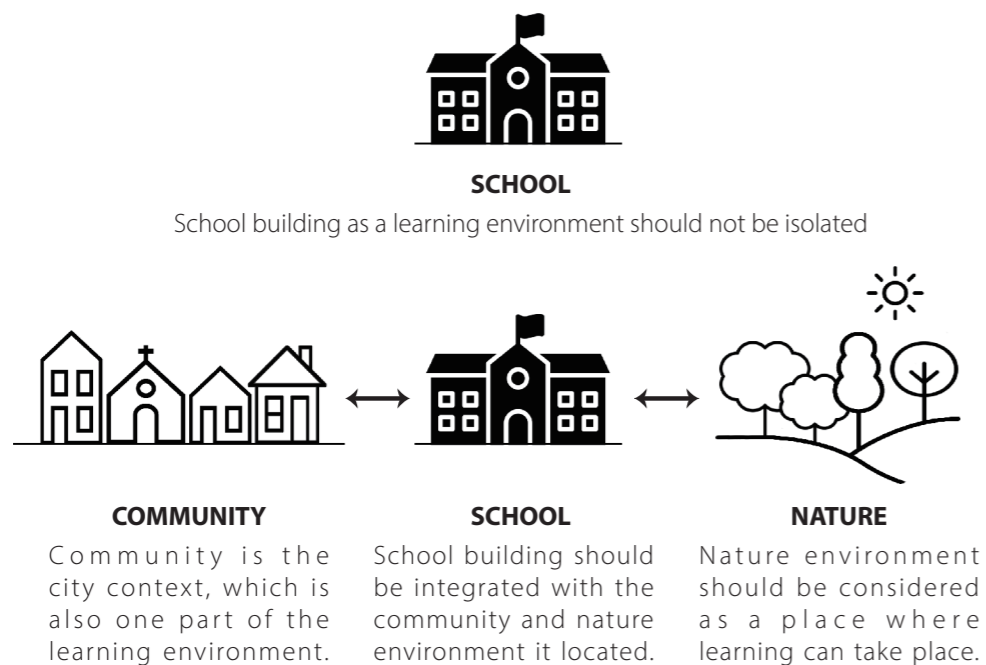
CURRENT STATE
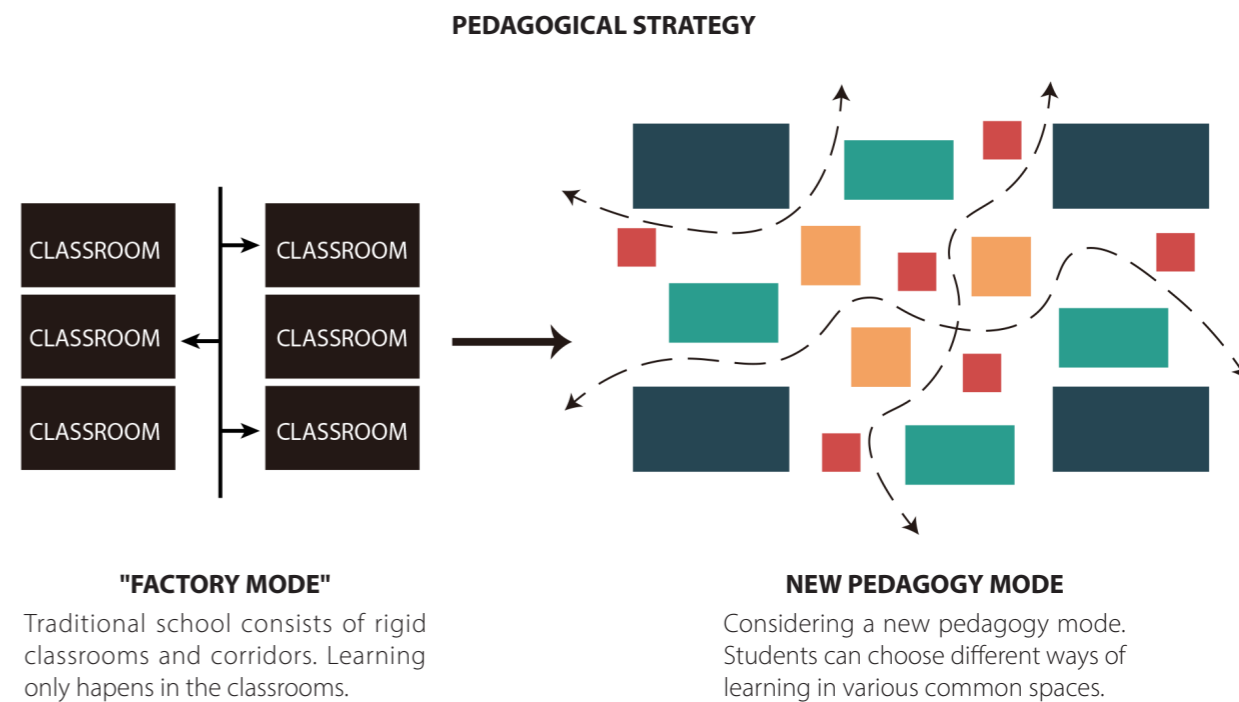
NEW OPENING STRATEGY
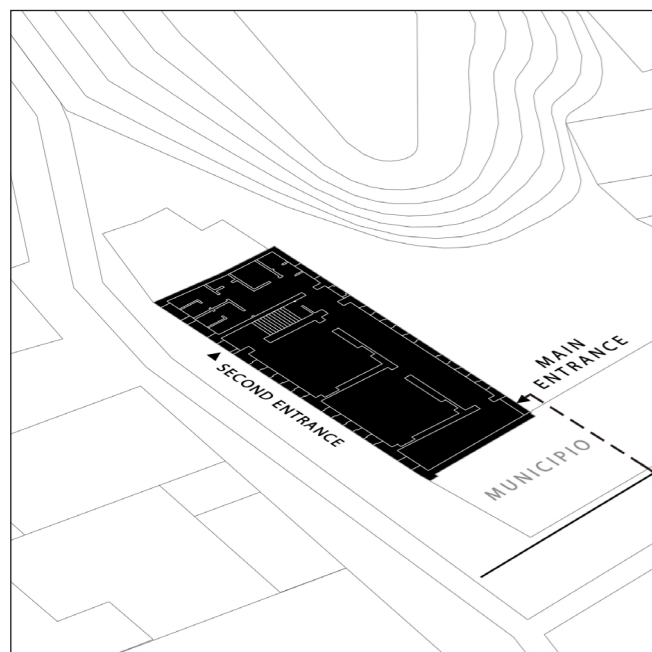
There is little connection between the school building and its surroundings. People need to walk through