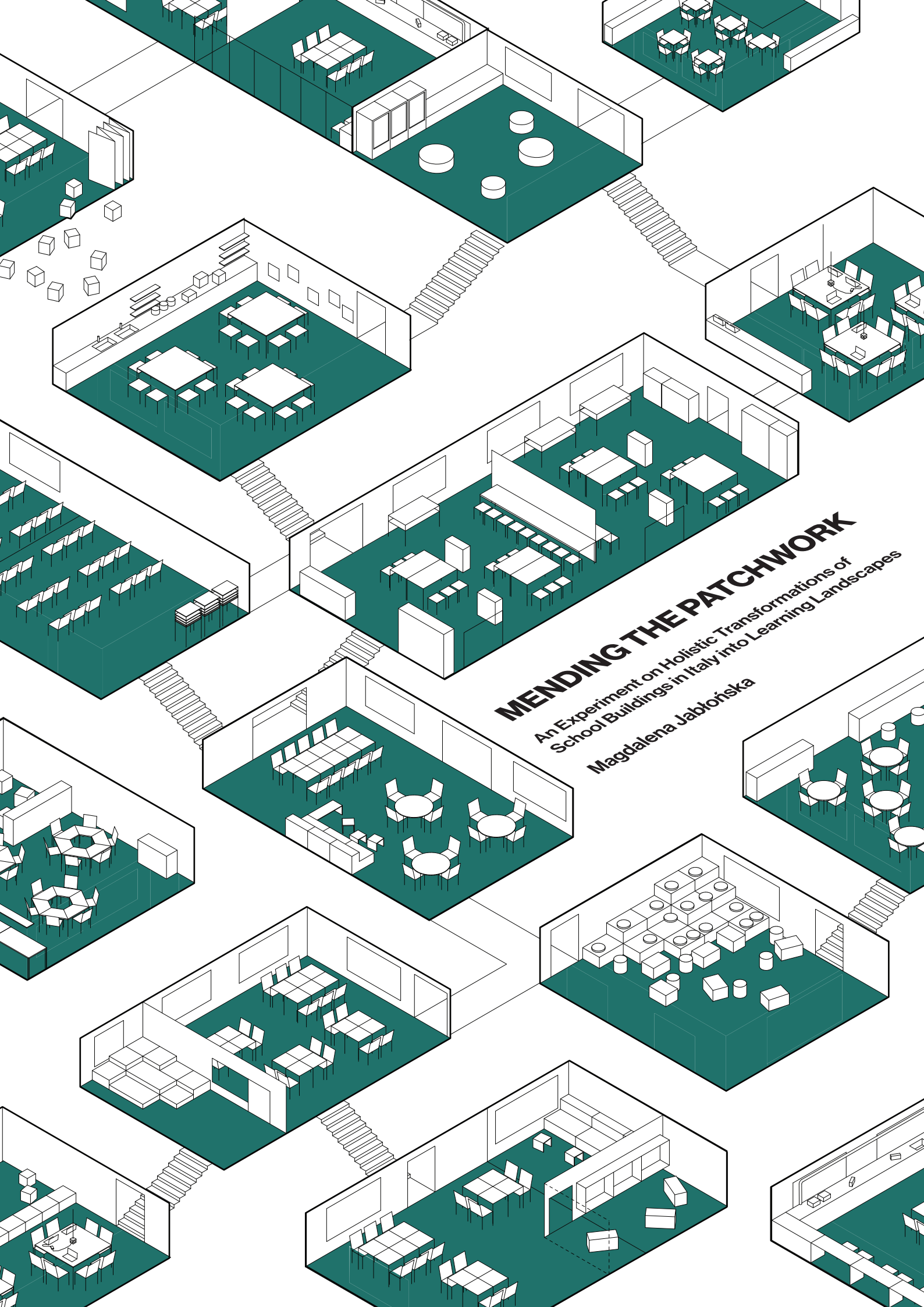

MENDING THE PATCHWORK

An Experiment on Holistic Transformations of School Buildings in Italy into Learning Landscapes

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Abstract

The innovations in learning approaches gaining popularity in recent years have brought the need for transformations in the school environment to accommodate new varieties of teaching methods based on active involvement and discovery. The traditional classroom model fails to support these new practices.

Many Italian school buildings were built during the 1960s and 1970s demographic boom and fail to accommodate these practices. Furthermore, the poor structural conditions and decreasing number of students demand transformations of the existing learning spaces. It is projected that between 2019 and 2030, the school population will decrease by 1 100 000 students, which corresponds to over 40 000 empty classrooms. This demographic shift is both a challenge and an opportunity, requiring a strategic adaptation of the resulting surplus in learning spaces.

Fragmented funding, dispersed responsibility and ownership are significant obstacles to coherently considering the school environment. They concentrate on resolving individual issues, and, as a result, learning spaces are “patched”, rather than holistically transformed. For instance, funding programmes may introduce new technologies to classrooms requiring renovations, without first reconsidering the teaching methods used in the space. Therefore, the school buildings may modernise, but do not improve in function. Furthermore, innovative policies for learning environments often overlook the existing infrastructure, and instead focus primarily on new facilities, despite the low demand for new infrastructure due to the demographic decline.

This thesis explores whether and how existing funding can lead to the holistic transformation of learning spaces in Italy into innovative learning environments. It analyses cases of transformations of school environments in Europe to understand effective strategies and processes for creating innovative learning spaces. Additionally, it proposes a strategy for two school buildings in Turin, designed to provide a framework for future transformations, rather than step-by-step instruction.

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Introduction

Over the past two decades, extensive research in pedagogy and knowledge acquisition has led to the development of innovative approaches to learning, prioritizing the value of active engagement of students, over passive listening. These new approaches highlight the value of a learning environment in the process of learning. They are not completely new, and Italy played a significant role in the development of alternative learning methodologies. Pedagogists like Maria Montessori, or Loris Malaguzzi created school models that emphasize the importance of discovery-based learning and the crucial role of the environment. However, despite these influences, the majority of Italian school buildings remain outdated, as the traditional lecture-based approach continues to dominate in educational spaces.
The learning environments are a relevant topic as they lie at the intersection of architecture and pedagogy. They should go beyond formal and functional aspects, integrating also pedagogical aspects, which have often been neglected due to the dominance of a traditional classroom model.
There can be noticed a major improvement in the new school building constructions, which are more flexible and address the needs of today's students better than the buildings from before. However, there is no significant change in the quality of the existing spaces. They are merely "patched" through temporary fixes, rather than undergoing holistic transformations. This is due to the way funding is allocated—typically aimed at addressing specific problems, rather than providing for comprehensive renovations, and the lack of a holistic strategy for the entire spaces.

The issue of innovative learning environments has been widely discussed, especially in the past 20 years. The literature review reveals a wide range of research on this topic within the European context. This includes rich insight from the Organisation for Economic Co-operation and Development (OECD), which has conducted extensive work in the field of technology and education through initiatives like the "Innovative Learning Environments" (ILE). The design principles and tools were described in the handbook called "The OECD Handbook for Innovative Learning Environments" (OECD 2017). Additionally, OECD has researched methods for integrating technology into learning spaces, as summarized in the article "OECD Work on Technology and Education: Innovative Learning Environments as an Integrating Framework", published in the European Journal of Education (Istance, and Kools, 2017).

In the Italian context, innovative ideas often draw from European research, which is adapted for use in the Italian educational system. It was explored in the book "Spazi educative e architetture scolastiche: linee e indirizzi internazionali " (Educational Spaces and School Architecture: International Guidelines and Directions) (Borri, 2016). The research led by INDIRE (a benchmark for educational research in Italy) led to the creation of the "1+4 Learning Spaces Model", which is a framework for creating innovative and multifunctional learning environments in the Italian context. The attempt to integrate technology is also present in the Italian context, as widely discussed in the book "Makers at School, Educational Robotics and Innovative Learning Environments" (Scaradozzi, David, Lorenzo Guasti, Margherita Di Stasio, Beatrice Miotti, Andrea Monteriù, and Paulo Blikstein, 2021).

The conditions of existing school facilities in Italy were thoroughly described in the book "Rapporto sull'Edilizia Scolastica ", published by Fondazione Giovanni Agnelli in 2019, which synthesises and elaborates data from ISTAT statistics. Additionally, "Ecoststema Scuola", an annual report published by Legambiente assesses the Italian school buildings in terms of structural condition, energy efficiency, and quality, describes the main funding programmes, and current issues and opportunities related to school Infrastructure. The funding programmes have been also presented in an online database elaborated and updated by INDIRE. Based on the reviewed sources, it appears that the existing buildings have high maintenance needs, and therefore, a considerable amount of funding is dedicated to address these needs a big part of the funding is allocated to address these issues.

The necessity to rethink existing learning spaces has been highlighted in publications such as: "Re-school"(Barioglio, 2021), "L'aula in discussione. L'occasione mancata delle norme per l'edilizia scolastica del 1956" (Campobenedetto). They discuss the necessity to create more active and innovative learning environments and to use the spaces more efficiently, considering the changes related to demographic changes and consequently decreased student population.
However, there is a noticeable imbalance between numerous publications focusing on innovative learning environments for new constructions and a smaller number of publications addressing transformations the existing buildings.

The thesis began as a collaboration with the staff of the Educational Institute Ugo Foscolo in Turin. The goal of the collaboration was to design several spaces for which the schools received funding from PNRR. I had the opportunity to observe the spaces of the primary and middle schools within the Institute and to watch how they are used during the breaks and the lessons. Additionally, I participated in a teachers' meeting where they discussed how to allocate the funding. This experience helped me to understand the needs and

problems of the space users and how the spaces are currently utilized.

The received fundings were dedicated to the renovation of the Tinkering Workshop and small interventions in the assembly hall and several classrooms. There were also plans to renovate the art workshops and the teachers' room in the near future. Additionally, the teachers were discussing the potential reorganization of the learning spaces according to the DADA model where spaces are assigned to subjects, rather than to specific classes.
It became evident that there are numerous spatial divisions, which make the space strongly fragmented and confusing. Therefore, it was impossible to efficiently plan the planned renovations without considering their relationship with the rest of the spaces. Consequently, the first step was creating a general framework for the spaces, according to which the spaces could be planned more specifically.

Alongside the project, the research was carried out. The initial phase focused on understanding the Italian context, including the history of the school infrastructure and the challenges that it faces today. This led to the exploration of the existing solutions and ideas for improvement, initially in the Italian context, and subsequently on the European scale. An important step in this analysis was the exploration of case studies of the transformations of school buildings in Europe, which aimed to extract lessons and best practices that could be applied to the learning environments in the Italian context.
The important part for understanding how the fundings are used and managed was the internship at the municipality of Turin, where I could be involved in the work, understand what kind of funding there are and how they are distributed among school buildings: how they are distributed, who initiates projects, what is the role of school staff and the municipalities. I could also visit many school buildings – and see how they are used and observe how the renovations are carried out and monitored, and be included in the maintenance projects to see from the inside how it works. I also had an opportunity to ask questions about their work and understand the entire process of distributing the funding.

The research was conducted by first analyzing the issues and then identifying real examples, using school buildings in Turin as a case study, since the designed school building is located there.
The study of existing learning spaces is divided into three parts. The first part describes transitions on a European scale, which serves as a starting point for the second part, which analyses transitions on the Italian scale. The final part explores how these transitions influenced school buildings, using structures in Turin as a case study.
The analysis of the funding programmes and the condition of existing structures was carried out on an Italian scale, leading to the identification of how these factors influenced learning spaces in Turin.
The exploration of innovative models for learning environments along with the outcomes from the case studies of innovative learning environments in Europe, has been incorporated into the project for the primary and middle school from the Educational Institute Ugo Foscolo.
The final part involved creating a strategy for implementing the project in the primary and middle schools. This was achieved by applying the insight learned from researching about the funding process to the project design for the school spaces. The strategy proposes a holistic approach to the learning spaces, emphasizing regular adjustments of the framework, to accommodate changing needs of the schools' communities.

The main objective of the thesis was to understand if long-term transformation into learning spaces based on innovative pedagogical methodologies is possible in a context characterized by scattered funding and dispersed ownership. By examining the historical and current state of Italian school infrastructure, the research aimed to identify the main challenges related to the building transformation process.
The research focuses on the Italian context, where a demographic decline is among the most significant in Europe. The shift in the number of students brings the necessity to reconsider the use of learning spaces. A majority of them were constructed during the 1960s and 1970s, a period of a demographic boom, and now require significant renovation due to their age. However, the current approach fails to provide satisfactory results due to the complicated process and fragmented ownership.

The first chapter explores the history and evolution of Italian school buildings to understand how the past reforms and societal changes influenced the current learning spaces. It identifies three main factors that shaped the spaces: quantitative need for more space, regulatory adjustment aiming to improve the security and quality of school spaces, and pedagogical strategies. It investigates how these three factors intersect. Finally, it explores how they influenced existing school buildings, by analyzing two educational institutes in Turin. It revealed that they often resulted in adding new elements to preexisting structures, which resulted in learning spaces that have lost readability and coherence.

This led to the research about the reasons behind the unreadable and "patched" school buildings. It became evident that the structural condition of learning spaces and high maintenance needs led to prioritizing these aspects over implementing innovative learning

practices in the learning spaces. Additionally, scattered responsibility and the complicated process of managing the resources make it complicated to transform school buildings in a cohesive and integrated way. This leads to the conclusion that the current funding strategies concentrate mainly on responding to immediate problems rather than developing long-term strategies. As a result, the school buildings seem to be a set of separate spaces that are “patched” together. Furthermore, this approach to school infrastructure fails to address the important systemic changes such as the demographic decline and the new pedagogical approaches. Therefore, learning spaces cannot effectively address the needs of today’s students.

The third chapter aims to explore innovative models for learning environments created for the Italian context that are rooted in understanding the effective ways of learning taking into consideration the Italian educational system. It focuses on two models created for learning spaces in Italy: the DADA model and the 1+4 Learning Spaces Model, exploring their potential and limitations. The DADA model organizes learning spaces by assigning subjects to specific spaces. It highlights the importance of space in the learning process and provides better-equipped and more personalized environments. The 1+4 Learning Spaces Model enhances the diversity of learning spaces and the importance of informal learning through five types of spaces: group learning spaces, exploration labs, agoras, informal areas, and individual areas. The chapter notes that innovative models are often implemented only in new buildings, neglecting the existing ones. It also explores whether the existing spaces are a challenge or an opportunity for the development of innovative learning environments.

The fourth chapter examines European examples of innovative learning environments created in existing school buildings. It analyzes the transformation process, including aspects related to project development and the construction phase, local community involvement in the process, duration of construction works, and whether the schools were operational during that time. The analysis uses the 1+4 Learning Spaces Model to examine the learning environments of the case studies, aiming to understand how similar types of spaces can be implemented in the Italian context. Additionally, the chapter analyzes strategies and priorities that guided these transformations.

The fifth chapter focuses on implementing the strategies for innovative learning environments and the analyzed models into existing educational spaces, using two school buildings in Turin as case studies. The project aims to create homogeneous learning environments by eliminating unnecessary divisions that have accumulated throughout the school’s history and improving connections between spaces. It also intends to include the local community in school life by integrating the civic center into the school space. It seeks to create a clear and holistic organization of interior and exterior spaces. The project is intended to serve as a framework for planning the use of future funding and is intended to be updated according to the changing needs of the school communities.

The sixth chapter provides practical strategies for implementing the changes in the analyzed buildings. It identifies key interventions, that affect other spaces and ought to be carried out in the right order, and a range of interventions applicable to other spaces, with a special focus on the repeatable parts of the buildings, such as classroom modules.

From the research it became evident that there is a gap between strategies for innovative learning environments and methodology for their implementation in existing structures, using available funding. Additionally, the research underscores the necessity of long-term planning strategies that address not only immediate problems but also consider broader changes and perspectives.

By examining these issues, the study aims to provide insight into transforming existing learning spaces to better meet the needs of today’s students.

Ch. 1

From production compartments to educational landscape

Introduction

This chapter explores the historical evolution of Italian school buildings to understand how past reforms and societal shifts have influenced the learning environments. It is performed on three different scales: the European scale, the Italian scale, and the building scale, focusing on examples from Turin.

At the European scale, the chapter contrasts two approaches to school architecture: the traditional model, which originated during the Industrial Revolution and still dominates school spaces today, and the concept of a school building as a "third teacher." This latter concept, although visible in educational spaces for a long time, has gained popularity in recent years.

On the Italian scale, the study identifies three primary factors that have shaped school spaces: the quantitative factor (the need to provide sufficient learning spaces), regulatory adjustments aimed at improving security and quality, and pedagogical strategies. It analyses how these three factors have intersected, and emphasizes the necessity for a balanced approach between the three aspects.

At the building scale, the chapter examines how these transitions have manifested in physical spaces, by analyzing examples of school buildings in Turin. It highlights the prevalence of spatial divisions and discusses the changes in space usage caused by shifts in the educational system, noting that these changes often result in the addition of new elements to existing structures. Consequently, many learning spaces lose coherence and start functioning as a set of fragmented pieces.

1.1. Is schoola factory?

Transitions on the Eurpoean scale

The history of obligatory education is a record of constant tension between the well-established traditional educational school model and innovative approaches to learning. Although the school institution seems to be closely related to the idea of progress, it often prevents and avoids innovation, under the guise of protecting well-established teaching methods. The school buildings are a vivid representation of the constant tension between tradition and innovation.

Classrooms, an inherent element of school spaces, have become a common subject of discussions and debates, on both professional and public platforms. A statement that school spaces need reconsideration, as they may not align with contemporary pedagogical approaches gains popularity, and new solutions for the educational spaces are proposed. The traditional classroom-corridor school layout, which dates back to the 19th century – the beginning of mass education – is often stated to be outdated and suggested to be replaced with an active learning environment, in which the space plays an important role in the educational process.

We can therefore see the transition from mass education, deriving from the factory model of schools, to an active approach, in which school is an important element in the education process.

1.1.1. Mass education, stamp-like classrooms

Cause
Revolution powered by steam engine

The Industrial Revolution transformed European cities and the lifestyles of their citizens. The steam engine was the heart of new, modern society, influencing the way people lived and worked. The accelerating progress and modernization brought some breakthrough changes, including universal free education. The school buildings, with proud monumental facades, emerged as the symbols of progress and modernity (Burke and Grosvenor 2008). However, providing basic education for everyone was a major challenge.

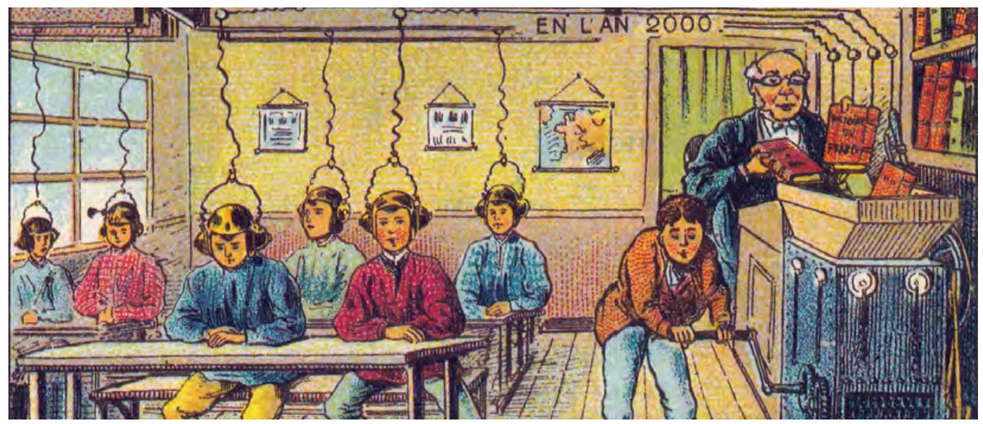
Space
The immortal model

In the 19th and 20th century, the main objective of education was to prepare students for their future jobs. The school system was designed to maximize the efficiency of this process, in a uniform, manufactory-like way; providing the same input for each student and expecting the same output (Mosa 2016). The manufacture model proved to be an efficient way to provide a large number of school spaces in a relatively short time. The students were divided into manufacture-like compartments distributed along corridors.

The school functioning as a factory “producing” future workers was illustrated by Jean-Marc Côté (1899), in his vision of school in the year 2000. Interestingly, his imagination was not entirely wrong. Since the 19th century, the “factory” model, with some minor improvements, has persisted as the dominant school layout. Often, it is still considered for a long time as the most natural and effective (Tosi 2019). The

Image 1. The vision of the school in 2000

Jean-Marc Côté's vision of school in 2000 drawn a hundred years earlier in 1901 (image in the Public Domain).



large overcrowded classrooms became smaller, better lit and ventilated, and blackboards were replaced with interactive whiteboards. The concept, however, remains the same: rows of students facing the front of the classroom, where, like on the stage, a teacher performs his or her presentation. The classroom functions as a background for the lesson, rather than an important element.

Reconsiderations
Is school a factory?

The school is commonly said to fail at preparing the students for the challenges of the current job market, which is changing faster than ever before. It prioritizes knowledge, over skills, such as collaboration, problem-solving, or practical competencies, as the identical lecture-based classrooms do not provide space for discussions, group work, and other types of activities (Biondi 2018).

The critical approach to the existing school institution and its infrastructure is not a novelty. For over a century, pedagogists like Maria Montessori, A.S. Neill, Loris Malaguzzi, etc., have been proposing alternative models, questioning the mainstream organization. However, the last two decades have been a particularly important period in terms of rethinking the relationship between pedagogy and architecture. The research from the last twenty years has led to a critical evaluation of the conventional classroom model, revealing its inadequacy for the new pedagogical approaches and changing requirements of society (Mosa 2016).

1.1.2. School Building as a "Third Teacher"

Cause
School space – more than a background

The classroom, whose importance was considered only as a background for school activities, at the beginning of the 21st century started to be recognized as an important aspect in the knowledge acquisition process – or, in the words of Loris Malaguzzi, it has become a "third teacher." Additionally, collaboration between peers, representing the "second teacher", has gained importance. This shift in the role of school buildings resulted in increased research about the relation between pedagogy and the design of learning spaces. The reflections on this relationship highlight the importance of the flexibility of spaces and their adaptability to changing curriculum and learning methodologies (Tosi 2019).

Space
Active learning environment

Unlike in traditional school buildings, where the users have to adapt to existing space, the innovative environment should meet specific needs of each school community. Additionally, the design process needs to be carried out in collaboration with the users of the space and readjusted to their changing needs. Therefore, a school building is not considered anymore as a static and unchanging structure, but rather as an active environment – a part of the learning process, adjustable to the changing needs of its users.

CELE
Exchange, Centre for Effective Learning Environments

The first action on an international scale for the rethinking of educational spaces according to pedagogical concepts was the establishment of the Centre for Effective Learning Environments (CELE), in 2005. The institution has been focusing on understanding the interrelation between space, learning processes and educational objectives, and providing guidelines and solutions for the design and organization of educational spaces (Tosi 2019).(Kuuskorpi and Cabellos González 2011). Importantly, CELE has been collaborating with national governments, who have been involved in promoting and carrying out modernization of school spaces. Shortly after, numerous programmes on a national and European scale were established, focusing on various aspects of the learning environments, such as classroom spaces, implementation of new technologies, etc. (Tosi 2019).

Reconsiderations
What about existing spaces?

Since then, there has been a major step forward from presenting ideas and visions for school spaces to proposing ways of their implementation. However, a majority of the programmes are still more focused on the new constructions,

providing limited practical guidelines for the implementation of these ideas in the existing buildings. These considerations are crucial because due to the demographic decrease in most European countries, there is a limited demand for new school buildings.

1.1.3. A gap between ideas and reality

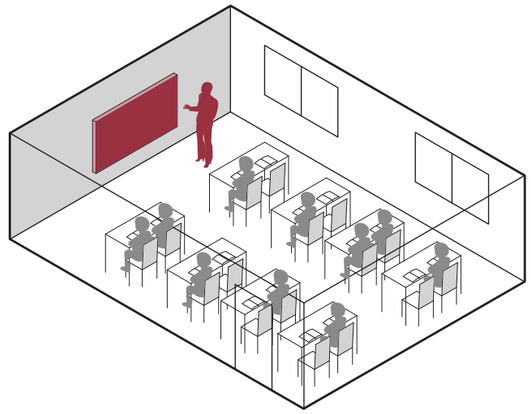
The role of teachers in learning process and the rapid advancement and widespread of technology have resulted in an urgent need to transform the learning spaces' model from a traditional one, into a more dynamic "teaching space" model (Kuuskorpi and Cabellos González 2011). These two approaches have been compared in the OECD's publication, which focuses on the requirements of the learning environmnts of the future (Graphic 1). The aim of the "teaching space" is to engage students in the learning process by providing a flexible, dynamic setting, which can be adjusted according to context and variable needs, as well as to diverse pedagogical approaches.

> *Despite the recent changes in pedagogy and the widespread use of information technology inside classrooms and school spaces, the physical learning environment has not yet changed in keeping with this evolution.*

Although the vision of the future learning spaces is clear, the shift of approach is not sufficiently visible in most learning spaces. As the publication highlights: "despite the recent changes in pedagogy and the widespread use of information technology inside classrooms and school spaces, the physical learning environment has not yet changed in keeping with this evolution." (Kuuskorpi and Cabellos González 2011, 2). Therefore, it is essential to investigate not only the needs of the students but also the way to make it feasible to accommodate the innovative approaches into the existing spaces, considering the variables of each geographical and social context (Dudek 2000). The following chapters aim to focus on this issue, taking into consideration the Italian context.