municipality buildings to reach the school's main entrance.
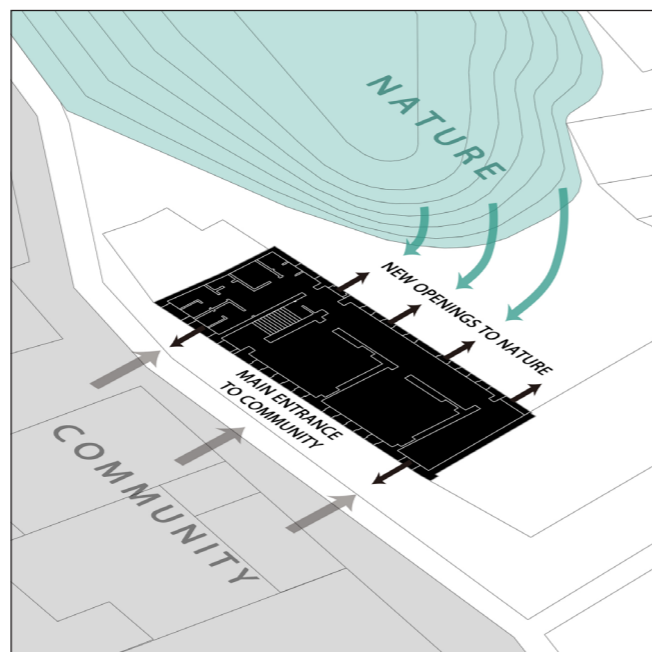
Put the main entrance on the street on the neighborhood side and open the new entrances to the nature-facing side. More accessibility of school to community and nature.