Graphic 1. The comparison of a traditional classroom and a dynamic learning space

elaborated by the author. Kuuskorpi, Marko, and Nuria Cabellos González. The future of the physical learning environment: School facilities that support the user. Paris: OECD Publishing, 2011.



CLASSROOM SPACE

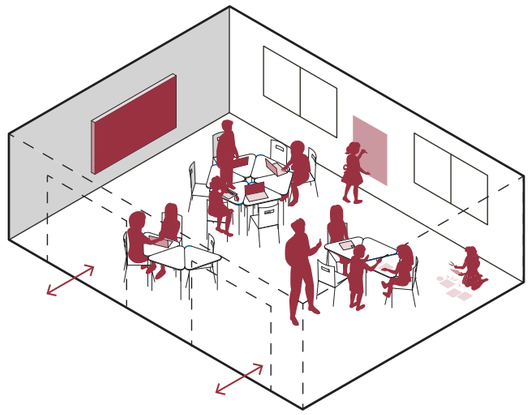
static space

permanent furniture solutions

content-driven work methods

technology confined to specific area

emphasis on individual work



TEACHING SPACE

static space

permanent furniture solutions

content-driven work methods

technology confined to specific area

emphasis on individual work

1.2. The overlapping objectives

Transitions on the Italian scale

When we deal with buildings, we deal with decisions taken long ago for remote reasons.

Brand 1994

This observation underlines the importance of understanding the historical context of the school buildings. Their shape and state of conservation has been strongly influenced by socila movements, political approaches and large-scale transitions.
This paragraph focuses on the history of the development of the Italian public school infrastructre trying to understand the logic behind them and the reasons for their shape. It is a crucial element in any conversation about the future of the existing structures.

1.2.1. Education for everyone

The introduction of obligatory education and the unification of Italy revealed a significant disparity in the level of development between the North and the South. Piedmont, Liguria, and to some extent Lombardia-Veneto and Toscany had already a decent network of primary schools, whereas the rest of the country was far behind in terms of the development of educational infrastructure. As shown in Graphic 2, access to elementary education in Northern Italy remained much better than in the rest of the country, even a long time after the Unification. It was partially caused by the insufficient fundings for school buildings, and partially by policies favouring the richer regions (Isabella 1965, 3-18). Initially, municipalities were responsible for their financing, which was a huge challenge for many of them, especially in the South. At the national scale, only 40% of children between the ages of 6 and 10 attended elementary school right after the Unification, and illiteracy levels remained high for the next decades, and the disparity in the number of classrooms among regions did not change much for decades.

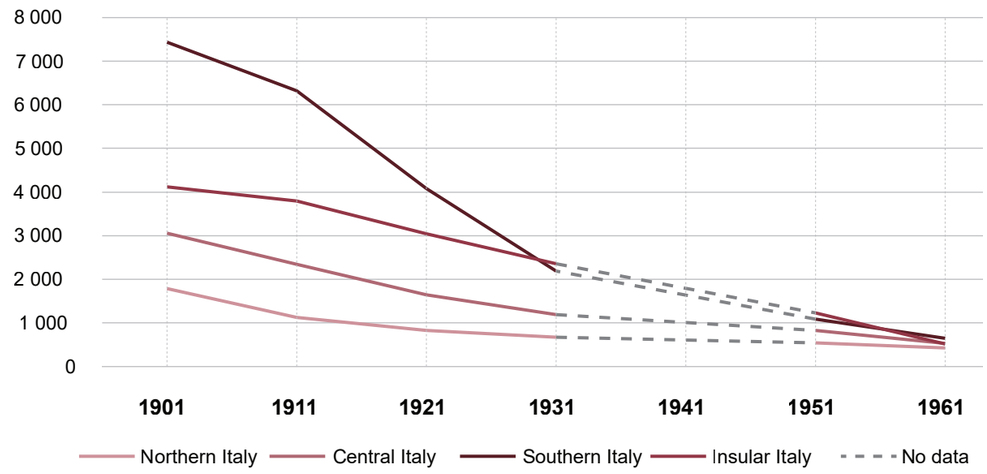
The school population kept increasing, especially after introducing the Orlando Law in 1904. It extended compulsory education to the age of 12. Within six years, from 1901 to 1907, the school population increased by 50% – from 2.5 million to 3.7 million (Sommario Di Statistiche Storiche 1861-2010 2011, 339-398). For a long time, the efforts were concentrated on satisfying this growing need for places at schools. In 1906 a law was introduced, providing the fundings for the school construction in the South. The state's responsibility for the school buildings was gradually increasing, which had a positive impact on the availability of education. In 1911, the Daneo-Credaro law brought about a major change in this field: primary schools, except those in big cities, started to be managed by the State. The aim was to ensure elementary education, especially in poor municipalities, until their budget was able to provide the school infrastructure. The strive to provide more classrooms between 1911 and 1921

1904 – Orlando Law
extending compulsory education to the age of 12

1911 – Daneo-Credaro Law
primary schools start to be managed by the State

Graphic 2. Number of residents per primary school classroom across the regions

elaborated by the author. Isabella, Ferdinando. 1965. L'edilizia Scolastica in Italia. Firenze: La Nuova Italia Editrice.



was a milestone in the history of school buildings. During that time, around 9000 classrooms were built, which almost doubled their number (Isabella 1965, 19-31). The school buildings were slowly becoming more uniformly distributed throughout the country, although the prevalence of the North was still evident.

1949, 1954
financing programmes for the constructions of school buildings

The time after World War II brought revolutionary changes in the educational landscape in Italy. Due to the demographic boom and thenecessity to rebuild the buildings destroyed in the war, the need for educational infrastructure was bigger than ever before. The next fifteen years were a time of strive to satisfy the growing need for places in schools. After the reform introducing the unified middle school (Scuola Media Unica), the need increased even more. To satisfy it, two financing programmes for the construction of school buildings were established – in 1949 and in 1954, resulting in uniform distribution of the new infrastructure across the country. The Italian landscape of that time was full of construction sites. It was planned to build facilities for 515 000 students but the real demand was even higher (1 770 000 places) (Fondazione Giovanni Agnelli 2019, 76-81). They were intended to be fast in construction and cheap, therefore the strive for better quality and pedagogical aspects and experiments were not significant during this period.

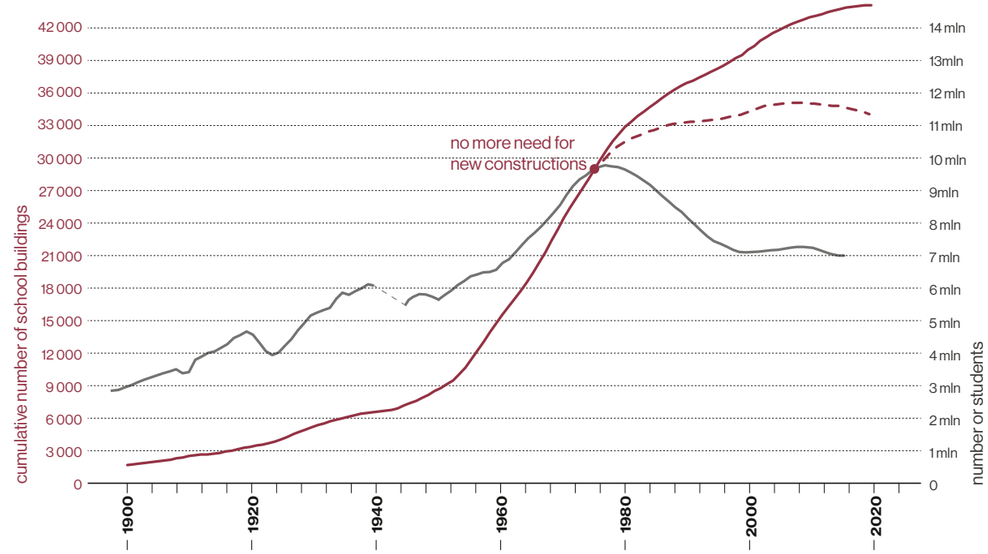
1968,1971
the laws introducing public kindergartens and necessity for more full-time primary schools

The state attempted to make free education even more available than before. The laws from 1968 and 1971, introducing public kindergartens and the necessity for more full-time primary schools, closer to students' homes also reinforced the need for additional school facilities.
The responsibility for school buildings was centralized, and the State had control over all public school buildings. (Fondazione Giovanni Agnelli 2019, 82-83).

Tremendous needs required radical decisions. A solution popular in many cities was to create repeatable models for school buildings, which would be built in several places. Furthermore, extending the use of prefabrication of structures allowed to decrease the time of construction even more (Isabella 1956). Their short construction time and relatively low cost made them so widespread that they remain an important element of the educational landscape even today. The demographic boom continued until the 1970s and the need for new schools remained high. Around the mid-1970s, the number of students started to decrease and it has been decreasing ever since. Consequently, demand for new

around 1970
peak of the demographic boom

Graphic 3. Cumulative number of constructed schools
elaborated by the author. Fondazione Giovanni Agnelli. 2019. Rapporto sull'Edilizia Scolastica. Bari-Roma: Laterza & Figli., Istituto nazionale di statistica. 2010. L'Italia in 150 anni: Sommario di statistiche storiche 1861-2010, 339-398. Rome.



construction, has not been as significant, as it was before. Graphic 3 shows the cumulative number of schools built since 1900 in relation to the number of students. Supposing that the average school building hosts 400 students, we can come to the conclusion that the need for new construction was satisfied around 1975. Since then, the additional area (the area surpassing the needs of minimum surface per student) has been increasing. Even if we consider that since 1975 every year 200 school buildings each year have been destroyed or have changed their function, around 30% of school area is redundant and can be used to enrich educational offer of the schools.
We are far from the times when hundreds of new school buildings were built each year. Looking at the recent years, we can come to the conclusion that Italy is again facing a crisis regarding school buildings. This time, it is caused by the demographic decrease and public finance constrain. Demographically, Italy is facing a decline in birth rates, resulting in a decreasing number of new students. This dynamic brings significant changes to the utilization of existing school buildings and the necessity to rethink how to use excessive space within school buildings.

1.2.2. Strive for quality

The quality of school structures notably varies among the present school builidngs. This irregularity is strongly related to the age of the buildings.

The oldest facilities can be found mainly in the northern part of the country, especially in the big cities. Their condition is also significantly better than the ones in the South from the same period. The obligation of providing educational network, introduced after the Unification, was a challenge for many municipalities. The schools were often organized in makeshift facilities, convents, barracks, and other structures adapted for schools (Fondazione Giovanni Agnelli 2019). In the North, the situation was better, although classrooms were often overcrowded, often accommodating 70 students or more (Image 2).

1879
first technical regulations for school buildings

The first general regulations for the school buildings date back to 1879. The technical regulations for the construction and furniture of school buildings were directed only to the municipalities (Deambrosis and De Magistris 2018).

The beginning of the 20th century was a time of experiments in the field of education. Although they were rather small-scale and did not revolutionize the public school buildings, some improvements were made. The spaces gradually be-

Image 2. Classroom in Volano, around 1930

"1 – Copia Di Scolari Classe 1925, in Fondo Don Angeli E M.O Collini (Prima Fila in Centro Sergio Zuco – 2. Ragazze, Prima a Destra Seduta Maria Furl." TELEVIGNOLE. Accessed July 11, 2024. https://www.televignole.it/diario-di-scuola-diario-di-guerra/1-copia-di-scolari-classe-1925-in-fondo-don-angeli-e-m-o-collini-prima-fila-in-centro-sergio-zuco-2-ragazze-prima-a-destra-seduta-maria-furl/.

came brighter and more spacious, as efforts were made to provide healthier learning conditions. Additionally, new construction materials were slowly introduced, especially reinforced concrete (Fondazione Giovanni Agnelli 2019, 68-75).

1925
guidelines determining paramers of school buildings

For a long time, there were no guidelines determining the parameters of school buildings, such as size or necessary facilities. The first guidelines of that kind appeared in 1925. They specified that each school building should contain 10 to 30 classrooms, adequate toilet facilities, at least one gym with changing rooms and a covered swimming pool, a medical room, a library, a canteen, etc. (Isabella 1965, 3-18). The designers started also to prioritize providing better daylight, ventilation, and better connection to the exterior (Deambrosis and De Magistris 2018).

The further development of quality requirements was overshadowed by the necessity to build more and cheaper to satisfy the growing needs for new educational facilities. During that time, some innovative concepts appeared, such as modular structures that would permit adding more classrooms if additional space for the students was needed. However, they were not widely discussed due to more urgent needs and limited budget. During this period, new building techniques were also introduced on a bigger scale, especially innovative ways of using reinforced concrete (Giannetti 2016).

Cheap and low-quality materials resulted in poor thermal and acoustic characteristics of the buildings, which are still common for many school facilities from that time.

Designers were in search of solutions that would satisfy the growing need for educational spaces and provide decent quality. The repeatable models seemed promising, as they allowed partial prefabrication, to guarantee fast construction and lower costs. It turned out to be a two-edged solution. As intended, many constructions were possible in short time. However, many problems regarding the state of conservation started to appear soon after their construction, due to the use of poor-quality materials – innovative, yet not properly tested (such as aluminum window frames or synthetic and plastic finishing panels). Repeating one model in different places was also problematic, as the design did not take into consideration local characteristics and cardinal directions (Fondazione Giovanni Agnelli 2019, 79-81).

1975, 1977
standards for thermal and energy performance, new safety regulations for public buildings

The years after 1975 were a time of renewal of regulations and a strive to adapt school buildings to those regulations. It marked the end of the demographic peak and the urgency to build more and more school facilities. A crucial factor resulting in changes in school buildings were the laws introduced in 1975 (and 1977) – standards for thermal and energy performance, as well as new safety regulations for public buildings. The huge discrepancy between the high standards and existing school structures resulted in a chaotic rush to make buildings compliant, which continued even in the 1990s. This was a strong shift from a quantity-centered to a performance-centered approach. The interventions in order to achieve regulatory compliance in many cases were often made the cheapest and the easiest way, ignoring practical and, in many cases, pedagogical point of view (Barioglio and Campobenedetto 2022, 9-13).

1990s
regulations for the security in public buildings

Th the 1990s, with the end of the expansion of school buildings, another technical regulation was introduced, aiming at increasing security in public buildings, including schools. It allowed to increase fire and seismic security, but also forced many compromises, such as adding multiple divisions, exclusion some spaces from use, addition of evacuation doors in corridors, evacuation staircases attached to the external walls, and so on.

Indagine Conoscitiva sull'edilizia scolastica in Italia
Camera dei deputati

In recent years, a document highlighting problems related to school buildings in Italy was created, highlighting issues such as the old age of the buildings, lack of uniform governance, and episodic and fragmented fundings. Steps to solve those issues have been undertaken, but they have had a marginal effect on the overall quality of school buildings and issues related to their age and history, as 60% of all school buildings open today were built before 1975. This percentage is even higher in the northern regions, especially Piedmont and Liguria. The new buildings, designed after 2000 prioritize energy efficiency and use of innovative sustainable materials. (VII Camera Dei Deputati 2017). However, the need for new constructions is still low. Therefore, the renovation of existing buildings is crucial to improve their general condition in Italy.

1.2.3. Learning at the center

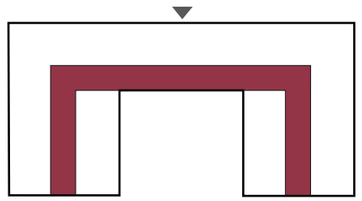
The transformations of school buildings have been usually focused on satisfying quantitative needs for educational facilities or on improving structural quality, energy efficiency, and safety. The aim of improving the quality of learning spaces from a pedagogical point of view seems to be the least urgent, therefore has often been marginalized. Comparing the quality of learning spaces is also challenging, as there is no direct parameter that would show the progress. Nonetheless, this factor has a tremendous impact on the schools and on the students.

The first school buildings in unified Italy were mostly situated in the cities. The classrooms were the central parts of the facilities and they were based on concepts of order, surveillance, discipline, and competition (Markus 1993). Thet were organized in order to facilitate a rigorous way of learning: based on knowledge transmission from a professor to students. Therefore, a densely packed classroom with elevated "cathedra"(teacher's platform) was the suitable

Graphic 4. Comparison of the school plans

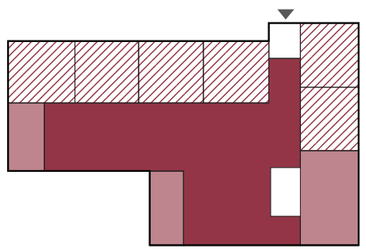
elaborated by the author. Fondazione Giovanni Agnelli. 2019. Rapporto sull'Edilizia Scolastica. Bari-Roma: Laterza & Figli., Barioglio, Caterina, and Daniele Campobenedetto. 2022. "L'infrastruttura della città. Il sistema ell'edilizia scolastica a Torino attraverso i suoi modelli." Rome: Lettera Ventidue Edizioni.

Istituto Comprensivo Statale Niccolò Tommaseo in Turin, ground floor plan



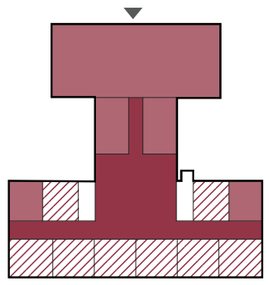
year of construction: 1874
- long, narrow corridors
- classrooms – the main element
- monumental, favouring discipline and chierarchy

school in Strada Bertolla 50, ground floor plan



year of construction: 1960
- innovative approach to circulation areas
- large common spacer

Don Milani School in Turin, ground floor plan



years of construction: 1968-1970
- repeatable model (2 cases)
- big circulation area
- ground floor open for the local community

circulation
services
classrooms

solution to achieve this goal. The monumental facades were emphasizing the importance of national educational institutions and the classrooms, situated along corridors, were the most important elements of the school, as shown in the first example of Graphic 4 (Fondazione Giovanni Agnelli 2019, 54-59).

However, even at the beginning of the 20th century, the first reconsiderations about the didactical aspects of the schools started to appear. The first pedagogical experiments in Italian schools appeared at the beginning of the 20th century. Maria Montessori challenged traditional school organization in Italy, which also influenced school typologies. Diversified spaces were created to enhance a more active learning approach. However, these experiments did not significantly impact public schools of that period. Nevertheless, the school spaces were gradually becoming less strict and rigorous and more pleasant. In the late 1920s, the first international conferences about the new didactical concepts started to be organized, introducing the idea of the active school and hypotheses about the development of children's psychology and its influence on educational buildings (Deambrosis and De Magistris 2018).

The rules specified that each school building should contain 10 to 30 classrooms, adequate toilet facilities, at least one gym with changing rooms and a covered swimming pool, a medical room, a library, a canteen, etc. The school buildings started to be more uniformly distributed throughout the country, although the prevalence of the North was still evident during that period. Physical activity started to play an important role in education.

After World War II, the necessity for new school facilities resulted in a cultural movement of redefining the characteristics of schools and the relationship between architecture and pedagogy. The need for new school buildings enabled some experiments, which resulted in innovative educational spaces, especially in terms of distribution and common areas. They were appearing more and more frequently and they started to remain open after school hours for local communities. Fondazione Giovanni Agnelli 2019, 76-83). For the first time on that scale, schools started to work like an organism, rather than a set of separate environments. The classrooms were no more a central element, but rather one of many components, organized around a big common space – playing a crucial role for the school community. One of the first examples, of such experiments is the primary school in Strada Bertolla 50, in Turin, visible in Graphic 4. The classrooms, still organized in a line, are opening to a spacious common area, which can accommodate various collective activities for students and for the local community (Barioglio and Campobenedetto 2022).

In the 1960s, the school buildings became an important place for participation, open to the local community, and suitable for various activities, including concerts, discussions, etc. The facilities from that time used to have big, recognizable entrances and a relatively open ground floor, like in Don Milani School in Turin (Graphic 4).

The concept of an open school was progressively abandoned in the following decades due to safety issues and the costs generated by keeping schools open for a longer time. The experiments were gradually losing popularity, in favour of repeatable models, gaining popularity at this time. The plans became more pragmatic and cost-efficient. The strive to improve the condition of the structures overshadowed the pedagogical aspects of school buildings in the 1970s. The adjustments in many cases complexified the initial structures and resulted in fragmenting the "organism" into separate spaces. Despite this fact, the need to create

a homogeneous educational environment, or an "architectural organism", was still highlighted, with the need to create diversified, flexible spaces. (Barioglio and Campobenedetto 2022, 9-13)

Between 1999 and 2001, the autonomy of schools on an administrative, didactical, and organizational level was introduced, opening up new possibilities to rethink educational spaces for school communities.

2012
conference "Space Can Teach"

Even more attention to pedagogical aspects of the learning environments started to appear in the discussions about school spaces at the conference "Space Can Teach", organized in 2012 by the Ministry of Education in Italy. It aimed to highlight introducing new pedagogical methods to the school spaces, such as abandoning lecture-based classrooms and making an environment more interactive. Soon after, in 2013, new technical regulations for school buildings were introduced, focusing on the connection between architecture and pedagogy in the school buildings (Borri 2018).

2013
technical regulations focusing on the connection between architecture and pedagogy

The need to create a homogeneous educational landscape in a recurring topic in the discussions and regulations, almost since the beginning of obligatory education. Nonetheless, it has often been relegated to the background, as the attention was focused on other aspects, such as security, or quantity. Nowadays, it appears to be more possible than before to take actions in order to make a real change in this aspect. However, the existing school spaces are out of the most important debates considering innovative educational environments.

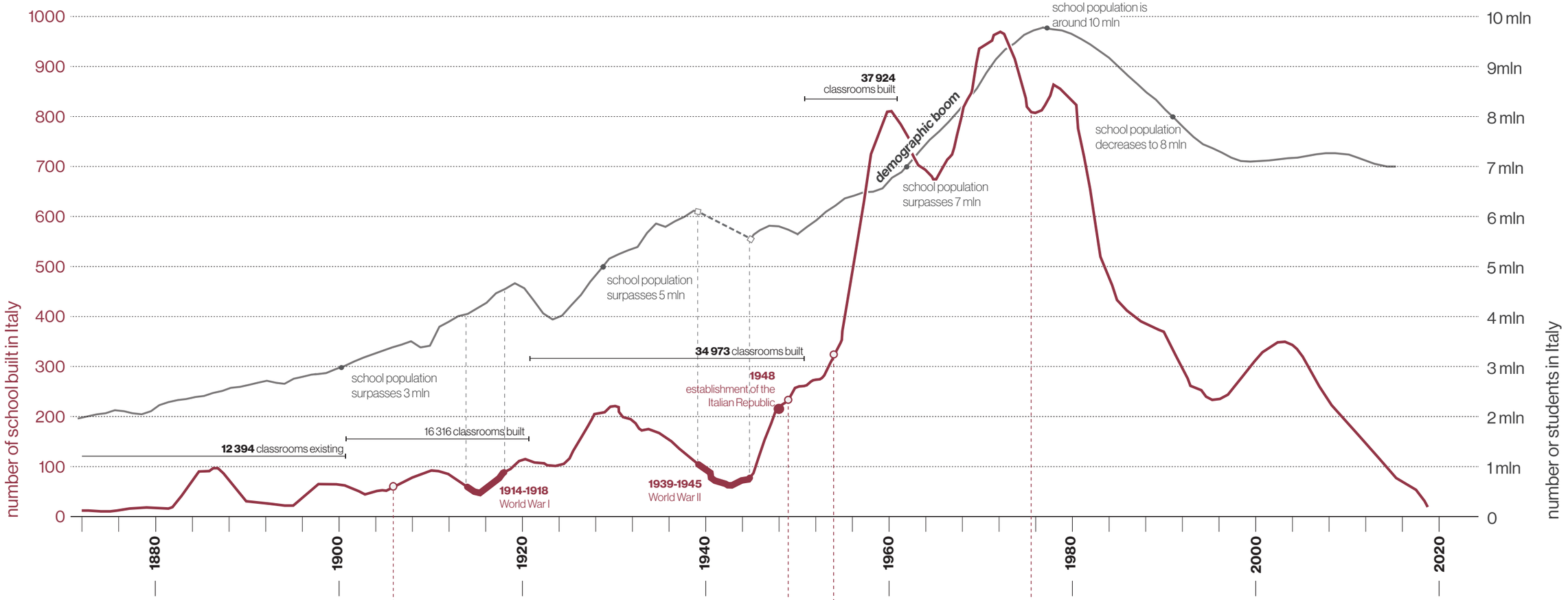
1.2.4. The overlapping objectives

Although it is possible to distinguish separate periods regarding school buildings: a period of construction boom, when fast and inexpensive construction was the priority, and a period of structural adjustments, when quality started to be more important than quality, it is essential to notice that multiple principles have always overlapped.

There can be noticed some breakthrough moments in the history of school buildings in Italy when the main attention has been switched from one aspect to another. For instance, a strive to improve security and technical condition of school buildings started in 1975 with the introduction of new technical regulations.

In the recent decade, there has been a noticeable increase in the attention to pedagogical considerations regarding school spaces. They are strongly highlighted in the regulations from 2013, for the new school buildings. However, the main attention concerning the existing school building is still put on renovation and improving their structural condition. As we are in huge need for innovative educational spaces, the change of priorities seems necessary, not only in new buildings but especially in the existing ones, which are a vast majority. It seems that whether we will witness another milestone in the field of educational spaces depends primarily on what will happen with the existing buildings.

Graphic 5. Timeline of school building infrastructure expansion elaborated by the author. Fondazione Giovanni Agnelli. 2019. Rapporto sull'Edilizia Scolastica. Bari-Roma: Laterza & Figli.



Education for all

1904 Orlando Law

1906 "Legge speciale per il Mezzogiorno" state fundings for primary schools in the South

1911 Daneo-Credaro Law

1949, 1954 laws 589, 645 fundings for school constructions

1962 law 1859 establishment of the uniform middle school

1968 law 444 estabilishment of state nursery school

1971 law 820 full-time primary schools

Strive for quality

1879 regulations for the constructions and furnishing of primary school buildings for municipalities

1925 regulations for new school buildings
- 10-30 classrooms
- new obligatory functions

1975 DM 18.12.1975 regulations for materials and components of school buildings

1999-2001 administrative, didactical and organisational autonomy of schools

2013 new regulations for school buildings

Pedagogical aspects

1874 Borgo Nuovo school, Turin

1909 Casa dei Bambini – first school opened by Maria Montessori, Rome

1960 primary school in Strada Bertola, Turin

1971 First Lancia school, Turin

Trends in school buildinngs

classroom as the main element of the school monumental facades large classrooms, for numerous students	pedagogical experiments, health considerations, first uses of reinforced concrete	less numerous classrooms importance of physical activity new functions	school-civic center use of reinforced concrete poor quality	school-civic center prefabrication repeatable models	lower, more simple than before, better quality of materials adjusted to technical and safety regulations	school-civic center flexible spaces good energy efficiency

compulsory education

2 years | 3 years | 5 years | 8 years | 10 years | 12 years | 10 years

1.3. Traces left on school buildings

The overlapping strategies for schools (as organizations) development have a direct impact on educational buildings. The buildings have been constantly reshaped by the changing goals for the educational system, changing demography, and new needs, since their construction. These factors impacting the educational spaces are visible from the inside and the outside, as new spaces are added, and the existing ones are merged, divided, and repurposed. This paragraph examines the interrelation between the organization and the actual school buildings, as well as the way they change. It argues that the spaces need redefinition, according to the changing society and new approaches to learning and teaching, in two main categories: expansion and transformation.

1.3.1. Need for space - expansion of the existing school buildings

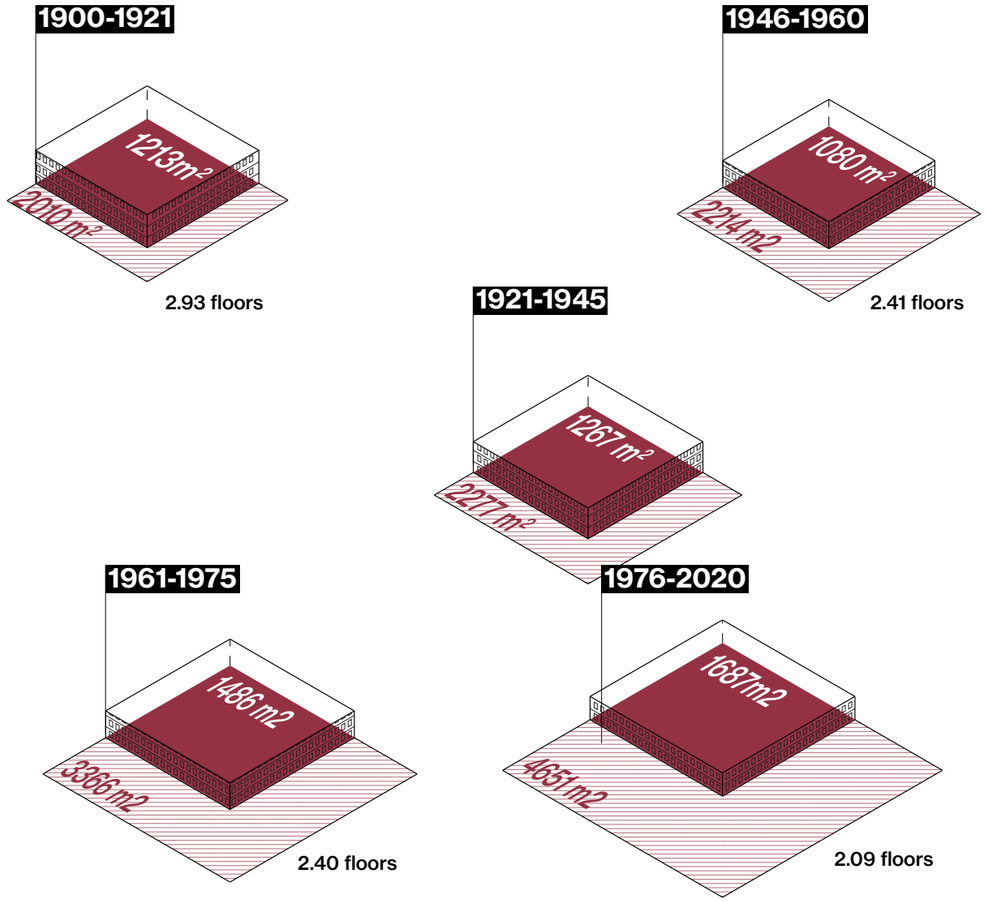
In Italy, there can be observed a trend of an increasing size of the school buildings and their plots, caused mainly by evolving regulations for the minimal area per student, and new functions within the pre-existing, structures, such as gyms, libraries, etc.

The regulations remained vague for a long time, mentioning only the necessity to provide "appropriate and sufficient classrooms for students" (Fondazione Giovanni Agnelli 2019). Around the 1960s, there was a tendency to make school buildings more spacious and providing more external areas. The regulations from this time did not provide any specific dimensions, prescribing only the need to provide spaces of quality and adequate areas for sports and other activities outside.

1975
precise technical regulations

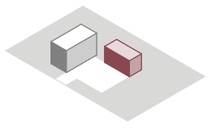
The following regulations from 1975 specified precisely the minimum area per student, the maximum distance from students' homes to school, and the maximum number of

Graphic 6. Average dimensions of school buildings according the construction period
elaborated by the author. Fondazione Giovanni Agnelli. 2019. Rapporto sull'Edilizia Scolastica. Bari-Roma: Laterza & Figli.

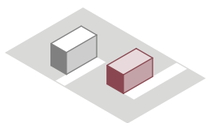


classes and students in each class. The schools built after 1975 are noticeably more spacious and the area of the plot is much bigger (Fondazione Giovanni Agnelli 2019).
The existing school buildings had to provide enough space for the increased number of students within existing structures. It was a significant challenge, especially for the oldest buildings, as they did not have all the necessary facilities. The following strategies have been used solve this issue:

- extensions: new spaces were added to existing school buildings, such as classrooms, gyms, canteens, etc. The buildings were extended either horizontally or vertically



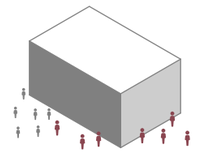
- additions: another solution was to add new buildings, separate from the existing ones, which accommodated a new function, such as a gym or a canteen, to the existing plot. Sometimes the new building was (or became) connected later with a corridor. Nowadays they can find many uses, for example as civic centers (Barioglio 2021)



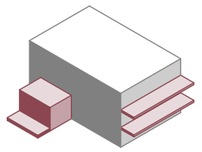
- filling the plot – new independent school buildings were added to a plot, next to existing ones: sites for educational purposes were often large enough to build a new building next to an existing one. The empty spaces on the plots, dedicated for school purposes were therefore filled with another building, shared by several schools, sometimes just divided into two smaller plots.

1.3.2. Changing approach - modifications of the existing school buildings

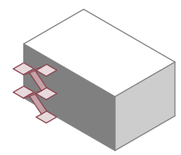
Much faster than the structures of the buildings, the spaces inside and the way how they are used change and undergo constant readjustments. Each interior displays a rich history of modifications, often having little in common with the original project. The following factors are the common reasons for the modifications:



- changing school grade: when decisions are made to accommodate different school grade level within existing structures, adjustments of the school building originally designed for a specific grade becomes necessary. In Italy, a vast number of middle schools were placed in buildings designed for different age of students after the introduction of the Unified Middle School, in 1962.



- adapting a school building to the needs of its community, e.g., adding new functions, new entrances, etc. Education facilities were usually built without the participation of the local community, or even without the specificities of each plot, repeating the same school model in several places, and due to changing needs and teaching approaches of school communities.



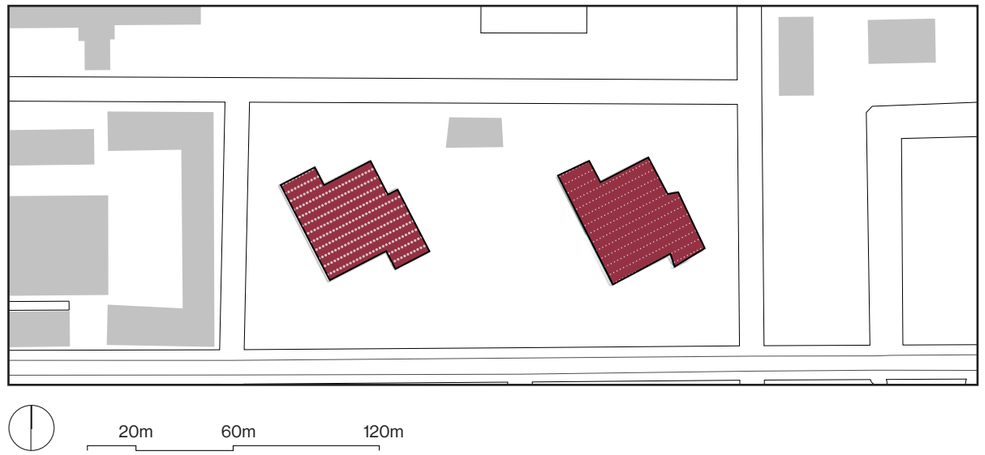
- regulatory adjustments, after introducing new technical regulations which required significant modifications of the buildings. These adjustments are visible even from the outside: staircases added to their facades, not used balconies, or elevators and ramps for people with disabilities.

School buildings are in an ongoing process of readjustments, as they have to be continually adapted to the changing needs of their users. Thus, it is essential for designers to anticipate some changes and to provide flexible spaces to facilitate further modifications. As Mark Dudek, designer and researcher specializing in educational environments said: “any school designer should anticipate the evolving nature of education within society and make provision for it in their architecture” (2000). To predict and effectively plan future adjustments, it is essential to understand past changes and the reasons behind them.

> *Any school designer should anticipate the evolving nature of education within society and make provision for it in their architecture.*

1.3.3. Zoom-ups on the school plots in Turin

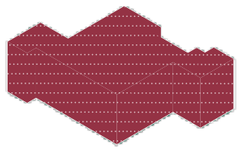
Graphic 7. Example: High School and Primary school on the same plot, on via Sidoli (Turin) elaborated by the author. "I.C. via Sidoli." Scuola in Chiaro. Accessed July 11, 2024. https://cercalatuascuola.istruzione.it/cercalatuascuola/istituti/TOIC88200X/ic-via-sidoli/.



Building 1

high school
Via Casana 5

Building 2



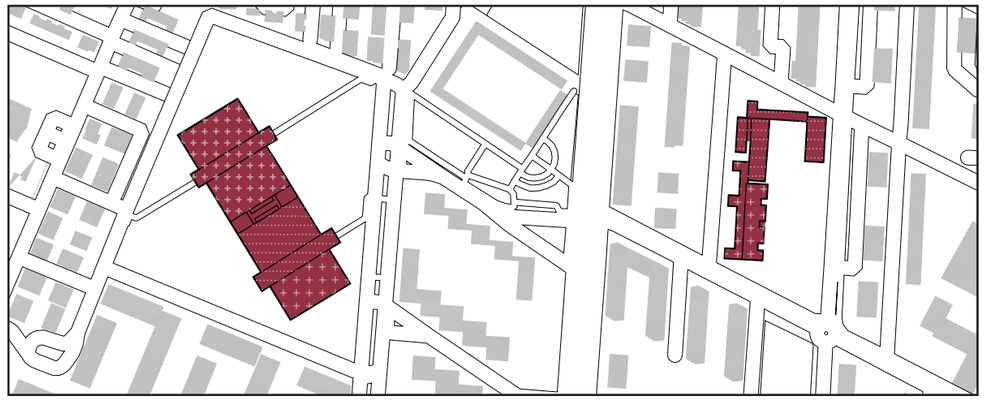
primary school
Via Sidoli 10

The plot on via Sidoli initially accommodated one school building (constructed according to a repeatable model. Another school building, identical to the existing one, was added next to it. The school, built according to the Frank model – a model for primary schools, was transformed into a high school. Although the schools have different grades and are managed separately, they share one plot.

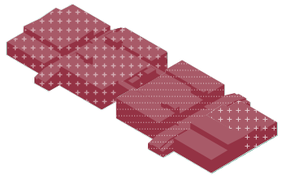
Legend

- high school
- primary school

Graphic 8. Example: Educational Institute Alvaro Gobetti (Turin)
elaborated by the author. "I.C. Alvaro/Gobetti - To." Scuola in Chiaro. Accessed July 11, 2024. https://cercalatuascuola.istruzione.it/cercalatuascuola/istituti/TOIC8B3004/ic-alvarogobetti-to/.



Building 1

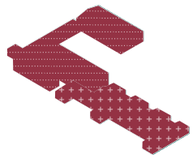


middle school
Via Balla 27

primary school
Via Romita 19

nursery school
Via Romita 19

Building 2



primary school
Via Baltimora 171

nursery school
Via Forno Canavese 5

The Educational Institute is divided between two plots, situated at a small distance from each other. In the first plot, on Via Balla, three schools share one building, designed as a repeatable model. The primary and middle schools share one plot, while the external areas for the nursery school are separated. On the second plot, on Via Baltimora, although the nursery and primary school share one building, (which has been extended several times), they do not share any internal or external space.

Legend

- lower secondary school
- primary school
- nursery school

1 educational institute
2 school buildings
5 school units

Ch. 2

Patchwork modifications of school buildings

Introduction

The glass vestibule with the entrance door cuts into the entrance area of the school. It gives a welcoming feeling, as it is filled with tables surrounded by potted plants and students' artwork. It has the peculiar shape of a distorted rectangle. There are a few similar ones, some of them placed in niches.

To the right, there are two identical doors side by side – one slightly elevated, the other at the same level as the entrance area. We go through the first door, which closes with a clatter. Beyond, it extends an empty corridor, segmented by fire doors. After passing through the fourth door, we find ourselves in yet another entrance area, situated on the opposite side of the school. It looks similar – distorted rectangle shape, many doors, and a glass entrance opposite to us. We turn around and pass through the door leading to a staircase. I start to feel confused about where I am and how I arrived here.

We ascend to the first floor and exit the staircase to an open space, resembling the one below. However, to my surprise, the door leading to the corridor is absent. There is, instead, a niche ending with a wall. On the left, there is a door that gives access to another corridor, running perpendicular to the one downstairs, which connects the two entrance areas. Along one side, there are classrooms, and further down the hall, we finally find classroom 17.

A similar feeling can be experienced in many Italian school buildings, as they have gone through various modifications and adjustments to changing needs, regulations, and approaches. Often, the interventions seem to be conflicting with each other, as if different decision-makers wanted to achieve opposite goals. The modifications often reverse what has been done previously. In this way, open and welcoming spaces become divided and detached from other areas, and each space seems to be completely different. Many transformations are planned not taking into consideration their context and without thinking about the next steps. After years of this kind of transformations, it seems that each stakeholder responsible for the school was having different rules and was playing a different game.

The second chapter examines how school transformations are handled nowadays. It explores the fragmented responsibility and ownership of school buildings that result in "patchwork" spaces. It ends with the examples of the "patchwork" transformations in the examples of school buildings in Turin.

2.1. Fragmented interventions to age-related issues

The landscape of educational infrastructure in Italy is characterised by old age and a big need for renovation. They struggle with structural issues, low energy efficiency, and insufficient accessibility for persons with disabilities. Most of the funding programmes concerning educational infrastructure focus on these three factors. Although some improvement can be noticed, the interventions are often fragmentary and do not improve the condition of buildings in a significant way.

2.1.1. Old buildings and consequently big needs

As mentioned before, there is not a big need for new school building constructions, as the number of new students decreases each year, and this trend is expected to continue. However, the maintenance needs of the existing buildings remain high, as they are relatively old – 55% of them were built before 1976 (Galimberti 2016).

Average age of school buildings by region (Fondazione Giovanni Agnelli 2019)

Liguria	75
Piedmont	64
Tuscany	56
Emilia Romagna	56
Lombardia	55
Marche	54
Friuli-Venice G.	53
Veneto	52
Umbria	49
Puglia	48
Campagna	48
Abruzzo	48
Sicily	47
Lazio	47
Basilicata	47
Sardegna	44
Molise	42
Calabria	42

The discrepancy in the level of development between the North and the South, present at the beginning of the 20th century, is visible in the age of the school buildings. As shown in Graphic 9, around 60% of the facilities built before 1900 are concentrated in Lombardia, Piedmont, and Tuscany. The average age of school buildings in Liguria – 75 years– is more than 20 years higher than the average for Italy. The region with the second oldest average school is Piedmont – located also in the northern part of the country (64 years). As the schools between the early 60s and the mid-80s, were built rapidly and on a large scale (on average 800 buildings per year), around 50%of all the schools open nowadays were constructed during this period (Fondazione Giovanni Agnelli 2019, 15-20). Nowadays, many of them need urgent interventions, mainly due to the following factors:

- structural issues – related primarily to the use of low-quality materials and the degradation of reinforced concrete
- energy efficiency issues– repeatable models proved in-

Graphic 9. Average school building age per italian region

elaborated by the author. Fondazione Giovanni Agnelli. 2019. Rapporto sull'Edilizia Scolastica. Bari-Roma: Laterza & Figli.

efficient because they were not adjusted to the cardinal directions. As a result, they did not effectively manage sunlight and heat. Additionally, inadequately tested and low-quality materials contributed to thermal discomfort. The buildings from this period are usually overheated during the summer and too cold during the winter.

- accessibility issues – numerous school buildings were built before the introduction of accessibility regulations, overlooking the needs of people with disabilities. Despite some adjustments, a large number of educational buildings are not adequately accessible.

2.1.2. Structural issues

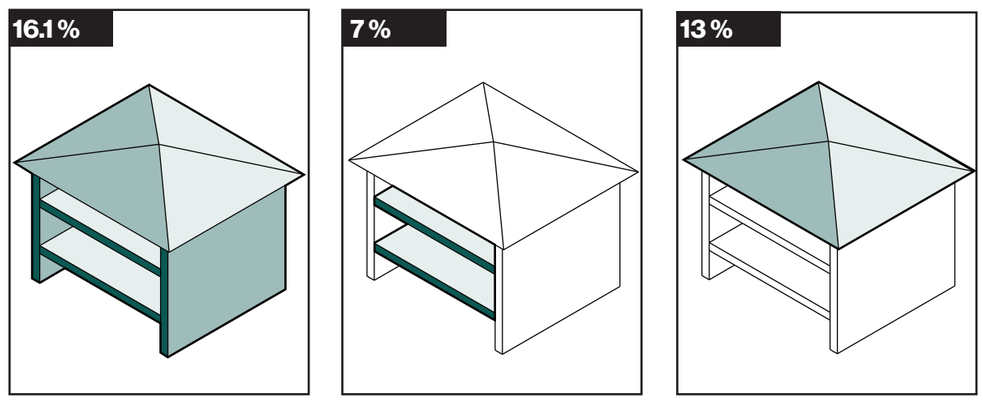
The most urgent factor of the existing school buildings is their state of conservation, which determines the decisions related to the structures – whether renovation is feasible or if the building should be demolished and replaced.

A noticeable amount of all the interventions is focused on the structural condition. Around 60% of the school buildings have benefited from maintenance interventions in the past 5 years. However, the needs remain huge: around 30% of the schools in the South have declared a necessity of urgent intervention (Legambiente 2023).

Dangerous load-bearing elements, leaking roofs – these are only some examples of urgent needs of the school buildings. The costs of repairs are often high, and, if there are no resources, the deterioration accelerates, increasing the costs even more. The process repeats until renovation is not feasible (Brand 1994). This spiral of deterioration would be possible to avoid if preventive maintenance was carried out. Its costs are noticeably lower than the costs of repairing elements which are already damaged.

The roofs need regular maintenance, as there is a direct correlation between the age and condition of the roofs – they show progressive deterioration related to the need for maintenance and replacement. Therefore, generally speaking the older the roofs are, the more problematic they become. Around 13% of the school buildings are in urgent need of extraordinary maintenance of their roofs. For the vertical load-bearing elements and slabs, windows, and doors, there is a noticeable difference between buildings from before and after 1975. The state of conservation of the structures from the 19th century is often similar to the ones from the 60s or the beginning of the 20th century, and the state of conservation of the younger structures is noticeably better. This is caused by the law introduced in 1975 which had a major positive impact on the construction methods and material selection. The need for renovation of these elements is also high – around 7% of all school buildings are in urgent need of extraordinary maintenance of their vertical structures and slabs (Fondazione Giovanni Agnelli 2019, 43-44).

Graphic 10. Diagram showing occurence of condition of school buildings'structures
elaborated by the author. Fondazione Giovanni Agnelli. 2019. Rapporto sull'Edilizia Scolastica. Bari-Roma: Laterza & Figli.



As a major part of Italy is seismicly active, the school buildings also require interventions to improve their seismic resistance. This is a long process, and the necessary modifications require substantial interventions into the existing structures.

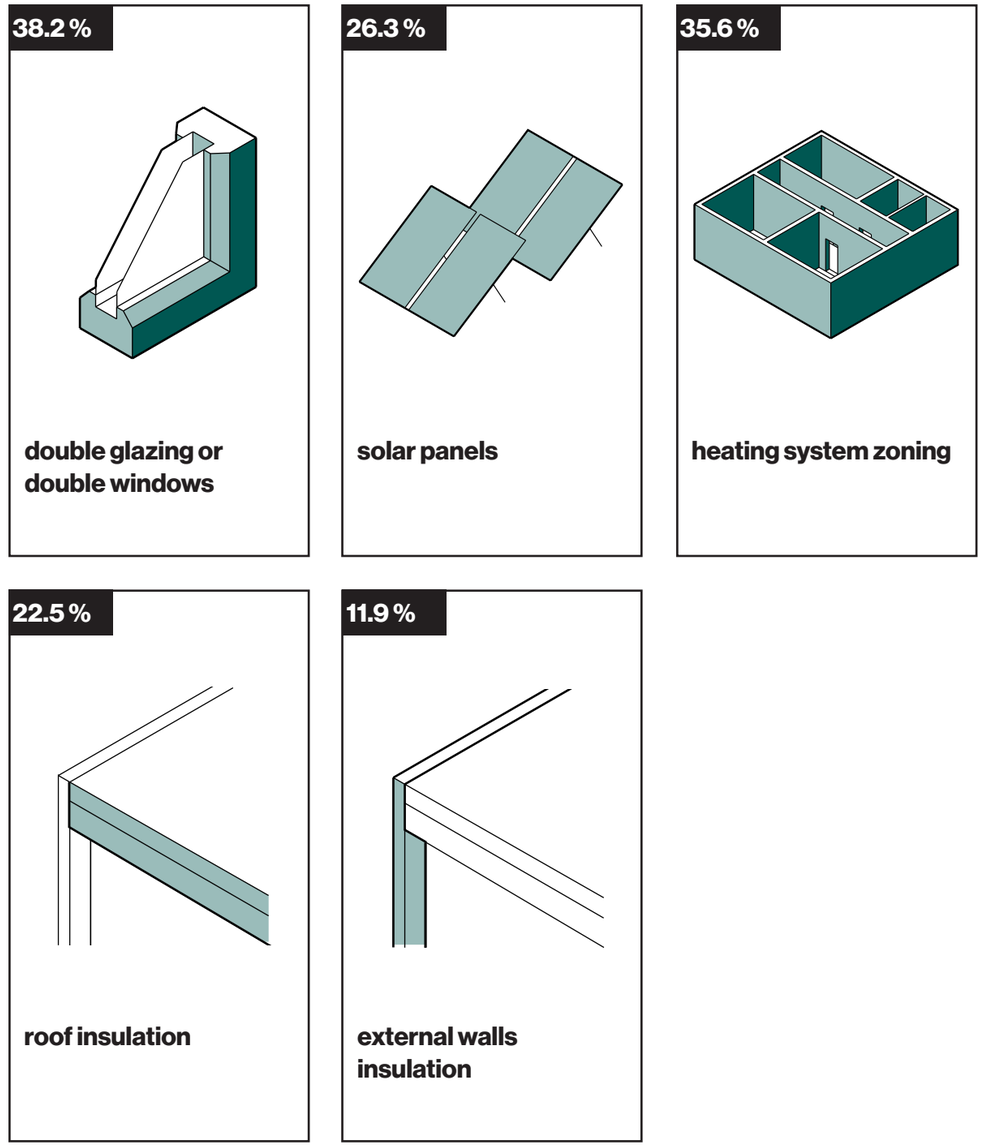
2.1.3. Energy efficiency

Fast construction of the buildings from the time of the school construction boom, low-quality materials, and lack of adequate standards and regulations have resulted in the poor energy performance of many school buildings. The educational facilities from this period are nowadays overheated during the summer, do not have adequate protection from direct solar radiation, and in the winter the internal temperature is too low. Therefore, they require a large amount of energy to keep them functioning.

Fortunately, energetical efficiency and environmental sustainability are nowadays one of the priorities for renovations and constructions of school facilities. 59% of Italian school buildings have adopted at least one measure to limit energy consumption, such as insulation of the external partitions, double glazing, zoning of heating system, etc. Additionally, there is an increasing number of schools with solar panels: almost 10 000 schools are equipped with them (Fondazione Giovanni Agnelli 2019, 40-41).