PEDAGOGICAL STRATEGY

CLASSROOM	CLASSROOM
CLASSROOM	CLASSROOM
CLASSROOM	CLASSROOM

"FACTORY MODE"

Traditional school consists of rigid classrooms and corridors. Learning only hapens in the classrooms.

NEW PEDAGOGY MODE

Considering a new pedagogy mode. Students can choose different ways of learning in various common spaces.

SPACE STRATEGY

TRADITIONAL CLASS	INFORMAL CLASS	GROUP WORK	INDIVIDUAL STUDY
1/2 teacher + 9 pupils Enclosed space	1 teacher + 4 pupils Semi-open space	3 pupils Semi-open space	1 pupil Open space

The learning space is divided into four categories, and each type of space corresponds to different learning behavior. At the same time, the number of pupils, scale, layout and openness are also changed.
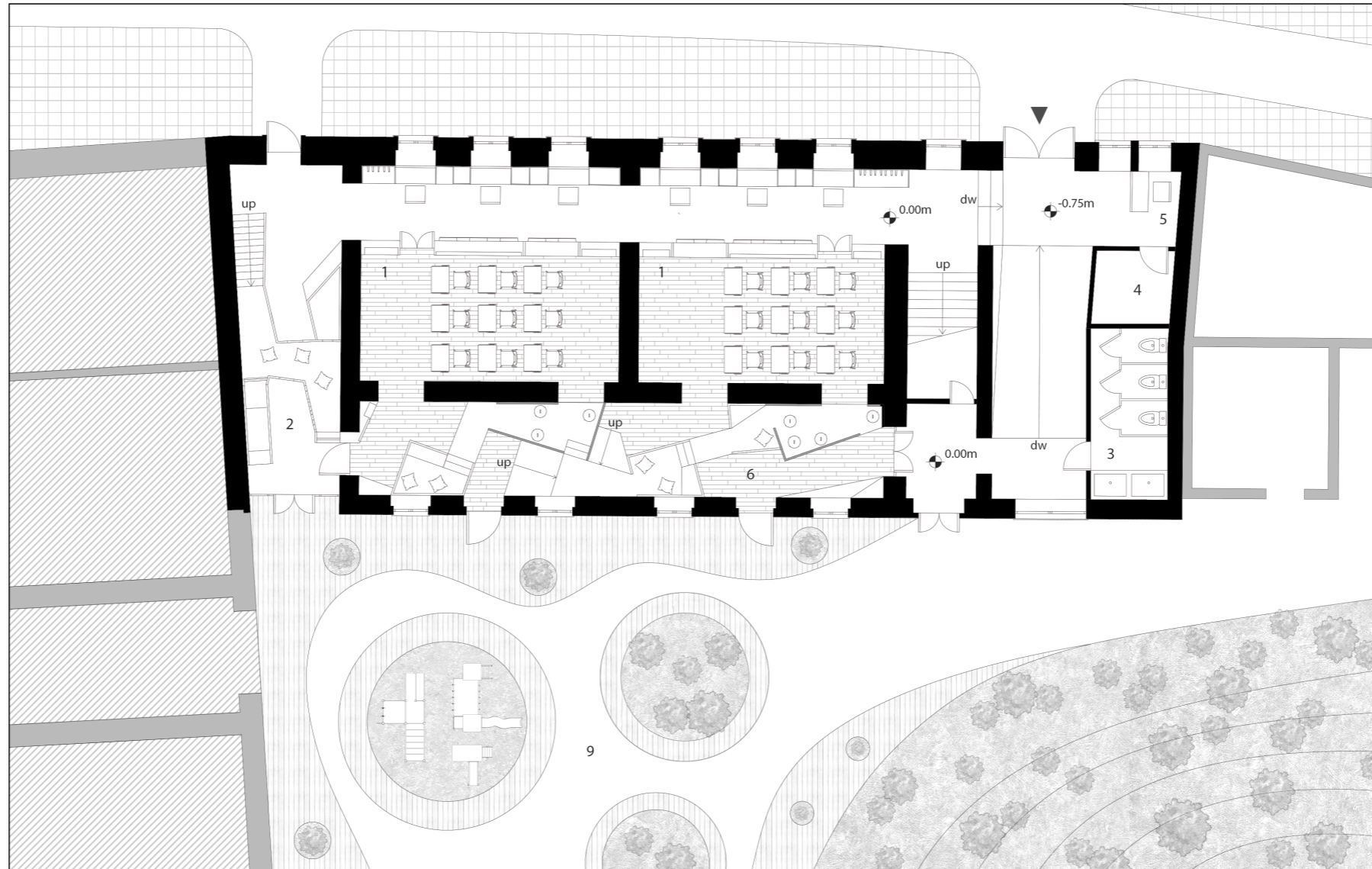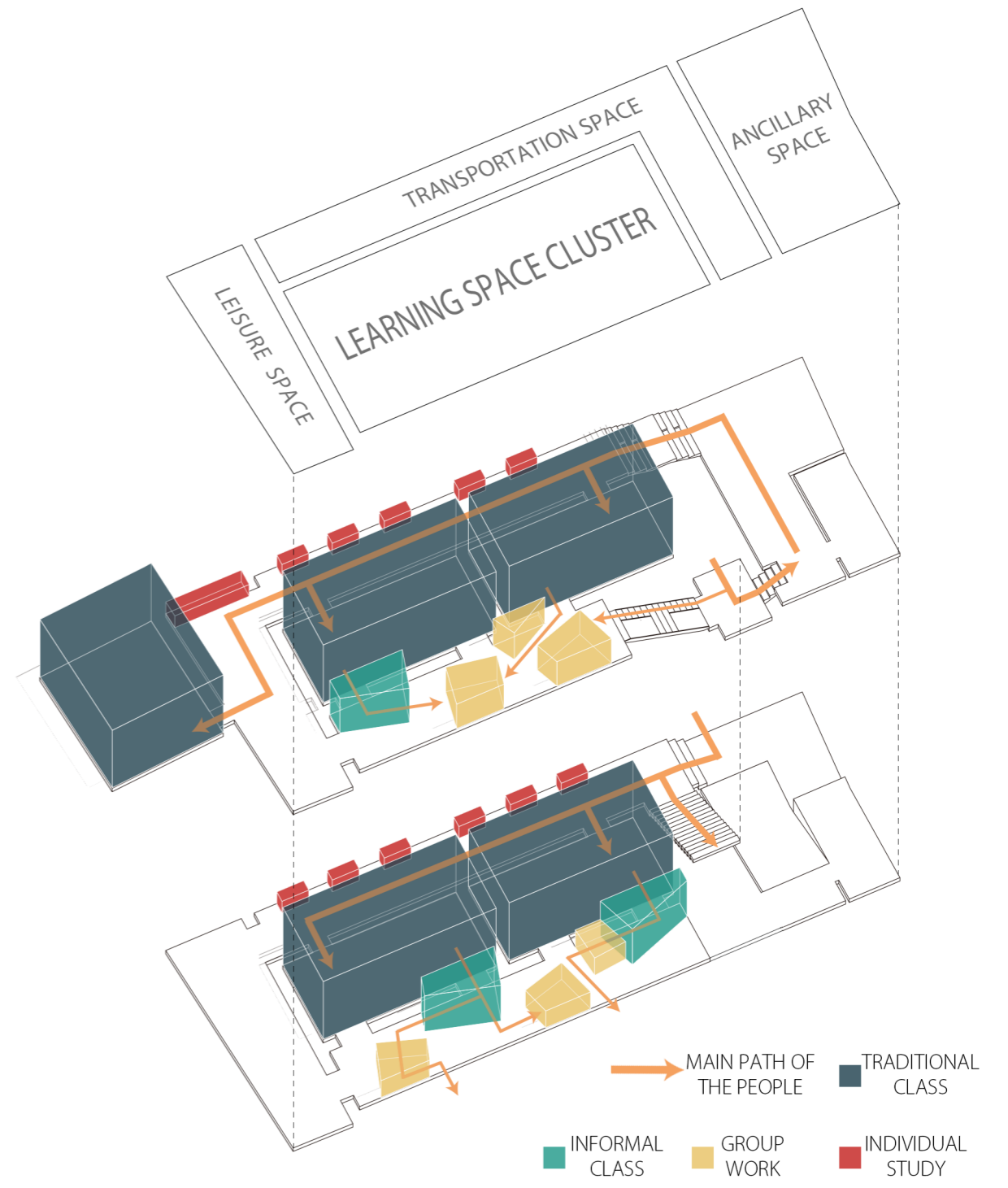
**GROUND FLOOR PLAN   1:125**
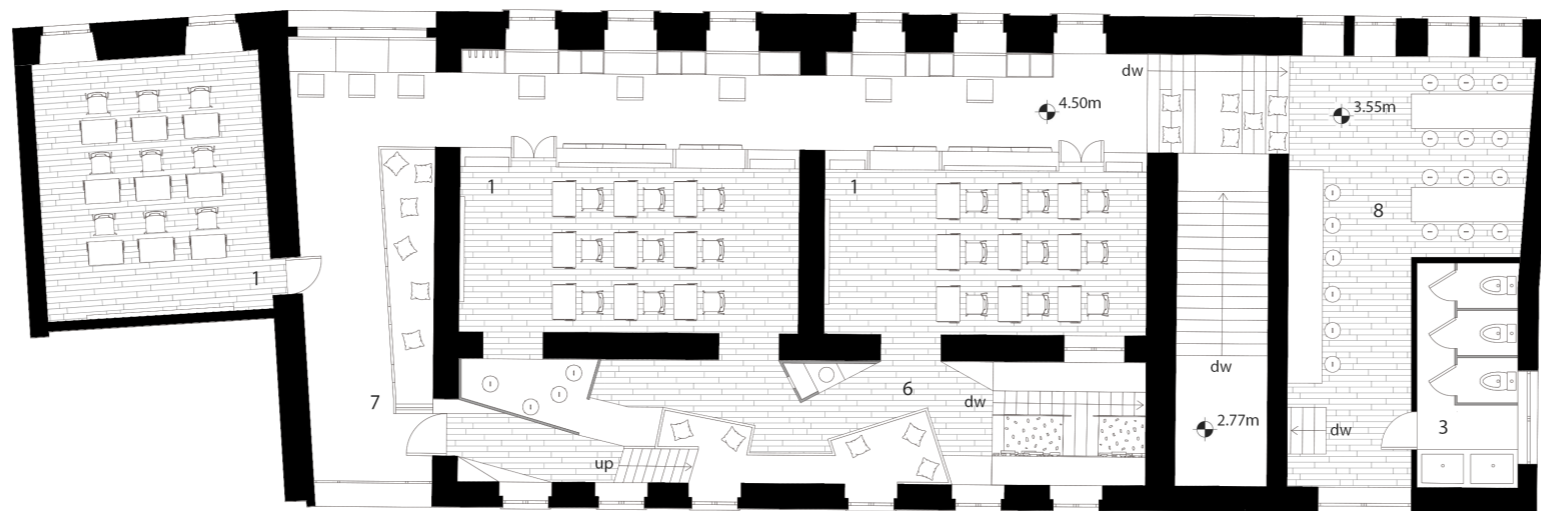
FIRST FLOOR PLAN   1:125