This does not mean the same number of buildings being energy efficient, especially during the winter. In many cases, solar panels are installed to use renewable energy sources but do not focus on actions to reduce the use of energy, for example by improving the insulation of walls and roofs, and replacing the windows (Legambiente 2023). Interestingly, according to the data from the AES, twice as many schools have solar panels than wall insulation.

Graphic 11. Diagram showing occurence of energy efficiency measures
elaborated by the author. Fondazione Giovanni Agnelli. 2019. Rapporto sull'Edilizia Scolastica. Bari-Roma: Laterza & Figli.



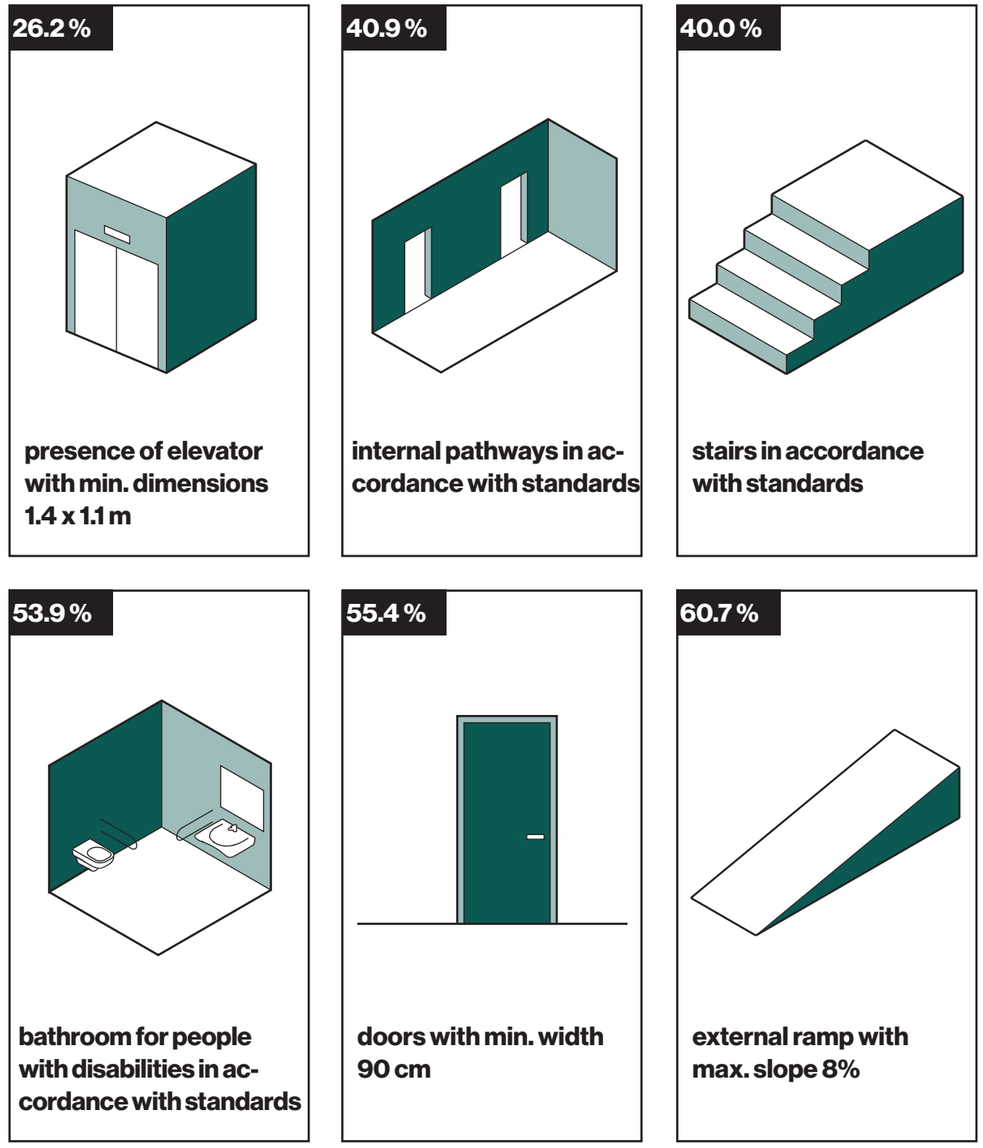
2.1.4. Accessibility

For decades, the focus on disability was limited to a clinical aspect, with little effort made to include people with disabilities in social life. It is also reflected in school buildings. The lack of attention and no regulations regarding accessibility during the construction of the education facilities built before 1975 resulted in many architectural barriers and places unsuitable for students with physical and mental difficulties. This condition has moderately improved since then, but there is still much work to be done.

The numeric data from AES interpreted in the book "Rapporto sull'Edilizia Scolastica" shows that Italian school buildings are not adequately equipped to provide a good level of inclusion for students with limited mobility. The statistics indicate that access to many school buildings and vertical circulation are currently not adapted to people with disabilities. Only 39.3% of schools have external ramps with slopes not exceeding 8%. Furthermore, only 26.2% of school buildings are equipped with elevators of appropriate dimensions (1.4 m x 1.1 m). Additionally, the stairs in many facilities do not follow the regulations – only 40% of them meet the standards. The dimensions of internal pathways are another worth mentioning factor– they have sufficient dimensions in only 40.9% of school buildings. Doors with sufficient width are present in 44.6% of school buildings.

The bathrooms are another notorious architectural barrier as they are often not adapted to the needs of persons with disabilities. Only 53.9% of the schools have bathrooms according to the standards. In total, 1/4 of schools do not have any of the abovementined features (Fondazione Giovanni Agneli 2019, 38-39).

Graphic 12. Diagram showing presence of elements to remove architctural barriers
elaborated by the author. Fondazione Giovanni Agnelli. 2019. Rapporto sull'Edilizia Scolastica. Bari-Roma: Laterza & Figli.



2.2. Form follows funding

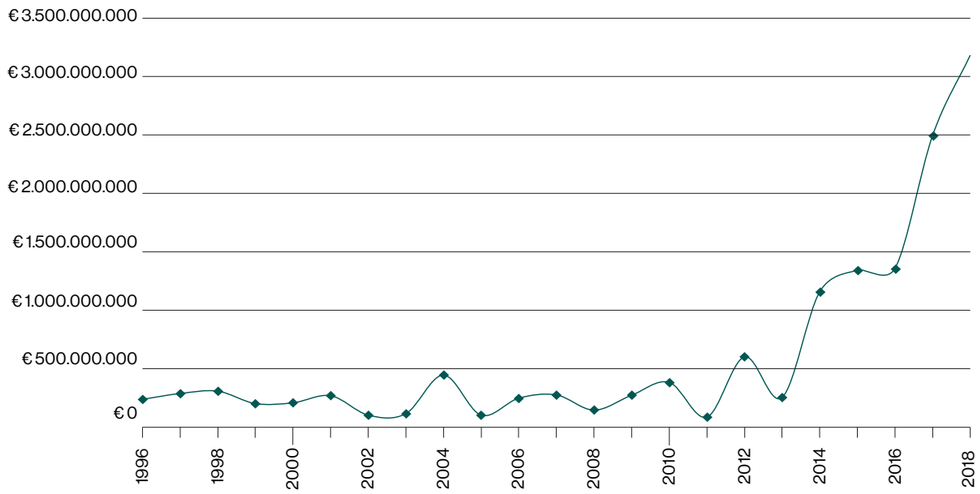
The funding programmes shape the school buildings. To understang how it happens, it is necessary to investigate not only the amounts of money for specific programmes, but also the way how they are realised. This paragraph examines how dispersed ownership and responsibility for school buildings result in fragmented modifications and "patchwork" spaces.

2.2.1. "Patchwork"process

In the last 20 years there has been a significant increase in public awareness regarding the need to improve the condition of school buildings in Italy and the rise in the funding for school infrastructure. As shown in Graphic 13, the resources for school buildings in 2017 were twice as high as in 2014. (dati.istruzione.it, access 2024) However, it is important to investigate if the increased fundings have resulted in the improved conditions of the school structures. Since the school population has been decreasing over the last few years and is expected to shrink even more, the funding programmes are much more focused on improving the condition of the existing school buildings, than on the new constructions. In recent years, new governmental programmes have been announced. Some, like "Scuole Sicure", and "Scuole Antisismiche" (Safe Schools, Antiseismic Schools) have strictly defined purposes: like improving security or seismic resistance. Others, like "Fondo Comma 140", have a broader focus, e.g. to improve the overall state of the buildings. Generally, they prioritize the safety and structural condition of the buildings over other aspects. However, some programmes also aim to bring innovations and improve the aesthetics of the spaces (for example "Scuole Belle") (dati.istruzione.it, access 2024).

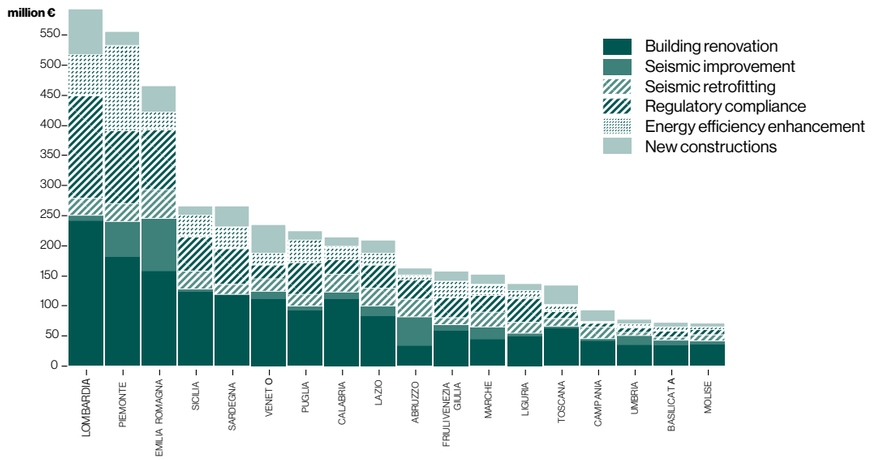
Graphic 13. Resources for school buildings according to year

elaborated by the author. "Esplora I Dati". Portale Unico dei Dati della Scuola. Accessed June 17th, 2023. https://dati.istruzione.it/opendata/esploraidati/.



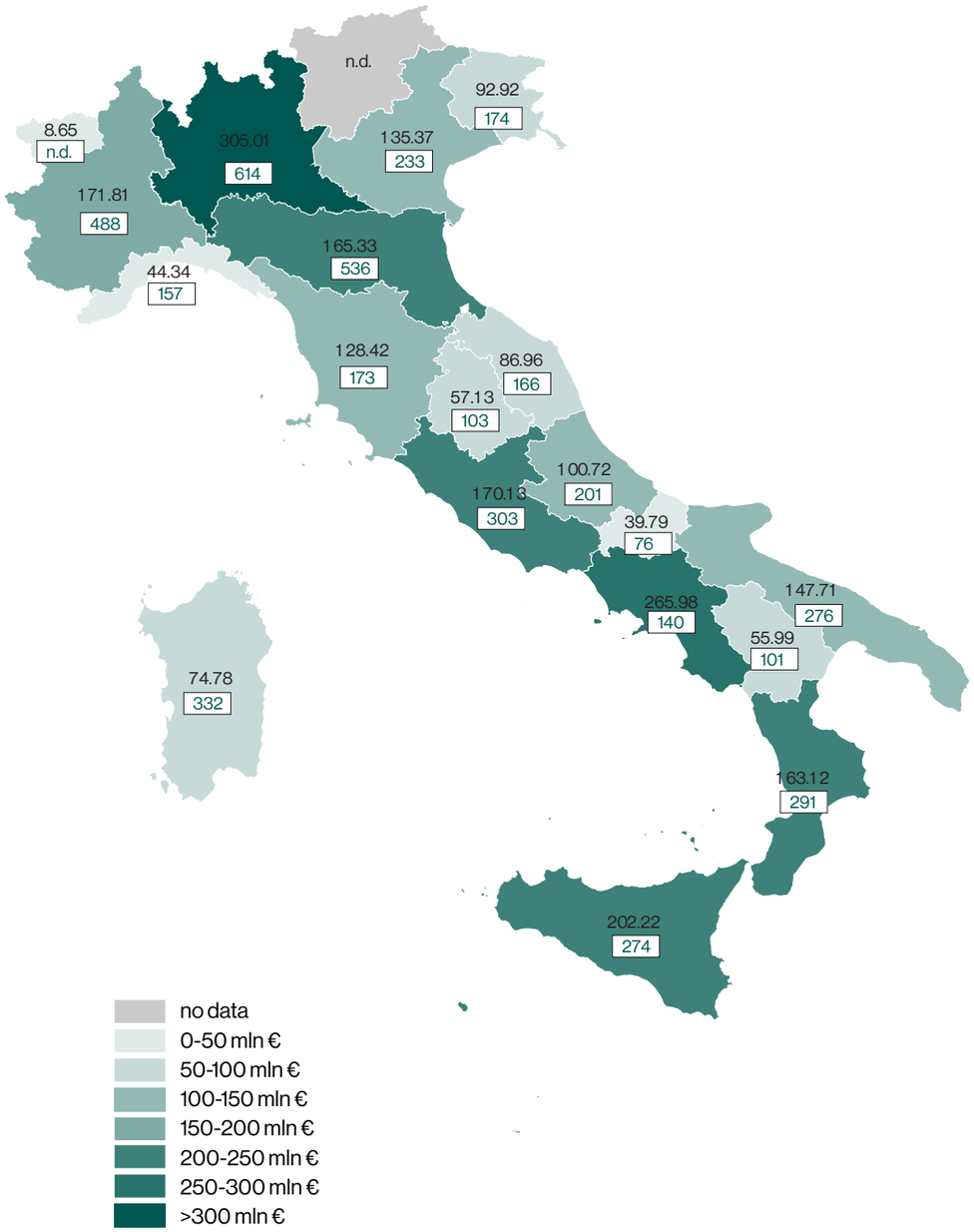
Graphic 14. Resources for specific goals per region between 2014 and 2016

re-elaborated by the author. "Gestione Interventi Edilizia Scolastica." GIES. Accessed July 11, 2024. https://gies.indire.it/banca-dati/.



Graphic 15. Resources for school buildings and number of projects financed per region between 2014 and 2016

elaborated by the author. "Gestione Interventi Edilizia Scolastica." GIES. Accessed July 11, 2024. https://gies.indire.it/banca-dati/.



The regions play a key role in managing these funding programmes, as they are responsible for controlling the resources from the government through the three-year programmes. As shown in Graphic 15, the resources from those programmes are distributed fairly evenly across all the regions. However, the allocation of resources among schools varies significantly between regions. Especially in Lombardia, Emilia Romagna, and Piedmont, the resources are spread across more school buildings, resulting in smaller amounts of money dedicated to each school compared to other regions (Graphic 14). This suggests that to undertaking a complete renovation of a school building in these regions, may require a bigger number of funding programmes.

The technical needs of the buildings are still urgent and the speed of renovation processes does not seem to be sufficient to go beyond solving problems and be able to fully focus on the goals for educational spaces of the future. This may be caused by two reasons: not enough resources, and not the optimal way to use them.

After the pandemic of the Covid-19, a new initiative called PNRR (Piano Nazionale di Ripresa e Resilienza) was launched. It aims to utilize funds allocated by the European Union's Recovery and Resilience Facility (RRF) to support EU members in recovery after the pandemic crisis. In the field of school buildings, it focuses mainly on improving their energy efficiency, refurbishing and constructing school canteens and sports facilities, integrating innovative technolo-

PNRR for school buildings

Ministero dell'Istruzione e Merito. *PIANO DI EDILIZIA SCOLASTICA PNRR*. Presentation, 2022.

increasing security and condition of school buildings
3.9 bn €

technological innovations, new classrooms and laboratories
2.1 bn €

canteens
0.6 bn €

gyms
0.3 bn €

gies, creating new classrooms and laboratories, and improving the technical condition of buildings. In this extraordinary funding programme, the resources are transmitted directly to the local entities (municipalities, provinces, and metropolitan cities). This funding programme is currently one of the biggest sources of fundings for school transformations in Italy and it is a huge opportunity for their development (pnrr.istruzione.it, access: 2024, Valente 2023).

An important factor related to the fundings is the way between the allocation of the fundings to their utilization. In Italy, this process is complicated due to the division between ownership of school buildings (metropolitan cities, municipalities) and responsibility for school staff and didactical programmes (the Ministry of Education). This division often results in decisions concerning the school buildings that do not go in parallel with educational programmes and teachig needs.

Additionally, the school communities have limited flexibility in deciding how to spend the resources, as they are managed by municipalities and allocated to specific purposes. The fluidity of the process strongly depends on both sides: the municipalities or metropolitan cities and the school communities. Municipalities, as owners of the buildings, bear responsibility for the buildings' condition and make decisions regarding the interventions. The school staff can request modifications to municipalities or metropolitan cities (typically for minor, non-structural aspects, such as changing wall and floor claddings, changing furniture, etc). However, the final decisions are not ultimately dependent on them.

Therefore, facilitating dialogue between all sides is necessary for good management of the resources. As dr Raffaela Valente wrote in an article about the importance of educational spaces*:*

A quality school is the result of a comprehensive vision achieved through a process that brings together different roles, leverages diverse contributions, and reaches its objectives through a structured path. (Valete 2023, 21)

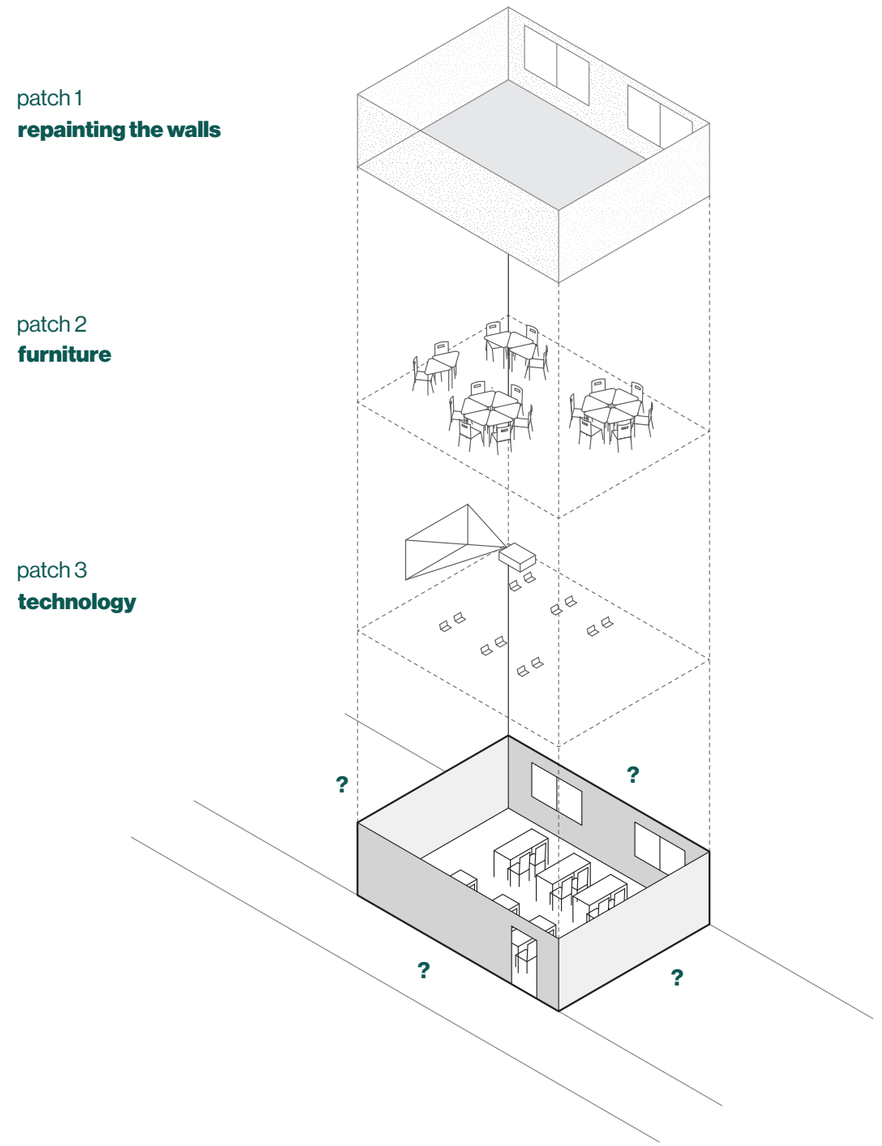
Unfortunately, there is still a lack of common goals and collaboration between different actors related to school buildings. The involvement of the school community – staff, students, and parents – is still insufficient in the decision-making process. The lack of comprehensive strategies for learning spaces lies on both sides, as neither municipalities nor users of the space develop a holistic understanding of current issues and directions for the future. Municipalities, dealing with numerous school buildings at the same time, focus mainly on reacting to the most urgent technical issues related to the condition of the structures. On the other hand, users do not engage with professionals and do not prioritize the physical condition of spaces. The lack of a holistic understanding of the space highlights the need for a collaborative approach to optimize the decision-making process regarding school infrastructure.

2.2.2.Patchwork spaces

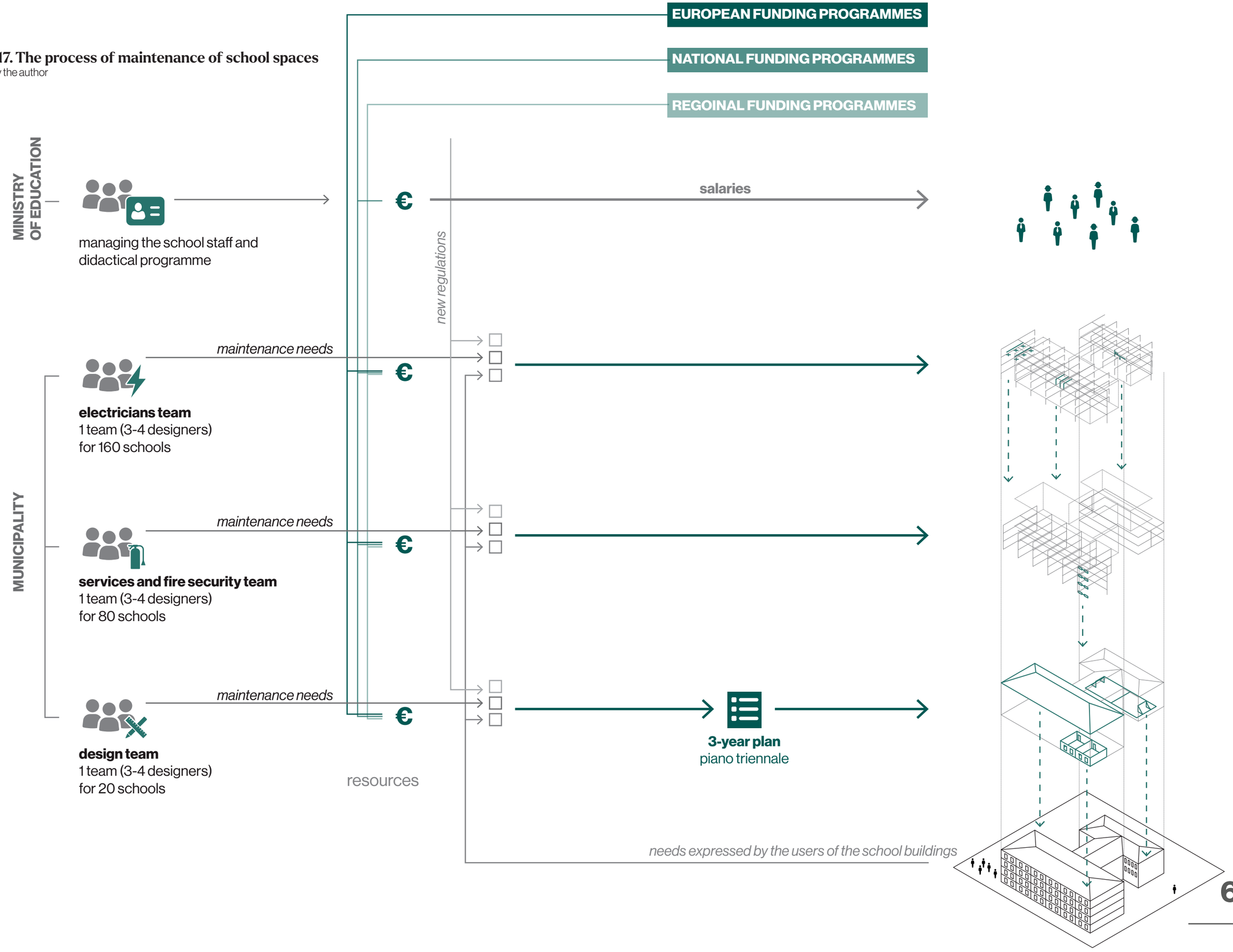
Perhaps the biggest issue in the transformation and renovation process of school buildings is the fact that the changes focus rather on single measures than on the school building as an entity. They usually concern single elements or aspects, without considering their relation to the other spaces. Since the construction of a building, new interventions are continuously added like new patches to an existing fabric: a “patch” “technology”, “new furniture”, “redecorating”, etc. (Graphic 16). Although they are beneficial, they do not improve significantly the functioning of the school.

The tight budget is not the only reason for this state-of-the-art. There is also a huge need for innovative methodology, applicable to various school buildings (Österreicher, Geissler 2016), and for interventions planned specifically for each learning environment.

Graphic 16. The patchwork transformations of school spaces
elaborated by the author



Graphic 17. The process of maintenance of school spaces
elaborated by the author



2.3. Short-term strategies

Although the fragmented, patch-like renovations and maintenance works contribute to improving overall condition of school buildings, they are only capable of fixing current, small-scale issues. If this is the only way in which the issues related to learning spaces are addressed, many important problems remain unresolved.

The fragmented intervention ignore important dynamics shaping educational landscape of Italy. Their effects can be noticed in each school building and they will be even more profound in the future. The learning spaces, which are not ready to face these challenges, are often said to be outdated and inadequate for today's educational needs.

Therefore, it is necessary to perceive the school spaces in more dynamic way, as an organism that needs to adapt to changes and needs of the users.

This paragraph describes two important issues that affect learning environemnts in Italy: demographical changes new approaches to learning. The firso factor, demography, is essential because it determines the distribution into classrooms, number of students in each class and the additional space, which can be used to extend didactinal area. The spaces need to be flexible to make it possible readjust annually to the number of students. The second aspect, new learning approaches, have been neglected for a long time, favouring the traditional approach to teaching and learning. The spaces need to be adjusted to the new ways and make it possible to accommodate new ways in the future, valuing also the use of technology.

2.3.1. Changing demography – threat or opportunity?

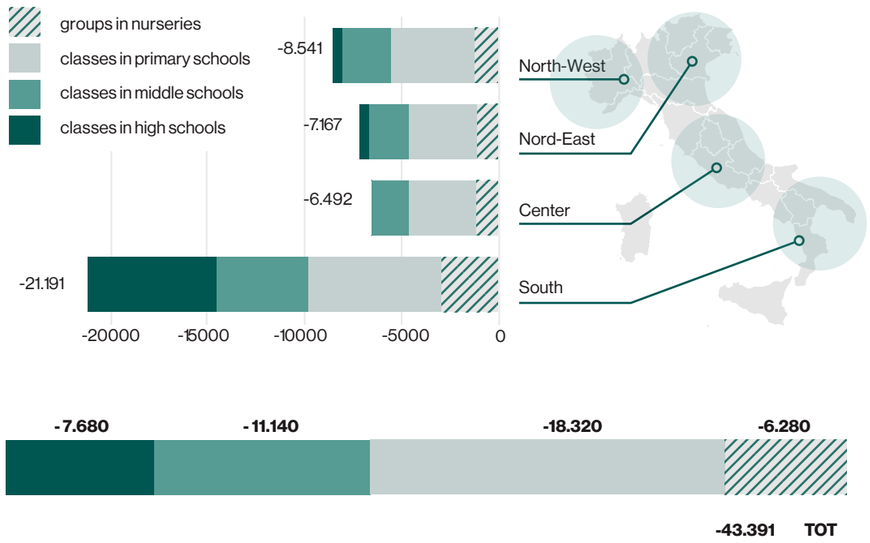
The changing demography is one of the principal aspects to take into consideration rethinking school spaces in a holistic way, as it defines the number and spatial distribution of the present and future users of school spaces. According to ISTAT, between 2018 and 2030 there will be 1 100 000 students less than in 2020 the school population will decrease from 9 mln to 7,9 mln (Barioglio 2021). Assuming that one class occupies one classroom, and the minimum area per student as 1,8 for primary and middle and 1,96 for high school, 43 400 classrooms will be emptied, which corresponds to 2 000 000m2 (Fondazione Giovanni Agneli 2019). This is not a marginal change, which brings the necessity to rethink the way in which the existing school buildings are used. It can be a major opportunity to transform the existing educational landscape according to the new pedagogical principles, as more space will be available. However, in order to achieve it, it is necessary to implement major changes in the way the school spaces are managed.

between 2018 and 2030
there will be 1 100 000
students less than in 2020

As shown in Graphic 18, more than 18 000 classes from the primary schools and 11 000 from lower secondary schools will be emptied, due to the decrease in the number of students by around 15%. This would mean additional space of at least 1-2 classrooms in each school, which can be used to enrich didactical offer of the facilities. The demographical change will affect especially schools in the south of Italy – in some regions the school population will decrease by more than 20% (Barioglio 2021).

The excessive space can be a benefit not only for the school members, but also for the local community. The free space can be also used in temporary reorganization of the school

Graphic 18. Predicted decrease in number of classes between 2018/2019 and 2029/30
re-elaborated by the author. Barioglio, Caterina. 2021. Re-school: Ripensare la scuola, a partire dagli spazi. Future Urban Legacy Lab



to facilitate renovation works during the school year, without necessity to close the school. However, without any strategy , school spaces will not be able to benefit from the demographic decrease.

2.3.2. Changing pedagogical strategies – how much does space matter?

School buildings strongly influence the didactical opportunities of students and the organization of school activities. As Stewart Brand observed, the buildings shape the users, and their users shape the buildings, and the process continuously repeats (1994). The way these two sides influence each other is, in the case of educational buildings, closely dependent on the way the school constructions and renovations are managed.

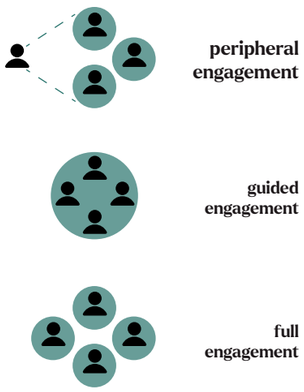
School buildings, unlike private buildings, are usually designed and managed almost without the participation of their users. This manufacture-like way of designing educational buildings was dominant during the demographic peak of the 1960s and the 1970s when the decision-making process was centralized and repeatable models were a common practice. Thus, the educational spaces did not meet well the needs of their users.

These school buildings usually have not changed much since their construction, and their spatial organization has remained almost the same as at the beginning. The users of educational spaces have limited possibilities to adjust them to their needs, therefore they are forced to adapt the school organization to the existing structure, created several decades ago, for another school system and different society.

Since the 1970s, new approaches to the relation between school spaces and pedagogical strategies have been introduced, highlighting the significance of the learning spaces in the educative process and, consequently, the need to create multifunctional environments that would facilitate the implementation of new pedagogical practices (Dudek 2000). The new practices have been based on the premise that the learning process cannot be based only on passive listening, but rather on common practice and experience. Étienne Wenger, educational theorist and practitioner highlighted four components of learning, which should be considered while creating educational spaces: community, practice, meaning, and identity (1998).

Community
Community refers to the need to belong to a group that shares the same goals and to participate in activities that build mutual understanding and collaboration. Therefore, it is important for a school community to gather regularly for school events, and to have opportunities to participate in school initiatives and events.

Practice
The practice of learning is about actions undertaken in relation with others to acquire knowledge and master skills. The educational spaces ought to be suitable for different types of engagement, such as:



re-laborated by the author Lippman, Peter C. 2010. *Evidence-based design of elementary and secondary schools.* Hoboken, New Jersey: John Wiley & Sons.

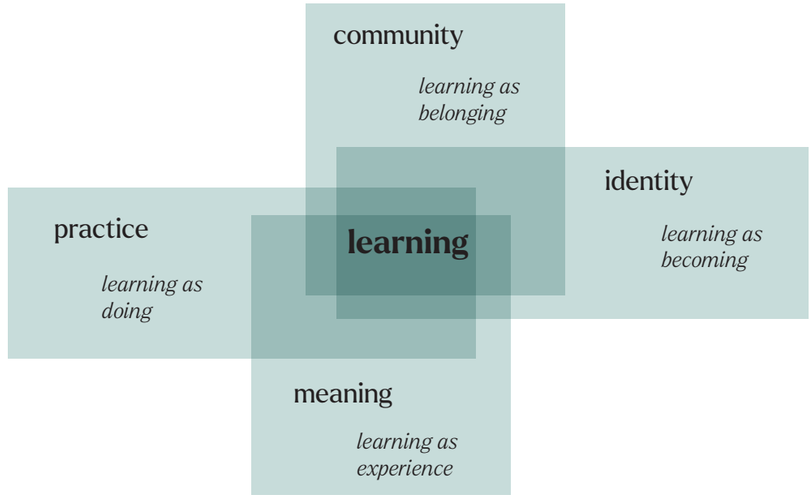
- peripheral engagement – or limited engagement; learners' participation is fully guided by a facilitator leading the process. It can be limited to listening or include interactions between the facilitator and learners that help to verify if they understand the topic

- guided engagement – or directed engagement; pair or small groups of students supervised by a facilitator work on a specific problem or project or share information and reflections

- full engagement – individuals work independently on a specific task, problem, or project (Lippman 2010).

Meaning
Meaning is a result of the participation of a group or individuals in activities. When students are involved in an action, they build meaning through participation, based on their previous experience and knowledge. As a result, single tasks become understood as elements of more general concepts. Sharing reflections and concepts within a group

Graphic 19. Components of a social theory learning
re-laborated by the author Wenger, Etienne . 1999. omunities of Practice and Social Learning Systems. 1999.



is crucial because it enables students to understand a concept from many different perspectives. Therefore, it is strongly related to actions and participation, rather than listening. In the educational spaces created according to this principle, students rather than a teacher, are at the centre of attention, and activities.

Identity
Identity is an outcome of the experiences of each student in their social and physical environment. The individuals acquire knowledge through working together and sharing thoughts. Not only do they develop individual identities, but they also contribute to building others' identities through various interactions. To realize this principle, the students should be able to influence the spaces they use and to be included in the decision-making process regarding the transformations of educational spaces.

The way how these principles are translated into learning environments varies from one school community to another. However, the existing educational spaces often limit the possibilities of diversifying the teaching methods. This concern has been broadly discussed in recent decades, which resulted in creating the technical guidelines for new school buildings, but the considerations about the transformations of the existing buildings in terms of new pedagogical approaches do not seem to play an important role in the discussions so far.

2.3.3. Accumulated modifications - consequences of short-term planning

The interiors of school buildings are constantly updated and modified due to the changing needs of their users, reasons related to maintenance, and changes in regulations. The modifications are usually minor, concerning a single space or issue – adding a new function, implementing new technology, or adjusting to new regulations. The interventions often resemble patches added to the initial structure, making it more cluttered and divided, as most of the modifications are based on adding new elements. Consequently, school buildings are usually perceived as a set of separate spaces connected with corridors. This is because the refurbishments often overlook the entire school setting and do not plan future modifications in a cohesive way (Österreicher and Geissler 2016).

Spontaneous decisions
The changing needs of the school communities are a common reason for modifications. New functions are added, that did not exist during the construction of the facilities, such as computer classrooms, immersive rooms, etc; existing spaces are enlarged, merged, divided, and merged again in a different way – the process never stops. Finding a place for these actions is not simple, and the results can often surprise: an irregular, polygon-shaped classroom, cut out of a large common space, windows "cut" in half with new walls, or a surprisingly crooked corridor. The spontaneous modifications rarely consider the context but rather focus on achieving short-term goals in the easiest and cheapest way.

Side-effects of regulatory adjustments
The technical regulations from 1975 and 1998 introduced significant changes to the safety measures in school

buildings and improved their technical conditions. Although they were necessary to increase security, the way they were implemented led to significant compromises in terms of educational functionality and the overall clarity of the spaces. Corridors became segmented with fire doors, staircases have become closed, and new evacuation stairs have been added to external facades. All these actions were undertaken to achieve regulatory compliance with a tight budget and limited time, and the solutions have not been reconsidered.

Additionally, certain areas, such as balconies, terraces, and distant classrooms, have become unusable and excluded from didactical use, because necessary adjustments were too complicated, not cost-efficient, or due to precautionary measures.

The space is often used inefficiently, due to the context-ignorant planning, focused just on solving single problems or adding single elements. Consequently, there the spaces do not change in a significant way. However, spaces can be transformed into innovative and efficient environments through holistic planning, even within the existing funding pogrammes. The comprehensive design strategies for entire school buildings could make iy possible to create an innovatine educational landscape. For the time being, spontaneous, “patchwork” modifications are still the prevalent way of transforming and renovating school spaces.

2.4. Zoom-ups on the school spaces in Turin

Image 3. Music classroom. Primary school, via Domenico Cassini 98 photo by: the author

Regardless of the funcion of learning spaces, a traditional layout with blackboard and rows of benches is still dominant

The physical environment of the spaces is often not adjusted to their specific function. For example, the walls of the music classroom do not have any sound insulation, which limits possible uses of the space

The innovative and engaging pedagogical approaches present more and more often in schools are limited by characteristics of learning spaces

Image 4. Old bathrooms. High school, via Giovanni Pacini 28 photo by: the author

Unused spaces often become spontaneous storage rooms, which is a missed opportunity for educational spaces

Temporary uses of certain spaces often end up as permanent solutions

Image 5. Circulation space. Primary school, via Giovanni Randaccio 60 photo by: the author

Gallery of students' works on every empty part of the walls. It shows the importance of giving students the possibility to impact their environment and display their work.

Wide corridors at the center of the building are not used in any other way than to move from one space to another.

Image 6. Entrance area. Middle school, via Giuseppe Piazzi 57 photo by: the author

Even though there is snough space in the courtyard, parents are waiting for the children outside, on a narrow sidewalk.

A welcoming area of the school is empty, and is at the same time the space for trash containers.

Image 7. Evacuation staircase. High school, via Bologna 183 photo by: the author

Fire security often dominates completely other aspects, such as aesthetics, and efficiency of spaces, sometimes making spaces almost unusable in any other way

Some spaces, such as balconies are excluded from use for safety reasons, instead of being adjusted to other uses

Image 8. External spaces. Primary school, via Domenico Cassini 98 and middle school, via Giuseppe Piazzi 5 photo by: the author

Poor connection between internal and external spaces makes it impossible to use them together and to fully benefit from the vicinity of the external areas

Divided plots of the primary and middle schools make it impossible to share the external spaces. As a result, the space for primary school students is not sufficient for their needs, while the part for the middle school most of the time remains empty

No green area on the primary school plot, all the space conered with concrete

Ch. 3

Has the classroom broken?

Introduction

This chapter discusses innovative strategies and models for educational spaces in the Italian context. It notices that they have become an increasingly relevant topic. It analyzes the DADA model, which is an organizational model in which spaces are assigned to specific subjects in order to create more active and dynamic environments. It also highlights the importance of space in the learning process and provides better-equipped and more personalized environments.

The second described model, the “1+4 Learning Spaces” introduces five types of spaces: group learning spaces, exploration labs, agoras, informal areas, and individual areas Each of them addresses different needs and types of learning. It also enhances the diversity of the learning environments.

However, most of the important discussions and policies focus on the new buildings, not giving much attention to the spaces that already exist. An issue of the existing infrastructure is crucial in improving the quality of learning spaces because the need for new school buildings is relatively low.

It also notes that innovative models are often implemented only in new buildings, neglecting the existing ones.

Additionally, the chapter explores whether the existing spaces are a challenge or an opportunity for the development of innovative learning environments by examining how much space is available for additional learning spaces, focusing especially on the importance of informal spaces.

3.1. New rules for new spaces

The conviction that schools require significant transformation has been a prominent topic of discussion over recent decades, especially in Europe and the United States. The learning environments, previously considered as a background for the learning process, rather than its important element, are now recognized as an active factor, or as Loris Malaguzzi defined them, a "Third Teacher". Therefore, the attention regarding school buildings switched from demographic and technological aspects to the relationship between learning processes and spaces (Borri 2018).

As most of the school buildings from the 19th and 20th centuries were based on a similar pattern, the learning spaces usually consist of classrooms – the most important element of the buildings, organized along corridors. This organization has been proven to be inefficient, based on only one type of activity, which is listening to lectures given by a teacher.

Schools are traditionally based on a dualistic framework – learning spaces – comprising classrooms and laboratories, and non-learning spaces, which are all other spaces, supporting the learning spaces.
This approach has been challenged by an understanding of school spaces as a uniform learning environment – consisting of a variety of spaces, providing diverse learning opportunities, suitable for diverse types of activities, as described in paragraph 2.2. Therefore, the school building should contain a uniform educational space, rather than a set of separate spaces. This approach is not only more suitable for the contemporary ways of teaching and learning but is also more efficient, assuming more multifunctional spaces where corridors can be used also for informal studying, large circulation areas, which can become spaces for school gatherings, wide stairs used for educational purposes, etc.

Although the general ideas of a school environment and pedagogical principles of schools are universal, the spatial tools and solutions vary from one place to another due to differences in educational systems, cultural nuances, unique challenges and necessities, and the ways in which fundings for school buildings are used. Therefore, *a successful school design has to evolve out of variables that are unique to each regional and social setting* (Dudek 2000).

> *A successful school design has to evolve out of variables that are unique to each regional and social setting*

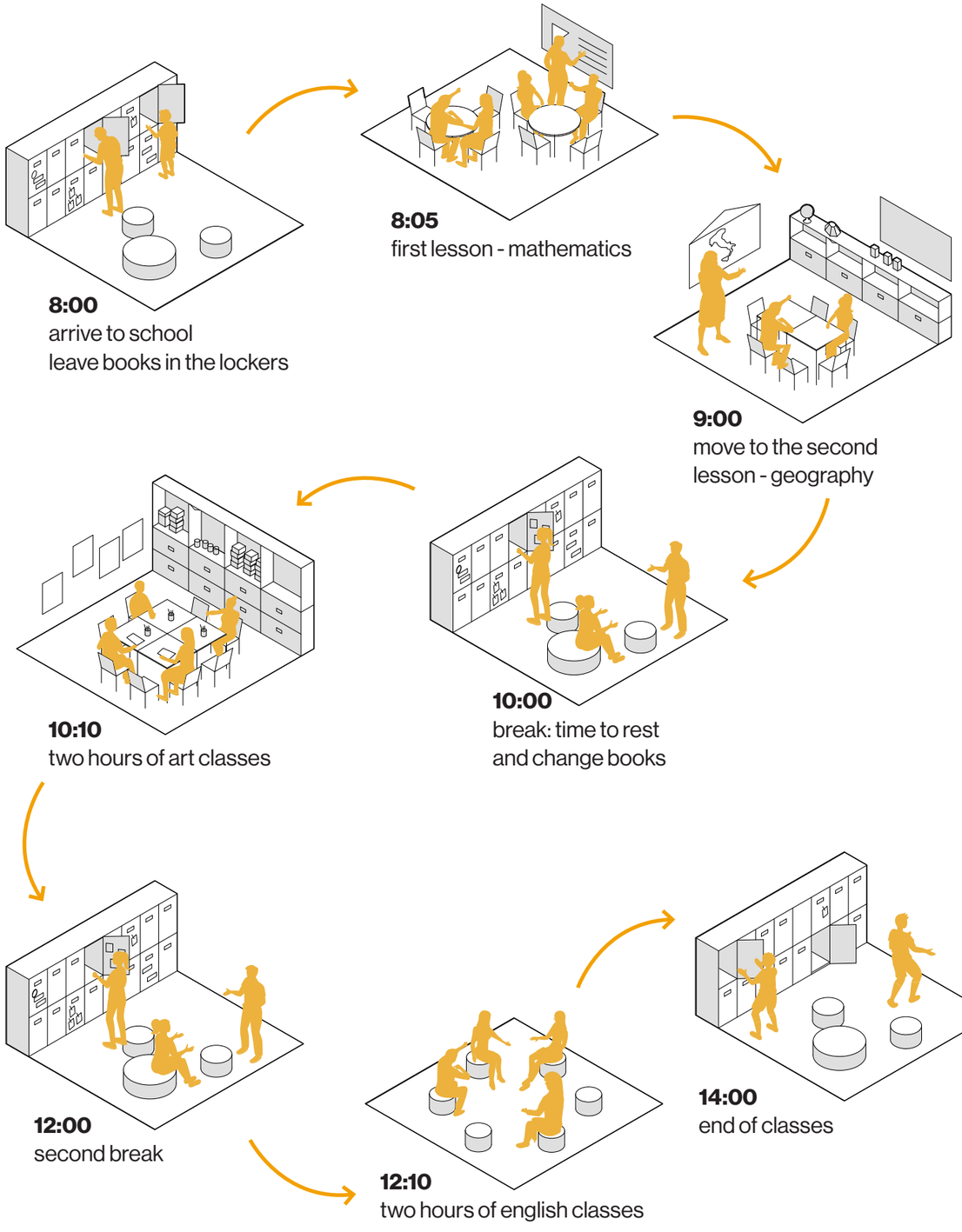
In Italy, a variety of ideas and models for school environments has appeared in the last decade. Their main purpose is to create spaces, which would enable the students to engage more and to develop their interests and cooperation skills. Therefore, they provide proposals for active learning environments –the design and the organization tools. The two most prominent models are the DADA model and the model called "1+4 Learning Spaces". They were both proven effective and suitable for Italian realities, and they consider school spaces as one environment, rather than separate spaces.

The DADA model (Didattiche per Ambienti di Apprendimento – Didactic Approaches for Learning Environments) focuses on reorganizing the classrooms by assigning them to subjects, rather than to each class (Benvenuto and attorini . The model aims to create more dynamic engaging environments. It has been already introduced in 50 schools in Italy (Cangemi and Fattorini 2018).

The 1+4 Spaces introduces a model based on five types of learning spaces, to accommodate various methods of learning – both formal and informal. It consists of the main space – the group space, in which students "build and maintain their identity" (Indire access: 2024), and four other types of spaces. The 1+4 Spaces manifesto was presented by INDIRE at the national conference From the Classroom to the Learning Environment in 2016.

Graphic 20. An average day in a DADA school

elaborated by the author. Istituto Comprensivo Via Delle Carine. *Progetto DADA. Ragazzin in Movimento. Nuova o Rganizzazione Della Scuola in Ambienti Di Apprendimento.* Lecture, n.d.



3.1.1. DADA Model

Many Italian school environments are strongly limited by the organization of the lessons. Typically, each class is assigned to one classroom where students spend the entire day, while teachers switch from classroom to classroom, on average every two hours (IC Via Delle Carine 2023). This model does not allow to use spaces in an active way – the classrooms are merely a background for the learning process, and cannot serve as educational tools, as they are not subject-specific and lack a sense of ownership.

To address this issue, the DADA model was developed, aiming at creating active learning environments and inviting students to participate in the learning process. The school spaces are grouped into “learning islands”, according to subjects. Each classroom is assigned to one or two teachers from the same discipline and is equipped with adequate learning tools. The teachers can personalize the spaces according to their needs and teaching style. Laboratories are not separate spaces, as it is a common practice in traditional learning spaces, but they are integrated into the educational landscape of each school. The learning spaces are flexible and fast to rearrange, as they are equipped with mobile furniture, designed for different types of settings. Technology is an integral part of the classrooms, as it is considered to be an essential study tool for today’s society of students.

During breaks, students move between the learning islands. The movement and physical activity works refreshing and stimulative, and the change of environments helps them to remain concentrated. Breaks are also an important moment to interact with peers and to learn informally. During the lessons, students can be actors in the learning process, as they are encouraged to discover and learn not only through listening but also through group work and experiments. In the DADA model, particular emphasis is put on the process

of “making”, as it has been proven to be an efficient way to memorize and learn effectively.

The DADA approach addresses the need for informal and formal learning, providing spaces for both of them. Furthermore, it promotes group work and learning through experience, in a diversified and specialized environment.

This model offers a different organization of the learning spaces and enhances their quality. However, more attention is needed to effectively implement this model in the existing spaces, considering their physical characteristics. It concentrates more on the organization than on the layout of spaces. Although somewhat general, it sets important objectives for creating innovative learning spaces.

3.1.2. 1+4 Learning Spaces

1+4 Learning Spaces
group learning
agora
informal area
exploration lab

The 1+4 Learning Spaces model was developed by joined work of researchers from INDIRE, in 2013. Rather than proposing regulatory adjustments, or organizational changes, the model requires an in-depth transformation of the role of education spaces, according to the innovative pedagogical approaches.

The last two decades were abundant in research works concerning the topic of the pedagogical approaches efficient in the 21st century, valuing group work and learning through doing and discovering. There has been a growing understanding that traditional classrooms, based on surveillance and discipline are inadequate for these approaches (Borri 2018). This resulted in promoting the understanding of the school environment as a “Third Teacher” – a concept formulated by Lorris Malaguzzi (Nulli, Mondaini, and Ferretti 2021). The “1+4 Learning Spaces” model is based on four different lines of investigation: identification of case studies in Europe, analysis educational policies fostering innovative learning approaches, studying technical requirements for school buildings, and literature review in the related fields (indire.it, access: 2024).

The model consists of five types of spaces: “Group Learning Space”, “Exploration Lab”, “Agora”, “Individual Area”, and “Informal Area”. The school building is understood as a uniform environment, rather than a sum of separate spaces.