1. Traditional classroom
2. Play area
3. Toilet
4. Storage room
5. Reception
6. Common learning area
7. Reading corner
8. Canteen
9. Ourdoor activity area

LEISURE SPACE

TRANSPORTATION SPACE

ANCILLARY SPACE

LEARNING SPACE CLUSTER

MAIN PATH OF THE PEOPLE

TRADITIONAL CLASS

INFORMAL CLASS

GROUP WORK

INDIVIDUAL STUDY

CIRCULATION AND FUNCTIONS

In contrast, the traffic space is placed on the other side of the building, the original corridor is transformed into common space, forming a learning space cluster with the classroom. In this cluster, students and teachers can easily switch to different teaching and learning methods. The students can communicate more with rach other. A stair was added on the first floor, making the route more smooth. The traffic function of the original staircase was weakened, and the amusement function was added.
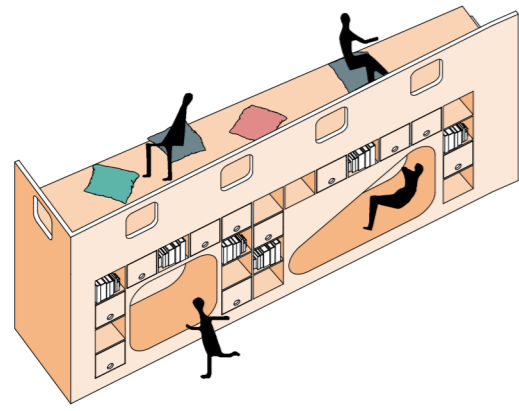
BOOKSHELF

Use the top space of the bookshelf to create more reading space.
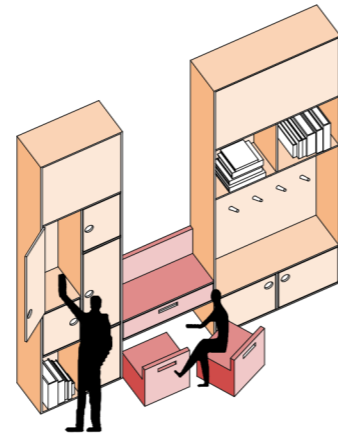
STORAGE