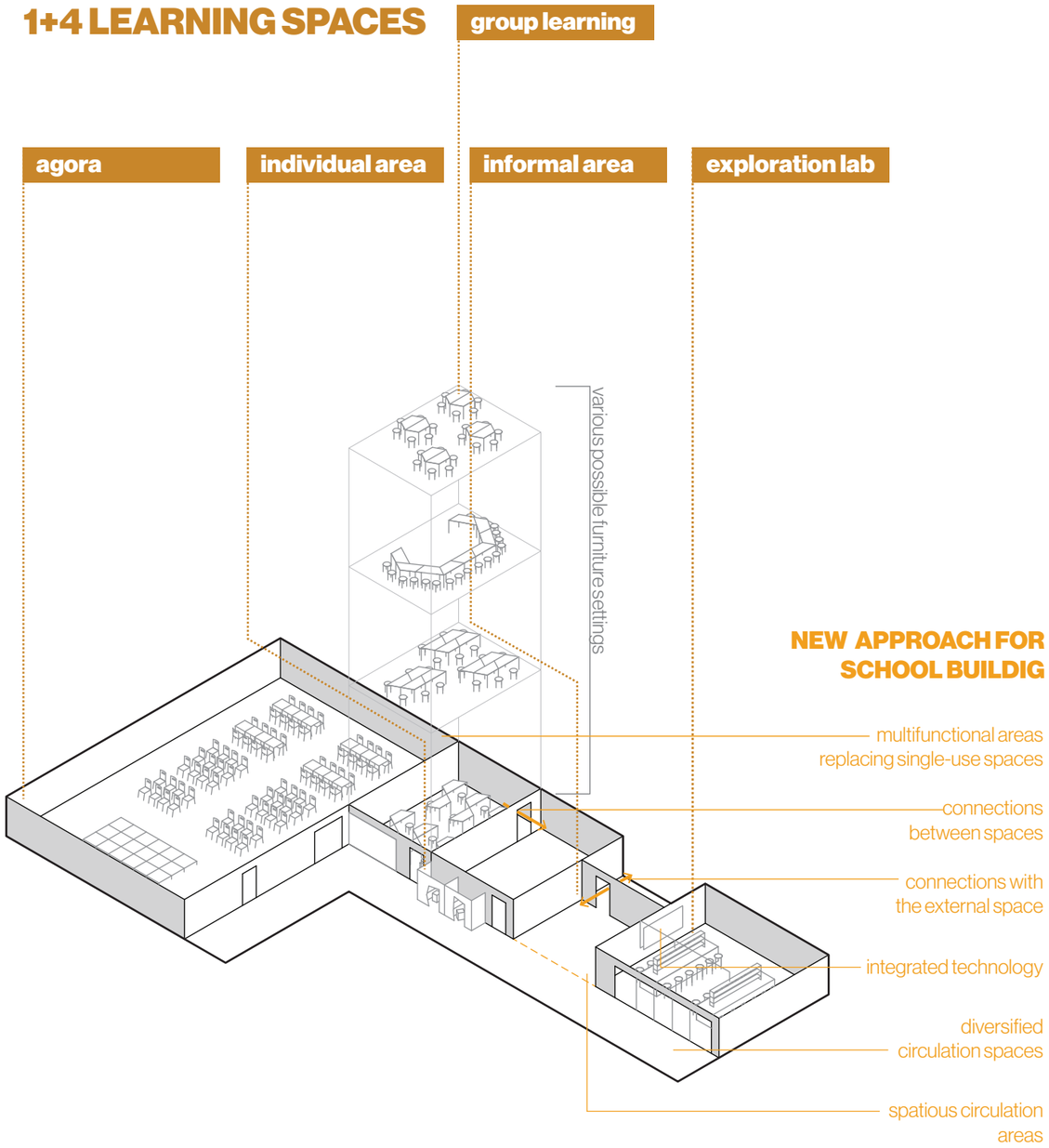
The “Group Learning Space” is a place for daily education, where the identity of a group is formed and developed. The spaces need to be equipped with furniture and suitable tools, and the layout has to be flexible to accommodate various activities, such as:

- Group work, in workstations arranged in islands, equipped with the Internet connection. Students acquire and analyze data, to complete a given task
- Designing and creating in a group works such as videos, posters, presentations, etc, with the aid of digital technologies and tools, developing, editing, and correcting them together
- Individual work: reading, listening, as well as performing individual tests to evaluate the students, in a setting that favours concentration
- Presenting work, in a setting providing optimal viewing
- Discussing problems and ideas, in a setting that provides a good view on all participants, and encouraging to take an active part in a conversation

The “Exploration Lab” is a space for discovery and experiments – to realize the idea of “Learning by doing”. Students

Graphic 21. Spaces according to "1+4 Learning Spaces" Model

elaborated by the author. Indire. "The 1+4 Manifesto for Educational Spaces." Architetture Scolastiche. Accessed July 11, 2024. https://architetturescolastiche.indire.it/en/progetti/the-14-manifesto-for-educational-spaces/.



develop problem-solving skills through observing, carrying out, and analyzing experiments, using specific tools and technologies.

Unlike the two previous spaces specifically dedicated to teaching, the "Agora" is dedicated for the entire school community gatherings. The space aims to build an identity of the entire school community. It is also a place to share the topics among parents and teachers' community.

The "Informal area, equipped with comfortable chairs, sofas, etc, is designated for relaxation and students' meetings, where they can rest between lessons, read, listen to music, and spend time with each other.

The "Individual Area" is dedicated to individual activities, where students can concentrate on reading, learning, reflecting, etc. It provides an environment for informal studying, an important element of education, through which students learn to manage their own time and attention, and develop a sense of responsibility.

The five types of spaces creating an educational landscape can be used flexibly. For instance, informal areas can be also used during the lessons, if there is a need for additional space. The "Agora" can be also a multifunctional space, used as a canteen, a library, etc. The boundaries are therefore less rigid than in a traditional school building. It is important to underline that the model is a general framework, and is intended to be realized in various ways, according to the specific needs of a school community.

3.2. Existing spaces: challenge or opportunity?

The actions for regenerating the educational landscape of Italy are still primary focused on new school infrastructure. A vast majority of national discussions and research in the field of innovative educational landscape do not focus on transformation of existing buildings. Also the technical regulations introduced in 2013, based on innovative pedagogical approaches, provide guidelines only for new constructions of school buildings. However, a significant change of the quality of learning spaces is possible only through regenerating the existing structures, as the demand for new constructions remains marginal.

The holistic transformations of the existing school buildings require translating the new pedagogical approaches and spatial models into the actual spaces, and creating a methodologies based on characteristics of actual spaces, the way how spaces are used, and how they are managed, that could be adapted to particular school buildings types (Österreichera and Geisslerb 2016). There is also a need for regulatory framework that would provide a framework and enable uniform regeneration of existing buildings (Barioglio and Campobenedetto 2022).

The holistic approach not only allows to introduce new quality, but also to use spaces in a more efficient way. Currently, most maintenance and renovation interventions focus primarily on classrooms, following the traditional division into classroom-learning spaces and less important spaces. Changing this approach enables a profound transformation of entire school facilities.

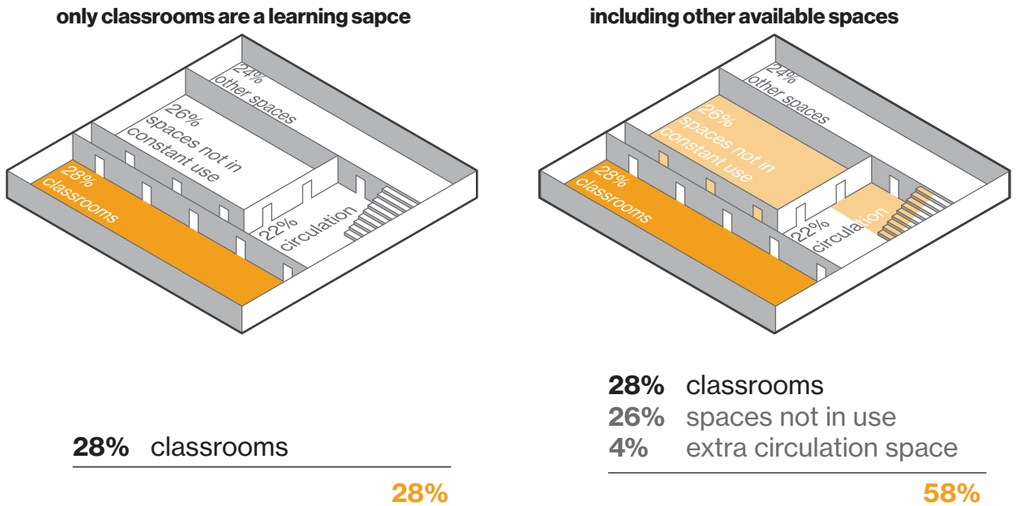
3.2.1. Space beyond classrooms

There is a great number of spaces, such as canteens, libraries, gyms, assembly halls, and many others, which are not in use throughout the entire day. They are often single-function, used for just a few hours per day, or even per week, and most of the time they remain unused. Other spaces, on average 3% of school buildings' area have been excluded from use. With time, they became excessive storage rooms, or they used to have a function, which is not necessary anymore (for example, quarantine rooms, which are empty since the end of the COVID-19 pandemic). Other spaces are not in use, because they do not meet all the safety requirements (such as maximum distance to evacuation way, etc.) (Barioglio, 2021). Broadening the uses of unutilized and single-purpose spaces could provide an extra 26% of the school buildings' area.

The circulation areas are one of the most important spaces from the point of view of school life. They are the first spaces that every morning welcome students, and the place where children and teenager spend their free time. Starting from the 1960s, spacious circulation areas, like internal court-

Graphic 22. Percentage of learning spaces surface: traditional and new approach

elaborated by the author. Barioglio, Caterina, and Daniele Campobenedetto. 2022. "L'infrastruttura della città. Il sistema ell'edilizia scolastica a Torino attraverso i suoi modelli." Rome: Lettera Ventidue Edizioni.



yards, or large entrance areas, started to replace, to some extent, a corridor layout. These spaces, around 19% of the overall circulation area (Barioglio 2021), can be used as the places for informal learning, and a gathering spaces, according to the school building's typology.

At the end of the day, the spaces other than classrooms, play a crucial role in creating an educational landscape. As shown on the Graphic 22, they occupy 30% of an average school building, which is more than the classrooms area. Also outside there is a lot of space, as the school buildings were planned together with the development of the cities, etc.

However, also the classrooms, which occupy on average 28% of the total school area, require reconsideration from a broader perspective – especially from the point of view of the present and prognosed demography. The excessive classrooms can find other functions, and the extra space of large classrooms can help creating more flexible, multifunctional group learning spaces (Barioglio 2021).

3.2.2. Not only a school

The idea of creating a civic centre within school facilities is not new. Especially in the 1960s and 1970s, school plots were often designed to accommodate not only didactical activities, but also a civic centre for the neighbourhood. The schools, for example in Turin, were constructed together with developing cities, and they are natural local centres. School designs following the guidelines from Quaderni, have ground floors of schools from that time is also open and the entrance is well visible to invite the citizens. Also their sport facilities is often used for the afternoon activities.

Additionally, their external areas, remarkably spacious, offer many possibilities of use, as the plot,assigned as educational does not change the form (Brand 1994). They are also equipped with sport facilities, and green areas, which can find many possible uses. They are often underutilized, sports courts are in bad condition, and are often used as parking places, and green areas are often neglected and not used.

3.2.3. Management

Owhership and management of the school buildings is a domain of municipalities and local administratives. The fact that every single entity is responsible for a vast number of facilities is a key factor in planning new renovation strategies, as it enables data analysis and development of transformation strategies at the municipal level.
The information about the school buildings and the history of the interventions is the base point in planning the strategies for their development. It also allows better post-occupancy analysis. The schools in each municipality share similar featues, and the strategies are already made for the regions. But the interventions are still planned usually separately, often without any shared strategies between the schools of similar construction types or models. This is a hidden opportunity for their development. It can cause a more efficient allocation of resources.

For the change of the vision for school buildings to be successful, it is necessary to be accompanied by the change of the process. There is a strong need to create a holistic vision for the school building. It was described as a "systems design", by Bela H. Banathy and C. Lynn Jenks (1990). The main idea is to focus on the vision for the entire building, or institution, rather than on fixing individual problems. This vision is supposed to give the direction for all the actions, and to set boundaries and guidelines for the decisions. The process is supposed to be grounded in findings and input from

various disciplines. understand the nature of education as a complex and dynamic system.

The systems thinking helps to understand the nature and dynamics of a complex system and to manage it efficiently. The issues within a system areno longer perceived as separated, but they arerather understood as interconnected and interdependent problems. It suggests that “the essential quality of a part resides in its relationship to the whole”. Therefore, each part should be perceived from the perspective of the entire system and how the element fits within it.

For the conventional transformations, the initial questions are revolved around the problem itself, for example:

“What are the main issues in the structure?
How can we improve quality of common spaces?
What can be done to eliminte architectural barriers?”

Instead, the starting point of the systems approach are the questions such as:

“What is the nature and what are the characteristicsof our society?
How these characteristics influence learning spaces?
What should be the role of the school?
What new opportunities and resources might be available?”

This approach shifts the main interest from finding and fixing the problem of the existing system to a broader perspective, focusing not only on the presence, but also on the future. It also provides a view of a desired future system, which is based on multidisciplinary knowledge. The decisions and actions are rooted in the vision.

A further step is to create boundaries and rules within which the decisions will be made and to create a view of the ideal system within these rules. Only after this a feasibility study can take place and decisions can be made about how much of this ideal situation can be done. In case of transfrmations dome from the state fundings, the rules and boundaries are usually preordained by the Ministry of Education or other funding entities and full flexibility is not possible.

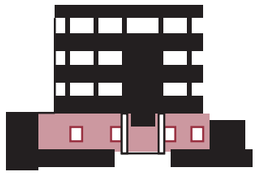
This process is supposed to be constantly revised and reconsidered. The design process is supposed to be concluded with its implementation. New solutions should be tested during their utilization, and conclusions should be drawn regarding their effectiveness. Subsequently, improvements and modifications should be implemented. The cycle then repeats with the system being continually adjusted and updated.

Ch. 4

Examples of effective transformations of school buildings into active learning environments

Primary school in Leoben

Fermi School

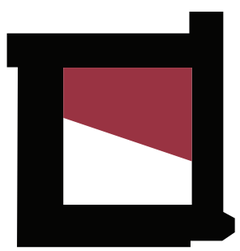


Munkegaard school

Primary School in Auer

Berlin Metropolitan School

906 School in Sabadell



Sint-Lievenspoor School in Ghent

Introduction

The analysis explores the innovative learning spaces created in the existing school buildings, constructed in the 19th and 20th centuries in Europe. The main focus is on identifying which interventions and strategies led to successful transformations taking into consideration the scale of transformation.

An important part of the analysis are the connections with the local context, for instance through outdoor areas, and ways in which learning spaces can be shared with other users. It analyzes how the space is distributed to ensure privacy for students simultaneously providing sufficient space for other users.

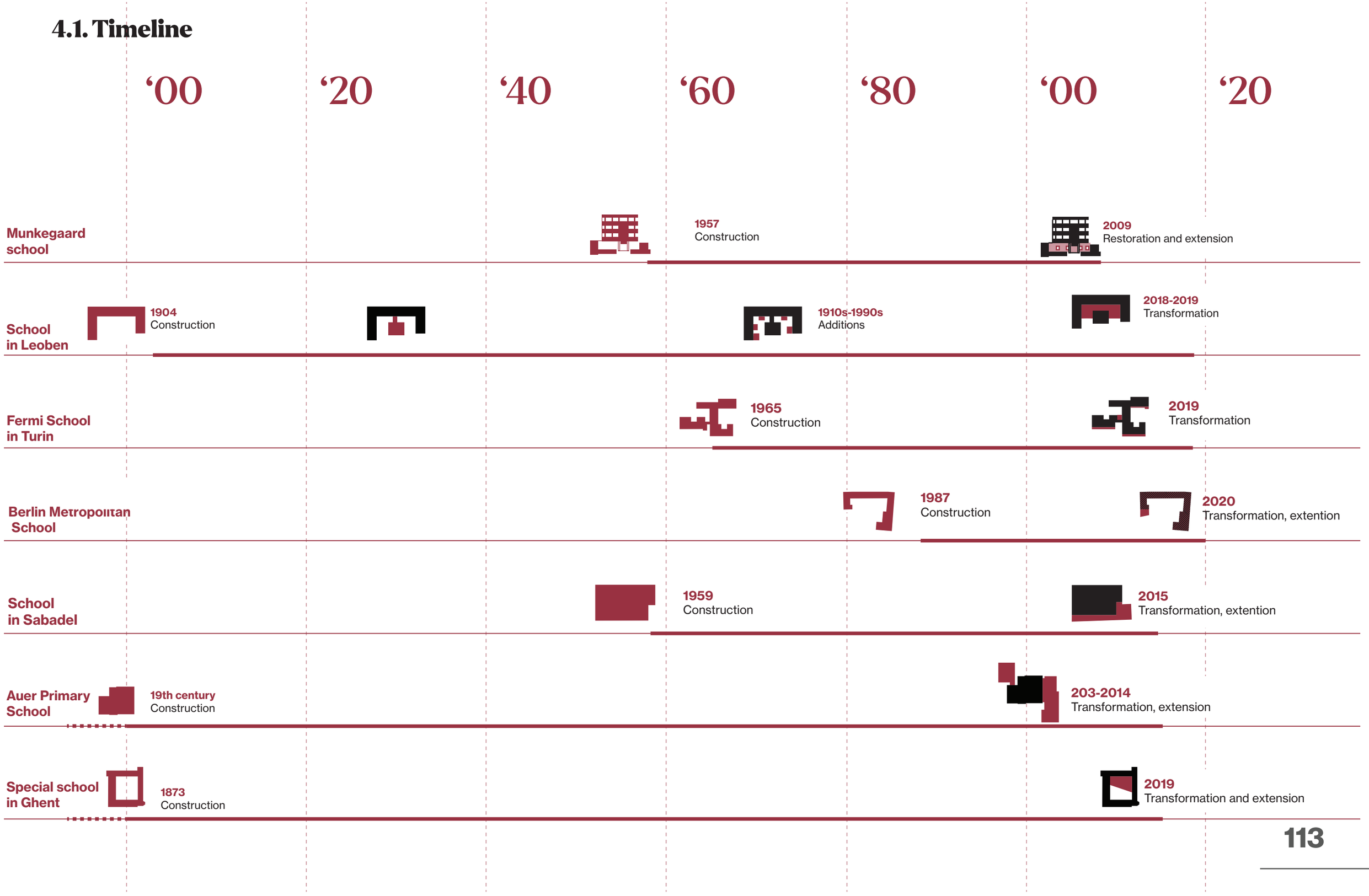
A focus is also placed on various types of learning spaces, examining learning spaces beyond traditional classrooms, such as outdoor spaces, large circulation areas, multifunctional rooms, etc; paying particular attention to how corridors have been transformed from narrow monofunctional spaces into an important and useful element of learning environment. The 1+4 Learning Spaces model, described in chapter 3 is utilized as a framework to categorize different types of spaces (group learning spaces, exploration labs, agora, individual areas, and informal areas). It also explores interconnections and relations between different types of spaces and analyzes how they are organized together.

The exterior parts of the school environments are analyzed to determine their character and functions and to observe the ways to use the space efficiently, providing all necessary functions, especially on small plots.

Additionally, the design and renovation process is examined, exploring if the local community was involved in the design and the duration of construction works, considering also if the school was open during the renovation works.

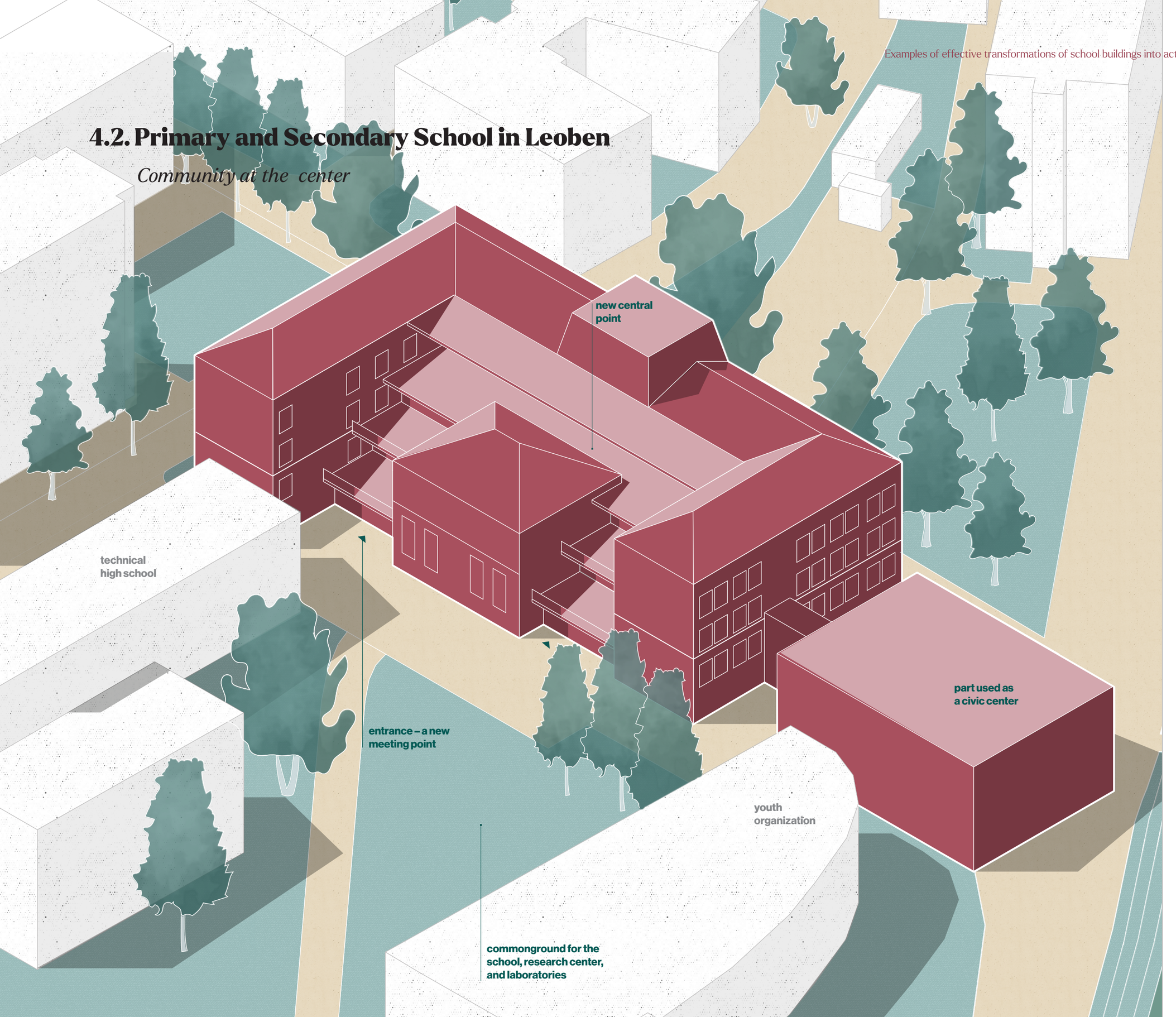
The case studies were selected for their innovative approach to learning spaces, which enables an active use of of both indoor and outdoor areas. Another important criterion was to choose school buildings in climates similar to Turin to ensure that the findings are relevant and applicable there. Additionally, diversity in terms of the location, density, size of the plot and buildings, and age of the initial structures, were considered. This allowed us to understand which solutions work best in which conditions.

4.1. Timeline


'00
'20
'40
'60
'80
'00
'20
Munkegaard school
1957
Construction
2009
Restoration and extension
School in Leoben
1904
Construction
1910s-1990s
Additions
2018-2019
Transformation
Fermi School in Turin
1965
Construction
2019
Transformation
Berlin Metropolitan School
1987
Construction
2020
Transformation, extention
School in Sabadel
1959
Construction
2015
Transformation, extention
Auer Primary School
19th century
Construction
203-2014
Transformation, extension
Special school in Ghent
1873
Construction
2019
Transformation and extension

4.2. Primary and Secondary School in Leoben

Community at the center



Location:
Leoben, Austria

School grade
primary and lower secondary

Year of construction
1904

Years of renovation
2018-2019

Arch. of renovation project
Franz&Sue

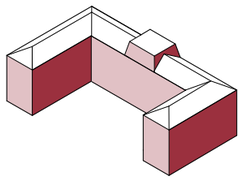
Client
Municipality of Leoben

Effective floor area
9 402 m²

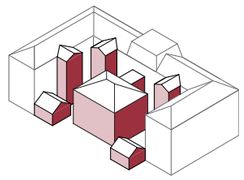
Transformation cost
14.4 Mio. €

4.2.1. Transformation process

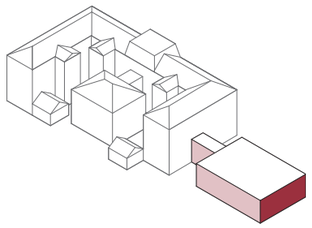
Pre-existing structure



The oldest part of the school structure dates back to 1904. It was characterized by layout typical for this time, with corridor and classrooms attached to it, an entrance in the central axis and a monumental facade facing the street. The school building did not contain other functions, such as recreation or physical activity, but it provided only traditional spaces for learning.

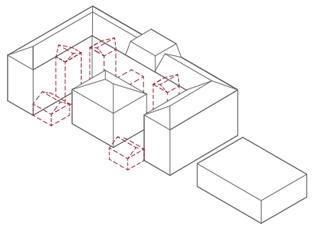


With changing needs and regulations, additional spaces were gradually added to the initial structure – such as school custodian, sports room, bathrooms, etc.
They were added spontaneously, without any logic or plan, just to solve urging need for extra space, quickly and with low cost.
Apart from the fact that they satisfied the need for extra rooms, they blocked the light and made an organization of the school spaces more confusing and less clear.

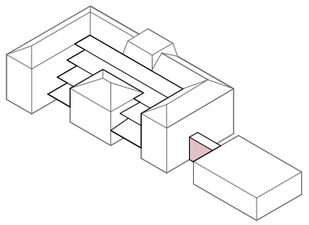


A new gym, this time bigger than the first one, was added next to the school building and connected to it with a roofed pathway. It contained also other spaces, such as changing rooms and bathrooms. The new building is remarkably different from the older ones and is rather perceived as a separate structure, not related to the rest of the school.