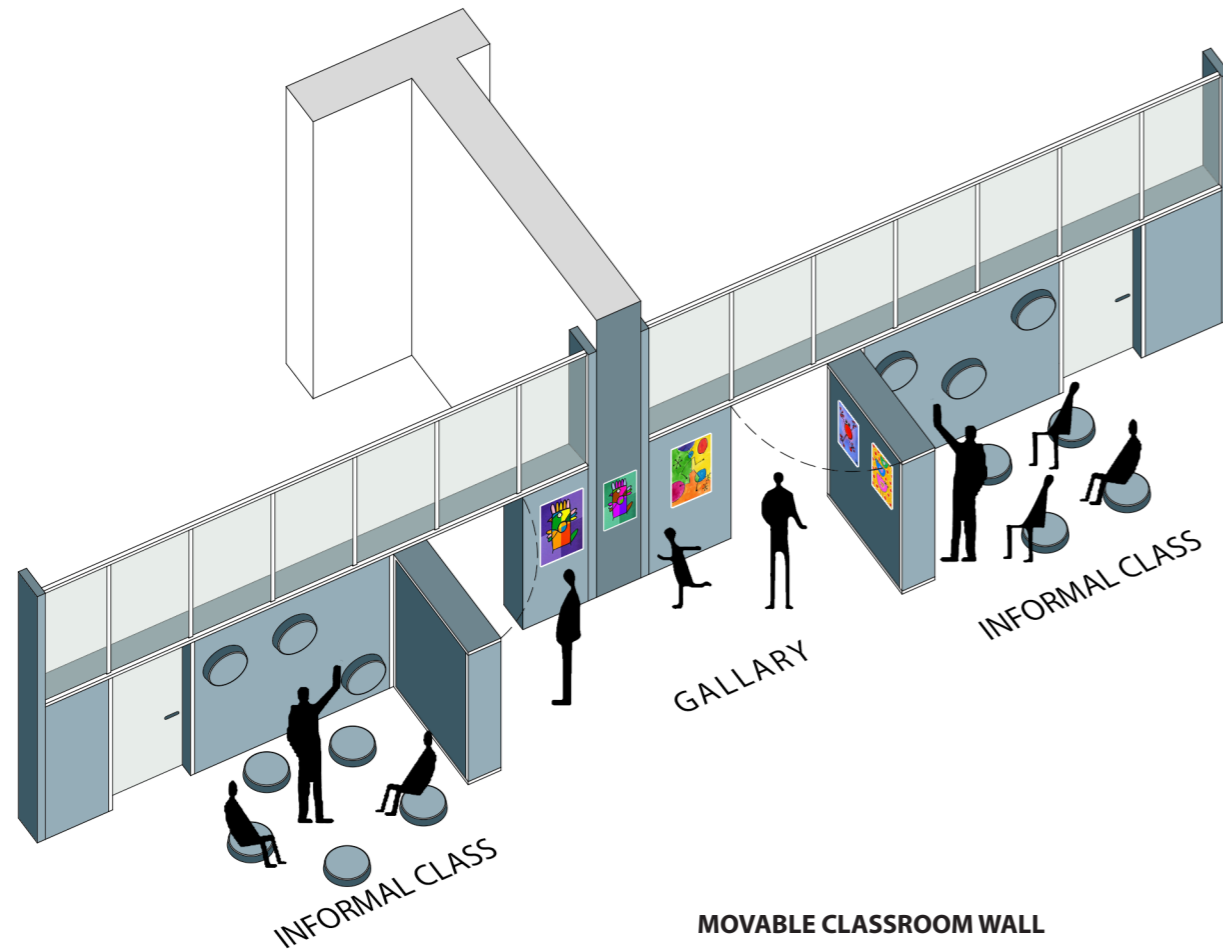The combination of storage space and learning desks. The chairs are movable.

GATHERING STAIRS

The rest platform allows pupils to stay, the cabinet creates more joyful experience.
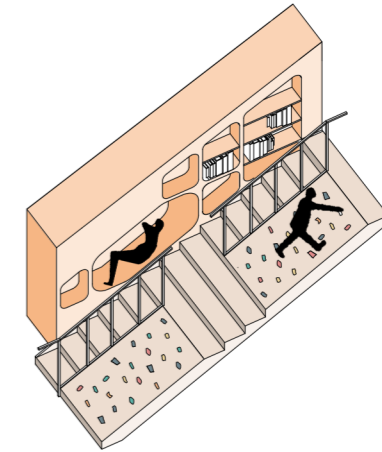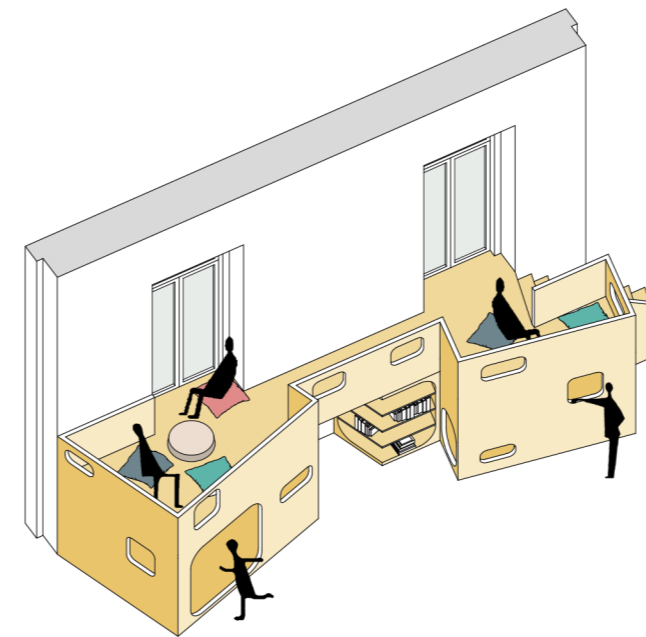

AMUSEMENT STAIRS

The combination of stairs and playfield, transportation function is weakened.

INFORMAL CLASS

GALLARY

INFORMAL CLASS

INFORMAL CLASS

MOVABLE CLASSROOM WALL

Some parts of the wall can be rotated, creating more small classrooms and gallery space when needed to meet the needs of occasional exhibitions. Cushions on the wall can also be used.