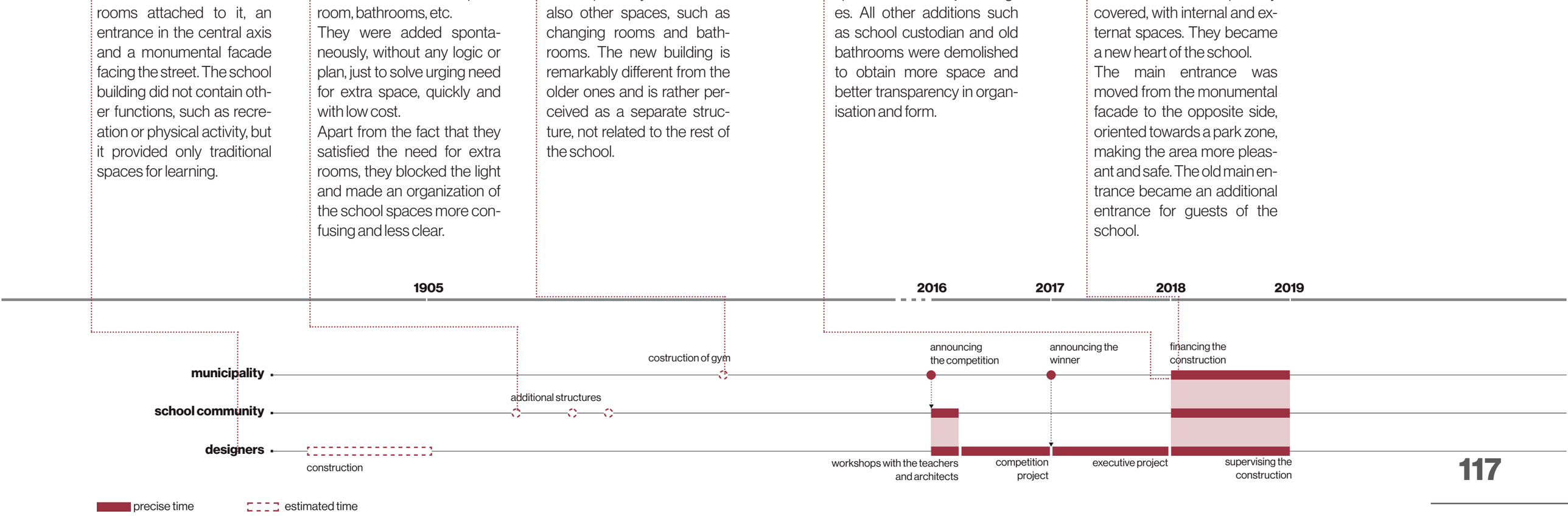
Transformation



The first phase of the renovation was preserving the oldest building and the two gyms and renovating the spaces, without major changes. All other additions such as school custodian and old bathrooms were demolished to obtain more space and better transparency in organisation and form.

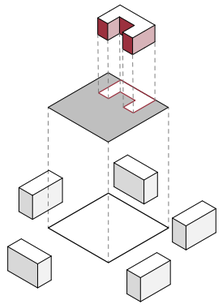


The newly created space was filled with common areas connected with the main corridor, opening to a garden. in a form of terraces, partially covered, with internal and externat spaces. They became a new heart of the school.
The main entrance was moved from the monumental facade to the opposite side, oriented towards a park zone, making the area more pleasant and safe. The old main entrance became an additional entrance for guests of the school.



4.2.2. Spatial analysis

context



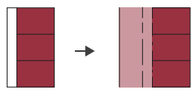
C- shape main building

40% plot coverage

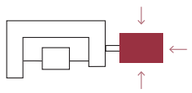
town up to 25 000 citizents
medium density

strategies

creating a heart of the school
providing a central area with spacious, internal and external, common areas

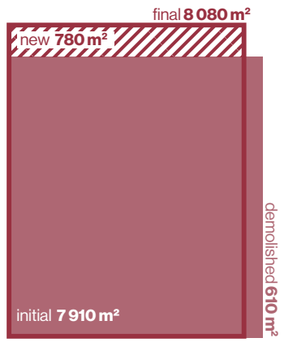


extending educational spaces
corridors and common spac-es can be used for didactical purposes



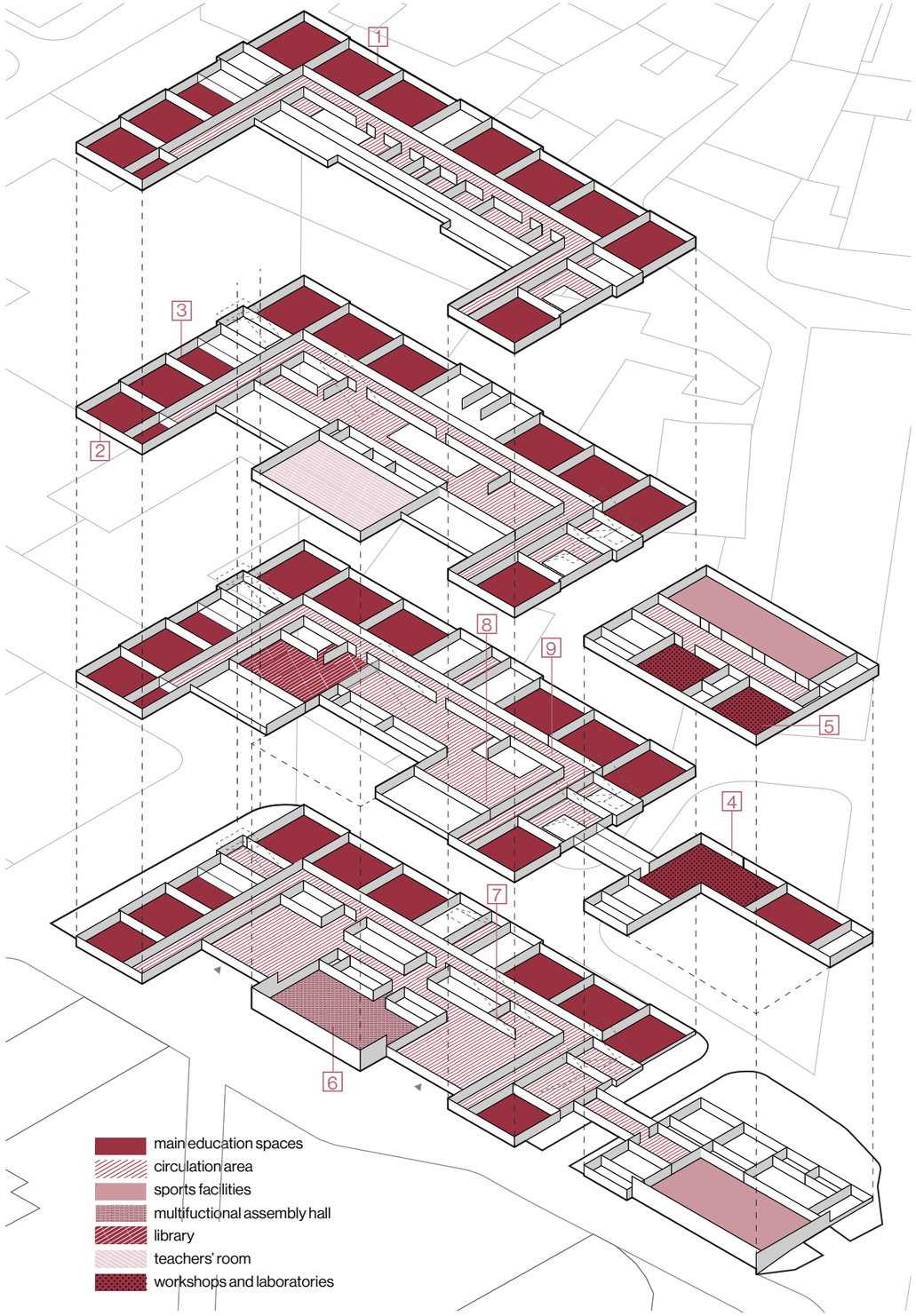
providing space for the local community
including the local community into the school building

intervention in numbers



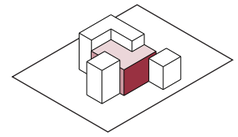
demolished
- more space for modifications
- improving daylight
- increasing transparency and clarity of the school building

new
- creating spacious common area and the school's heart
- opening the school onto the garden



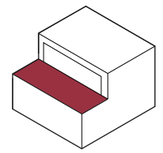
spatial ideas

expansion strategies



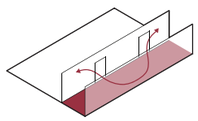
infill

additional learning spaces



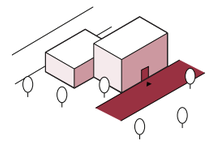
terraces – an extention of the common areas on the rooftop of lower parts

circulation



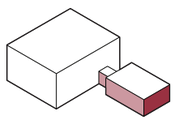
perforated corridors, blended with informal areas, and addi-tional learning spaces

entrance



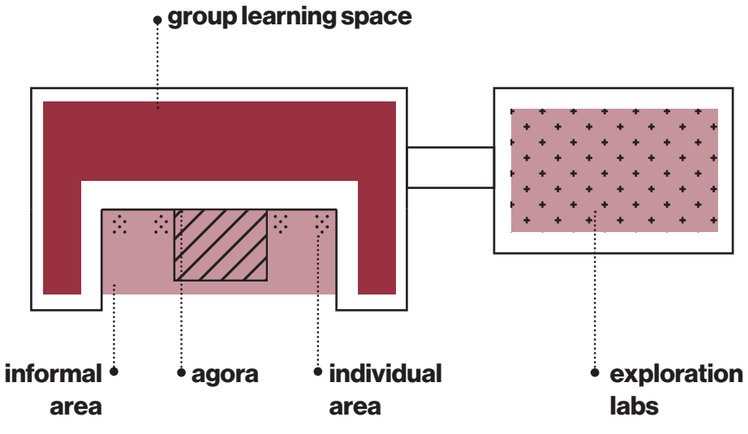
from a private road paralell to the main street

civic center



in a separate building, connected with the main one

Learning environments: spatial analysis through the 1+4 model

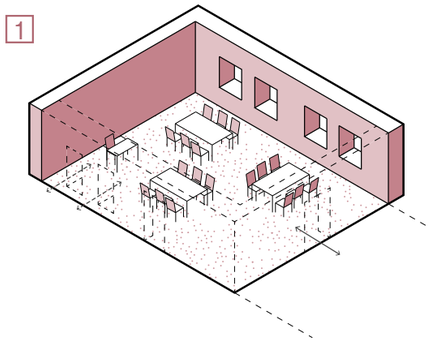


The school, placed across two buildings, ecompasses after the transformation, a variety of educational spaces,stretching beyond traditional classrooms. In the main building, the corridors blend with informal areas and additional learning spac es. In the middle, there is a multifunctional assembly room, which serves also as a small gym. Most of the classrooms (90% of the entire classrooms area) are bigger than 50 m². In order to create classrooms which can be used in many ways, their layout is simple, and equipped with mobile furniture, which can be used in many different ways.

In the smaller building, laboratories and a multifunctional workshop space, were situated, as well as a gym, available also as a civic center. This part of a school is also suitable for various meetings, presentations and gatherings of the local community.

Group learning spaces

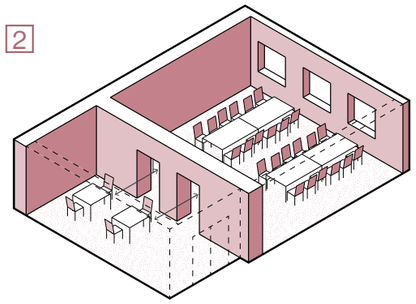
1



interconnected classroom

classroom with a connection with the other one, and with visual connection with the common space

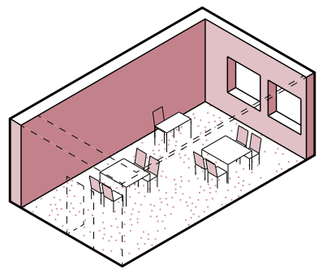
2



classroom + extension

classroom divided into two spaces, which allows to accommodate two different types of activities simultaneously

3

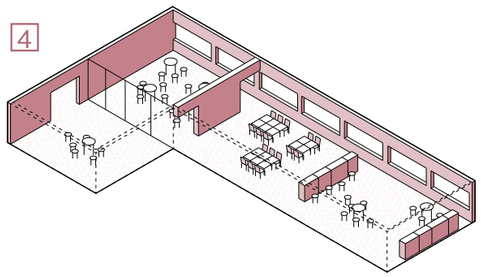


small classroom

a space for small groups and one-to-one activities

Exploration labs

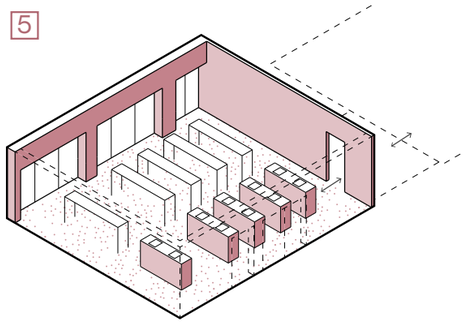
4



workshop space

Open-space workshop for different forms of art, special activities, etc. Available for the local community

5

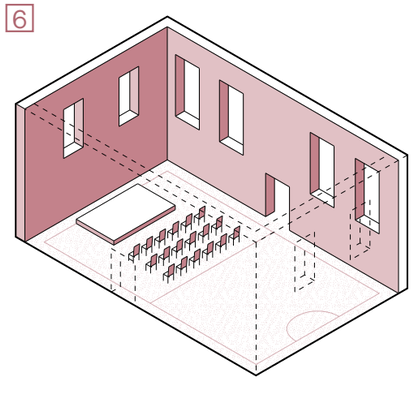


science laboratory

labooratory with a storage space shared with another laboratory room. Available for the local community

Agora

6

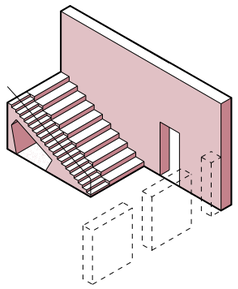


small gym

Multifunctional space situated at the center of the school, used as an assembly room and a gym

Individual areas

7

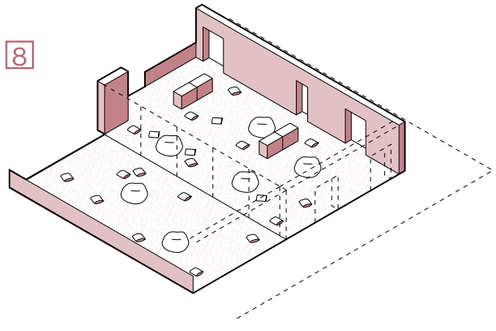


wide stairs

central stairs located in a common area, connecting all the floors and being used as a sitting space

Informal areas

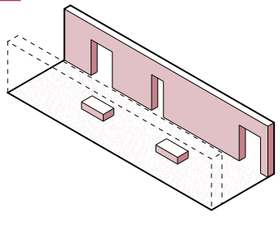
8



central common spaces

a multifunctional space which can be used during the breaks and lessons

9



perforated corridors

connecting all the spaces, used also exhibit the works of students, and as an extension of classrooms

4.3. Munkegaard School

Extension hidden under the ground

Location:
Gentofte, Denmark

School grade
primary and secondary

Year of construction
1957

Years of renovation
2007-2013

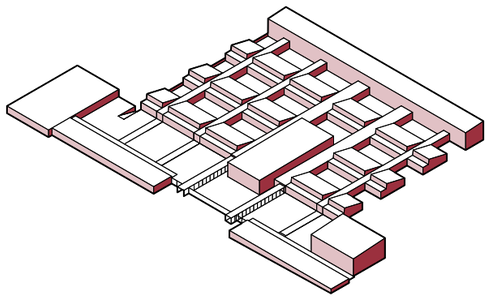
Arch. of renovation project
Dorte Mandrup Arkitekter

Client
Municipality of Gentofte

Total area
7 000 m²

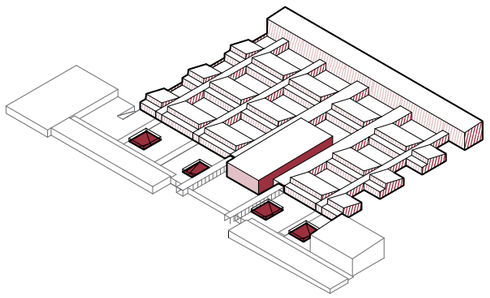
4.3.1. Transformation process

Pre-existing structure

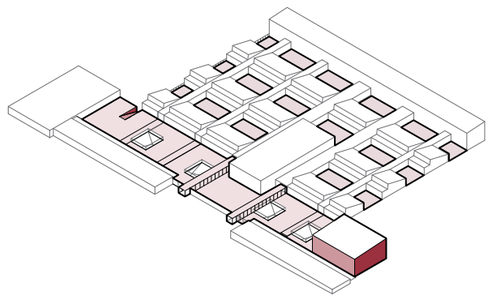


- The Munkegaard school, one of the most recognizable works of Arne Jacobsen, was built in 1957, eight years after the beginning of the design process. The architect designed every levelof the project: from overall shape to details and furniture.
The internal and external parts of the school complement each other. Each classroom have access to a small garden, where classes can take place. At the center, the assembly hall was design, to accommodate school gatherings.

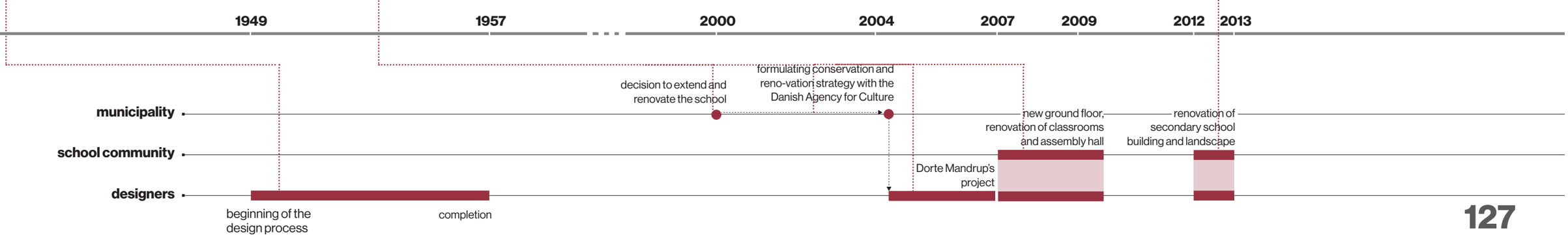
Transformation



- In 2000, the municipality of Gentoftedecided to renovate the school and to enrich it with project-based learning facilities.
In 2009, the ground-floor extension was completed, accommodating flexible learning spaces such as laboratories and the informal area.
Additionally, the orifinal design was renovated, and the media library was added to the assembly hall.

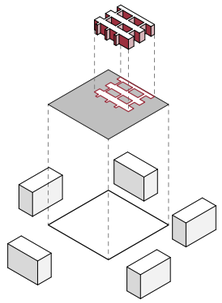


- In the years 2012-2013 the landscape project was realized. The fromt courtyard and the playground over the laboratories was created, and 17 courtyards connected with the classrooms, were restored. Previously accessible only from the classrooms, they became accedssible also from two adjacent corridors.



4.3.2. Spatial analysis

context

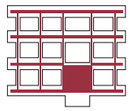


grid-shape main building

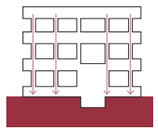
40% plot coverage

town up to 100 000 citizents
medium density

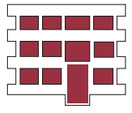
strategies



preserving original design
not introducing drastical changes tro spatial organization and the existing spaces

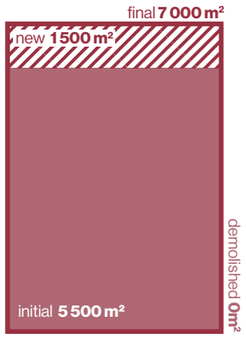


incorporating innovations
adjusting the school to the new pedagogical approaches and innovativetechnologies



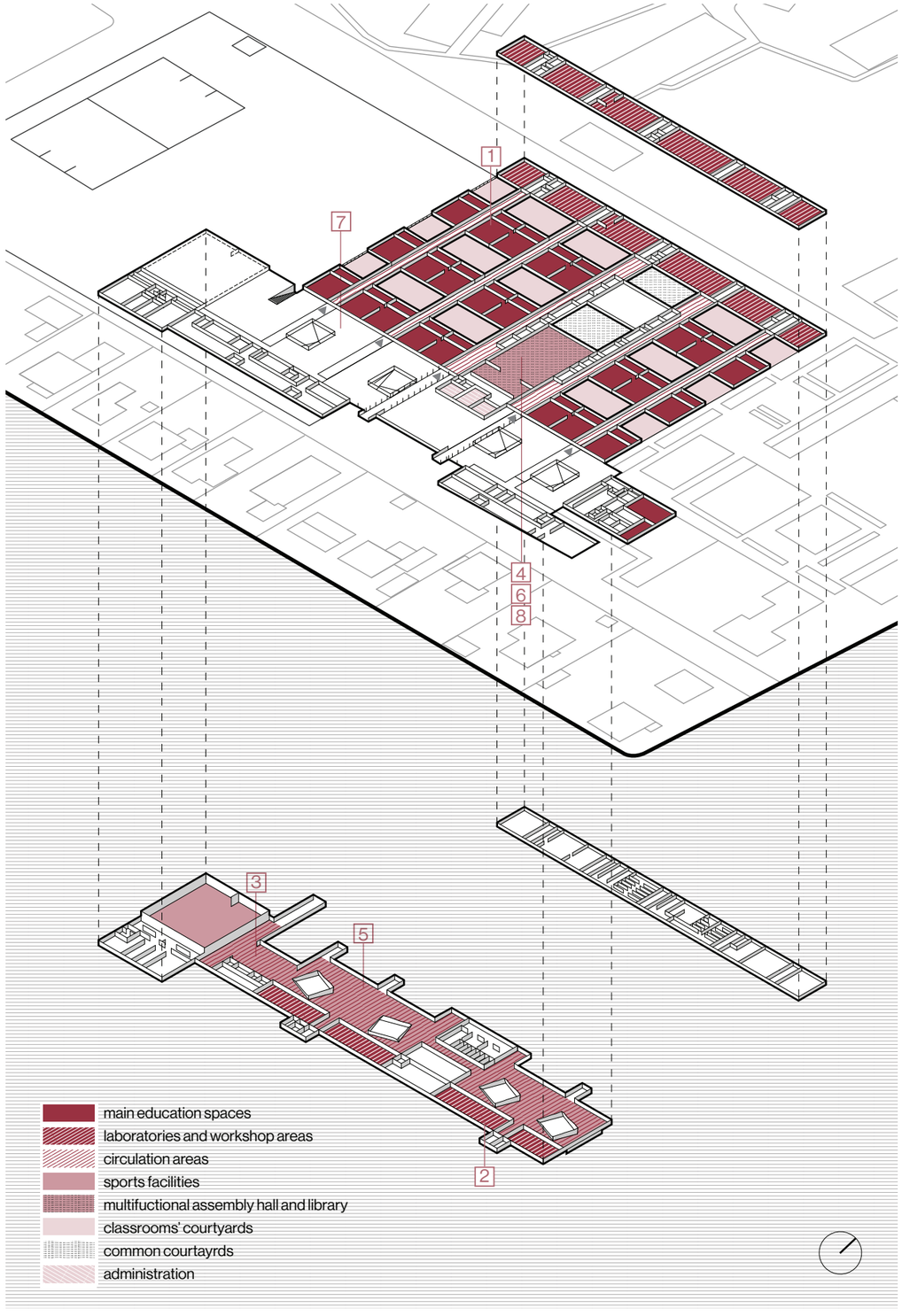
multifunctionalizing
extending possible uses of common areas

how big was the intervention



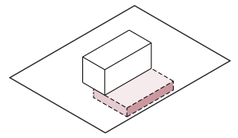
demolished
no demolition, preserving the entire existing structure

new
- creating informal area
- creating workshop rooms for interdisciplinary courses



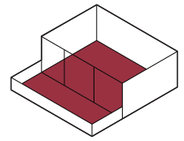
spatial ideas

expansion strategies



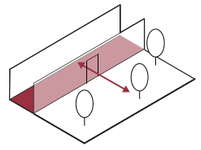
underground extension under the ground, to preserve the original silhouette

additional learning spaces



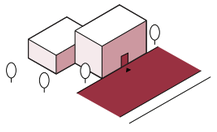
courtyards integrated with learning spaces

circulation



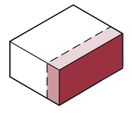
corridors connected with external courtyards

entrance



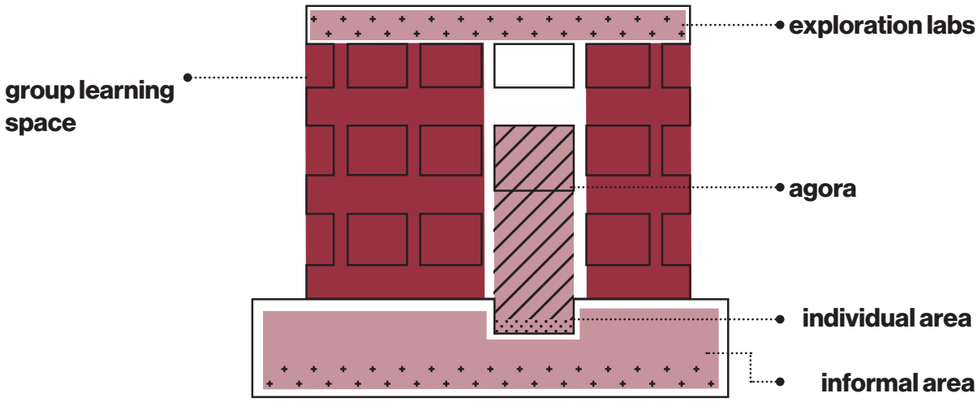
from a school courtyard

civic center



a part of a building dedicated for afternoon activities

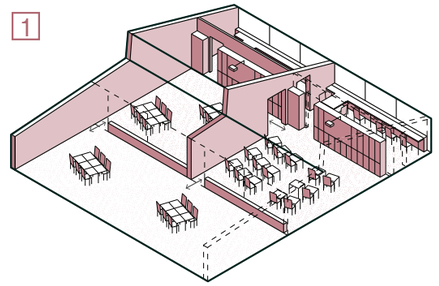
Learning environments: spatial analysis through the 1+4 model



The school is organized into houe-like spaces, where the group learning spaces are located. The learning spaces stretches outside the building, to private gardens. At the front of the school, laboratory and workshop areas are located, blended wirh spacious informal areas. At the back of the school, rooms for afternoon activiries were located, for the school community. The central part of the school, primarly used only as an assembly room, has gained a new function – a library, which also works as an informal and individual area.