GROUP WORK SPACE

Use the height of the window sill to create more high and low spaces, providing group discussion functions. At the same time, more joyful.
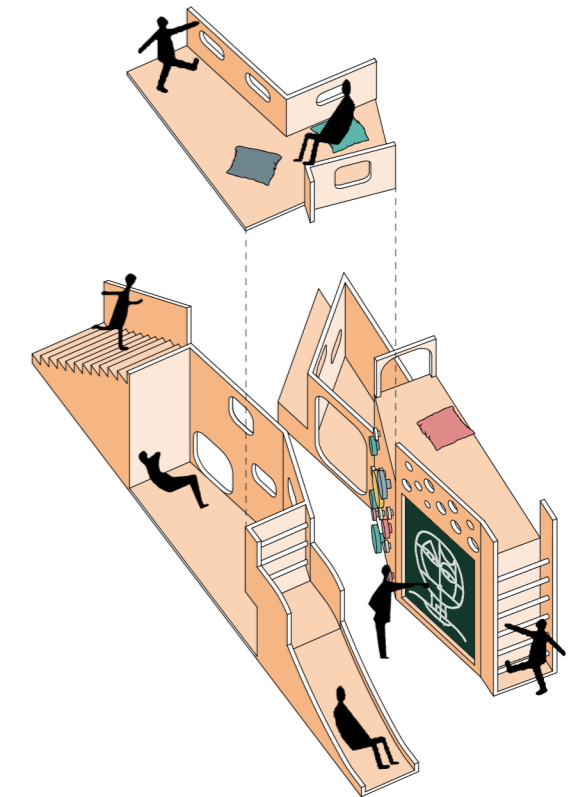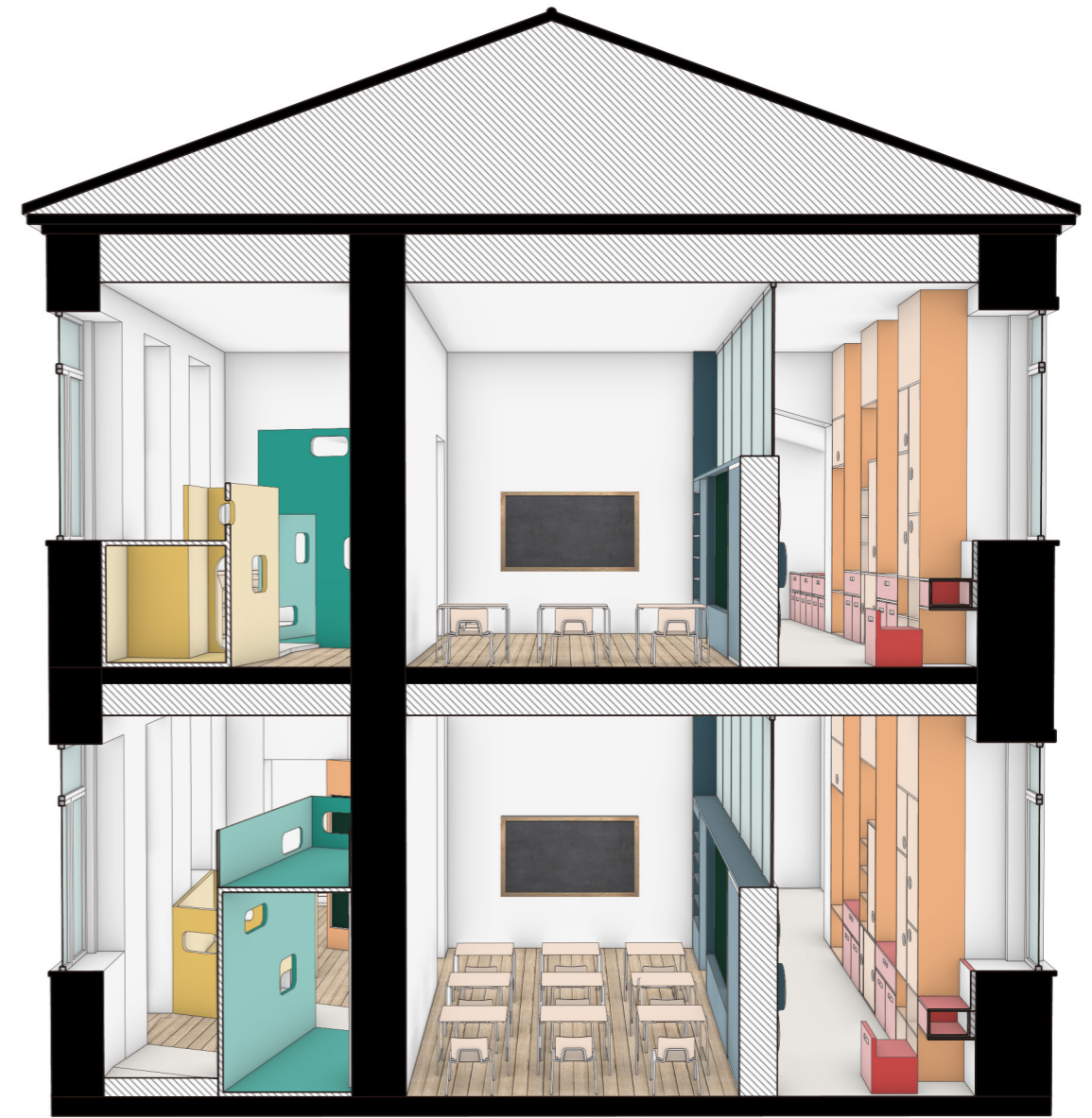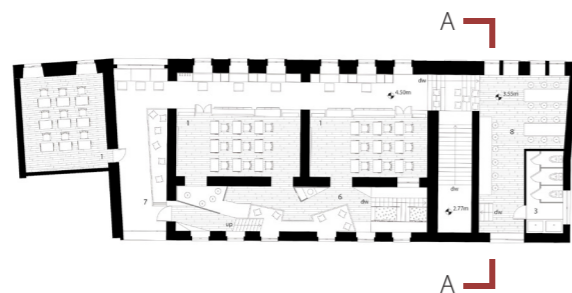

PLAYFIELD

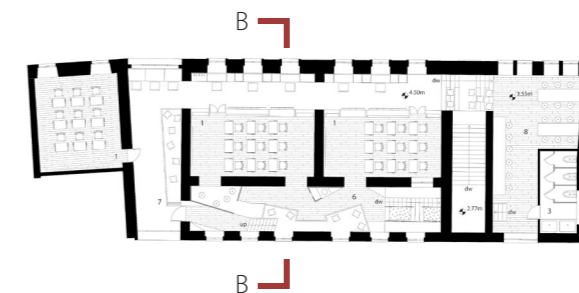Various spaces and joyful facilities create an interesting experience

SECTION A-A

SECTION B-B

Chapter 3

Conceptual Design and Practical Application