Group learning spaces

1

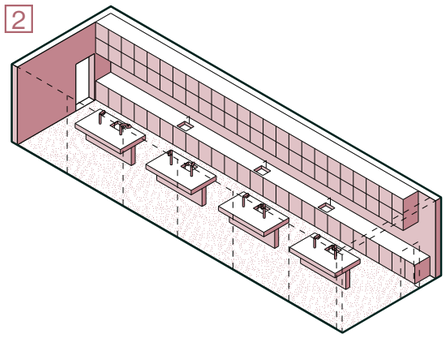


inside-outside classrooms

classroom with a small entrance area, integrated with a garden, which is used during the lessons

Exploration labs

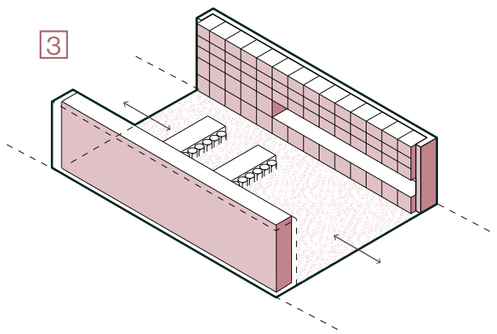
2



laboratory room

Innovative laboratory room, well visible from the common area

3

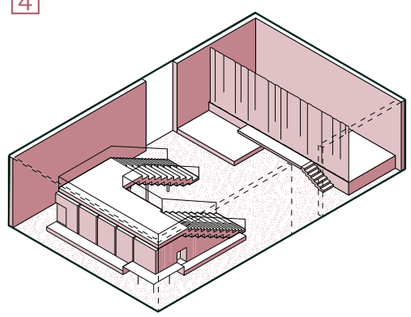


open workshop area

a workshop space, being a pard of the common area

Agora

4

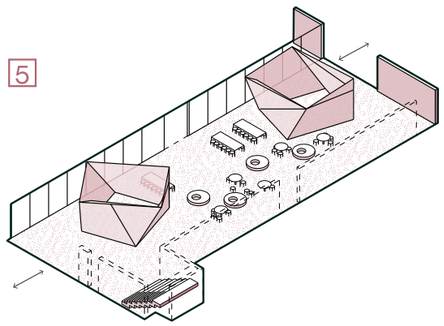


the stage room

Multifunctional space situated at the center of the school, used as an assembly room, with a sitting space on wide stairs

Informal areas

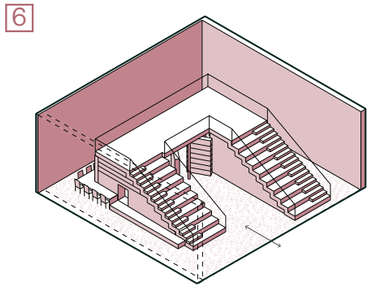
5



open learning space

spacious open-space area in the extension part of the school, equipped with flexible seats

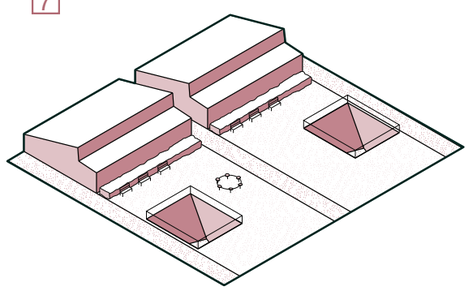
6



the stairs-library

multifunctional stairs, where the library is located, providing space to read, being also used as a meeting space by the students

7

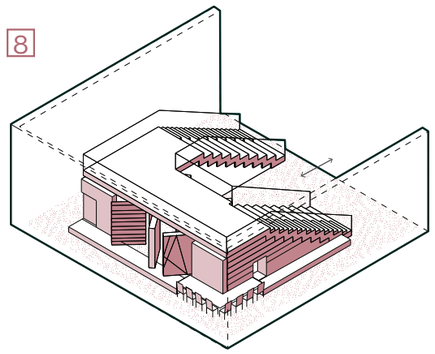


the extension rooftop

large entrance area, with playground elements, seats, where students can watch what is happening inside the school

Individual areas

8

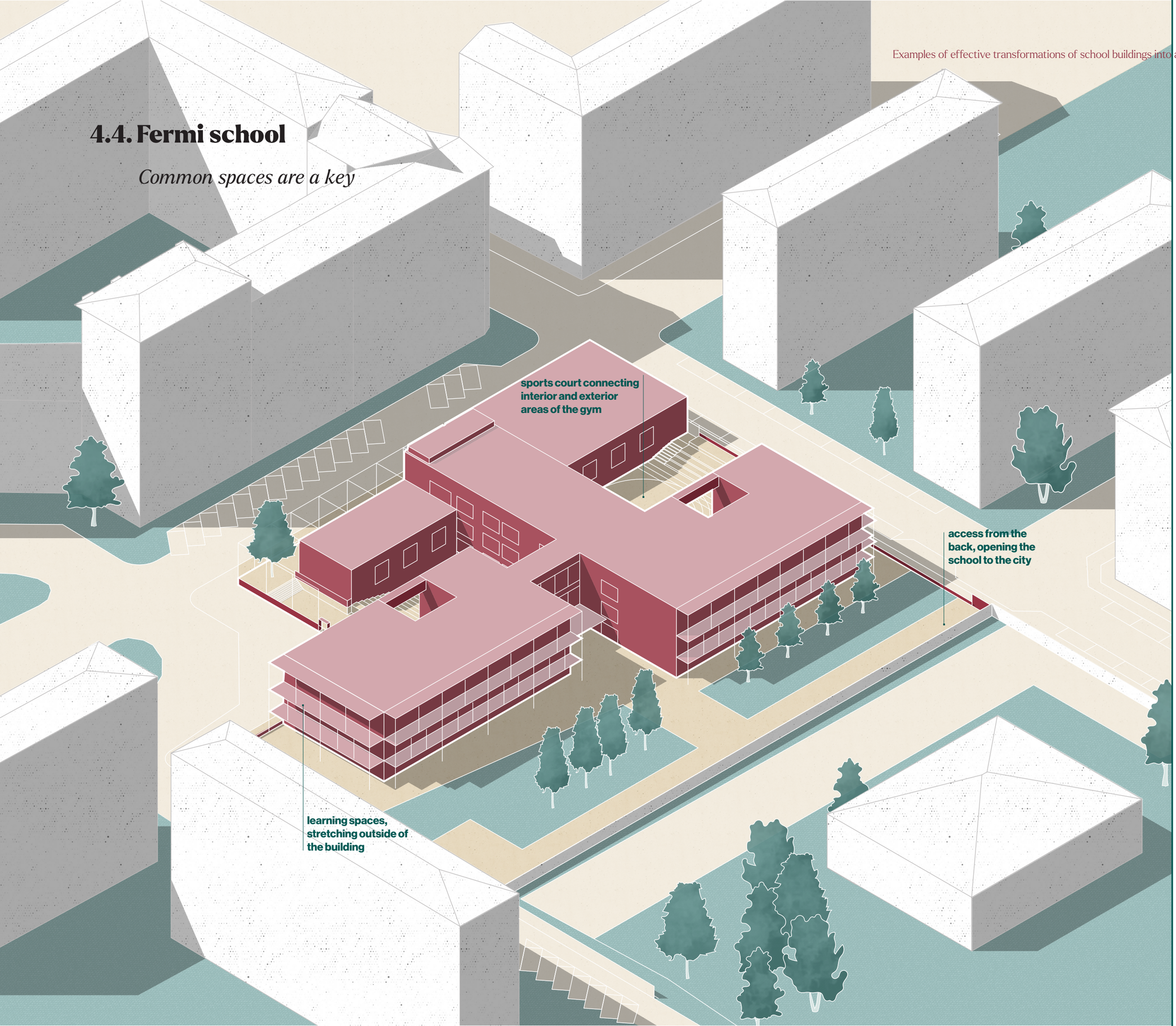


quiet library

the library contains more cosy and small spaces, for individual activities

4.4. Fermi school

Common spaces are a key



Location:
Turin, Italy
technical high school

School grade
lower secondary

Year of construction
1965

Years of renovation
2018-2019

Arch. of renovation project
BDR bureau

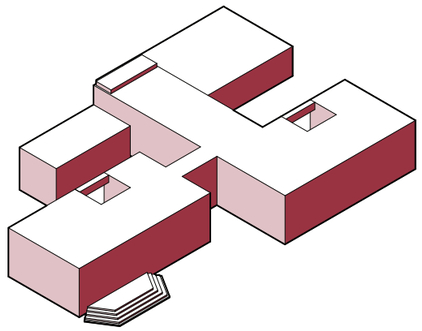
Client
Fondazione Giovanni Agnelli

Effective floor area
3 700 m²

Transformation cost
7.7 Mio. €

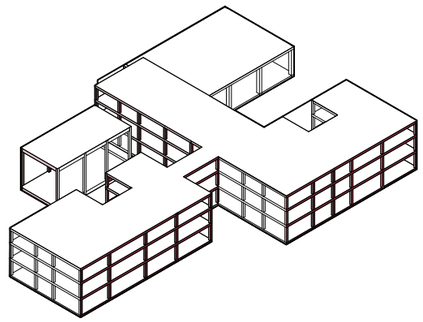
4.4.1. Transformation process

Pre-existing structure

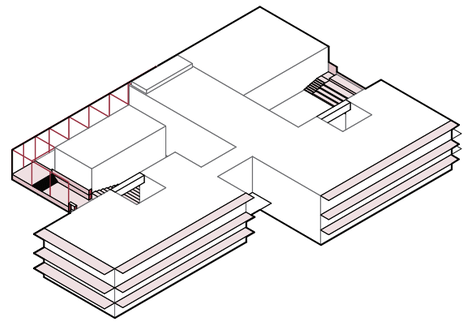


- The Fermi model was designed in the 1961, at the beginning of demographic boom, and built in several locations in Turin. It is a typical school for this period and location
- The school was built in the zone characterized by especially fast expansion, due to its industrial character.
- The building's structure and layout remaine d almost unchanged since its construction.

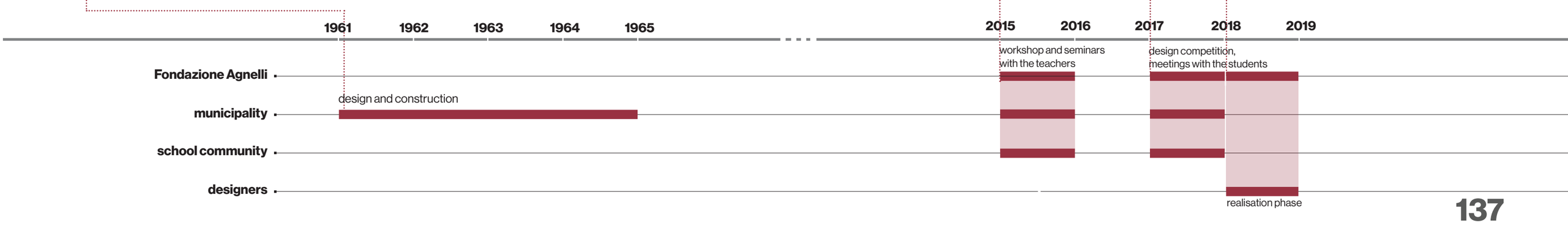
Transformation



- After a year of meetings and seminars with the school communit, from 2015 to 2016, the design competition was announced (in 2017), concluded with announcing the winning project (designed by the BDR Studio).
- The renovation started in 2018, and lasted for 410 days. The school was not used during this time.
- The first phase was the demoition of a major part or non-load bearing elements, leaving the structural parts of the building almost untouched.

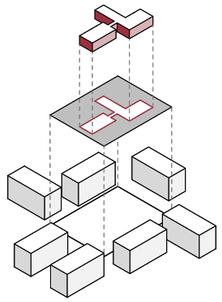


- The second step was the thorough redevelopemnt of the building, with an adition of around 510m^2 of new spaces. The transformation of the Fermi school has been intended to become a replicable example for similar interventions in Italy.



4.4.2. Spatial analysis

context

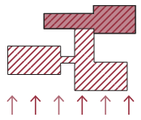


irregular shape main building

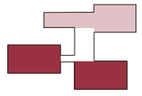
38% plot coverage

city with over 800 000 citizents
semi-peripheral district

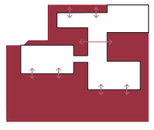
strategies



creating community school
integrating community life with the school life

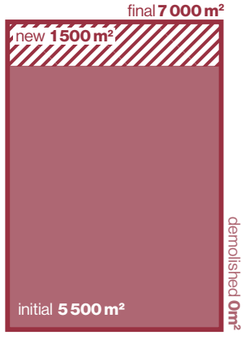


cluster organization
the group learning spaces are organized in clusters and laboratory spaces



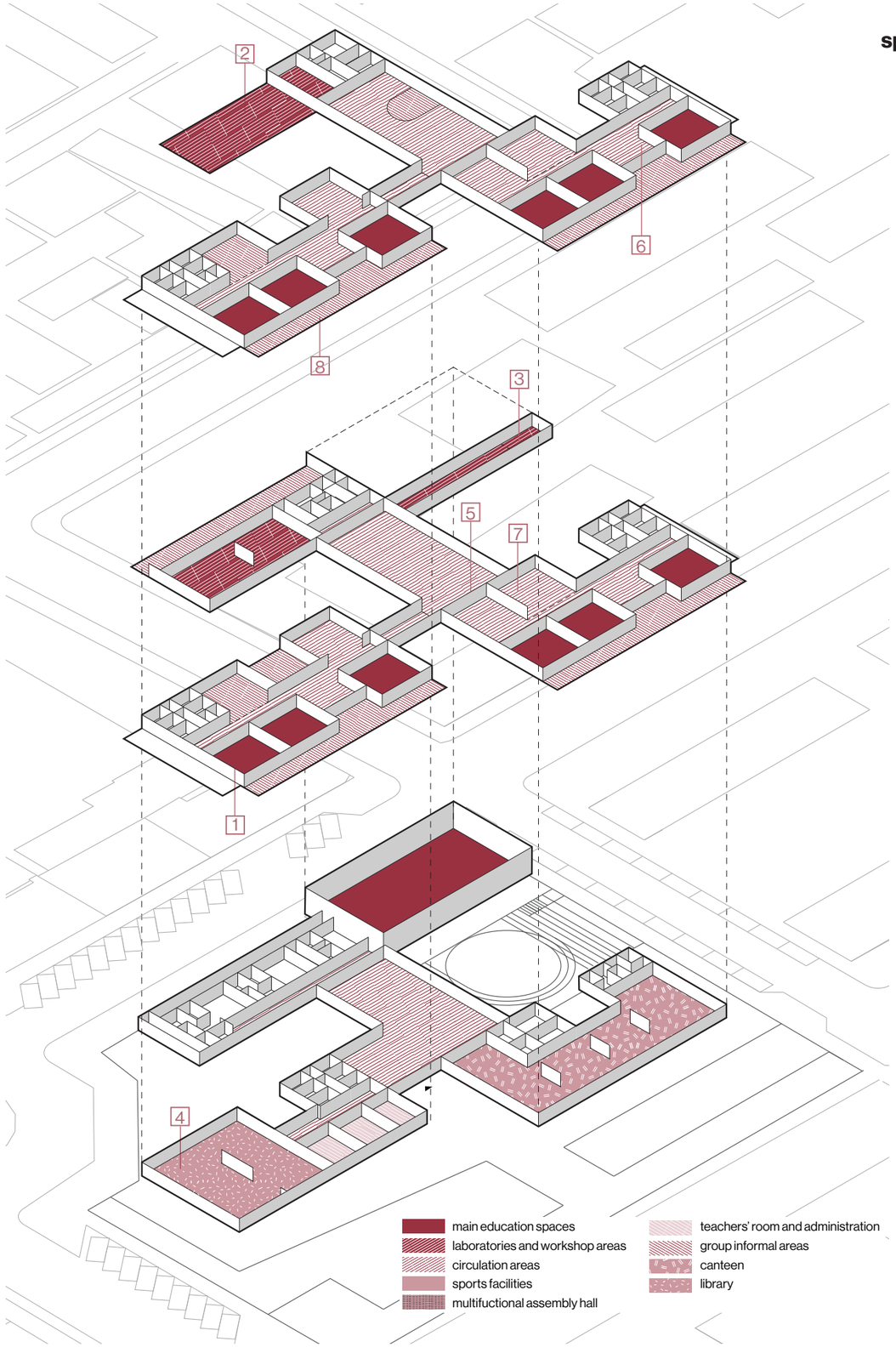
integrating external areas
external and internal areas are well connected together, and can accommodate didactical activities

how big was the intervention



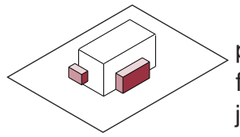
demolished
no demolition, preserving the entire existing structure

new
- creating informal area
- creating workshop rooms for interdisciplinary courses



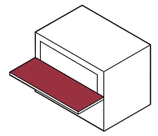
spatial ideas

expansion strategies



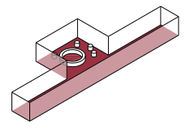
parasite
free standing structure adjacent to the existing buildig

additional learning spaces



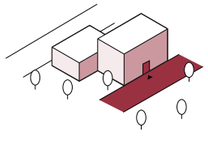
balconies as an extension of learning spaces

circulation



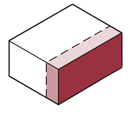
corridors with spacious informal areas

entrance



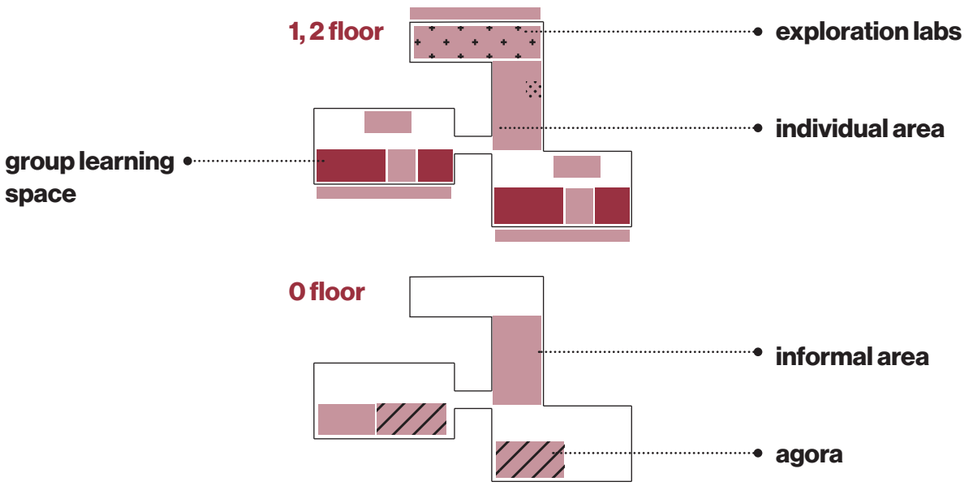
from a school courtyard

civic center



a part of the building accessible for the local community in the afternoon

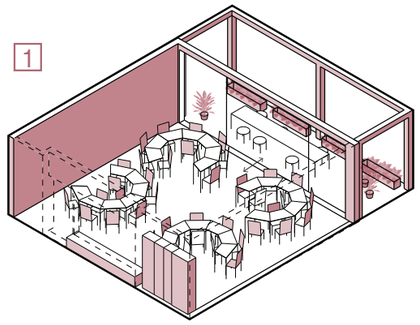
Learning environments: spatial analysis through the 1+4 model



The characteristic feature of the Fermi school layout is flexibility and multifunctionality of spaces. There is no strong division between learning spaces and informal spaces - internal and exiternal, such as spacious corridors, or balconies, can be utilized for the lesson's purposes. Therefore, the division into five different types of spaces does not limit the spaces to te assigned types.

The group learning spaces, on the first and second floor, are groupped into clusters. In each cluster there is also a spacious informal area inside and outside, on the balconies. The informal areas outside the clusters include more private places, for individual study and relax. The ground floor and the exploration labs, situated in the western side of the school, are available for the local community. The large spaces, such as libary and canteen are also gathering places for the school community and citizents.

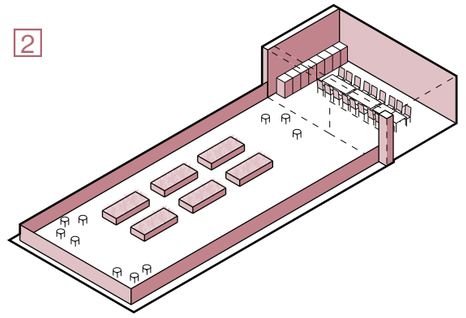
Group learning spaces



classroom in a cluster

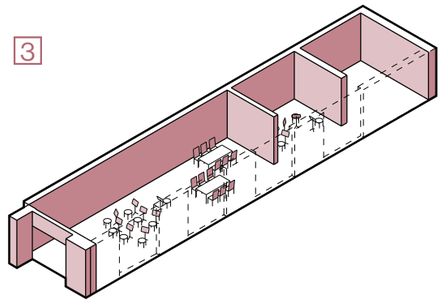
one of three classrooms of a cluster, with an access to the balcony. The balcony is also used during the lessons, if needed

Exploration labs



botanical laboratory

the room with a large external areas, where the garden is located, in which the students can lear in practice

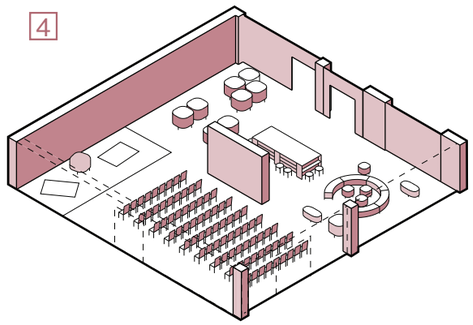


music workshops

situated in a secluded part of the school, to avoid the noise transmission, and available for the local community

Agora

4

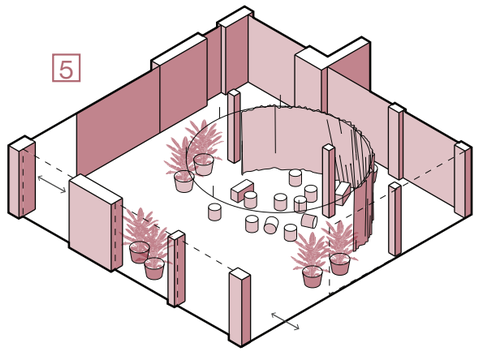


library

Lagre library room, with a space for the school and local community gatherings

Informal areas

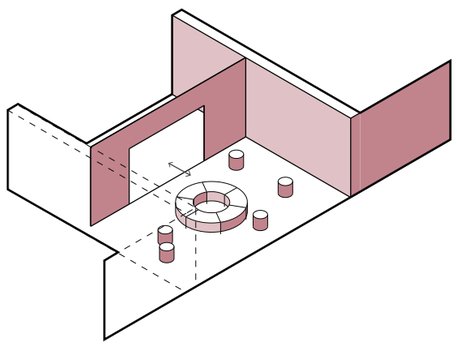
5



the circle

flexible space used primarly during the breaks, with a curtain partition for more private ambiance

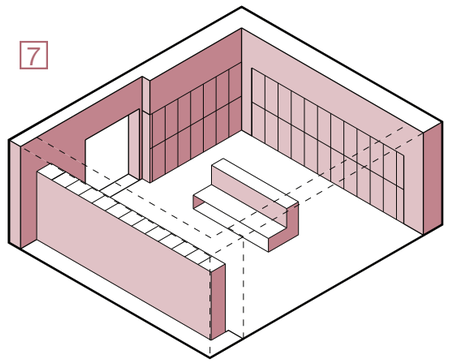
6



cluster's informal area

an informal area, situated in a niche withing each cluster, which can be used during the breaks, as well as during the lessons, as an extinsion of classrooms

7

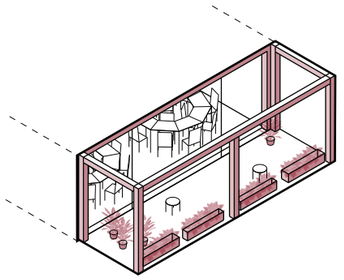


lockers

the open space in each cluster with lockers for the students, which is a natural meeting point

Individual areas

8



external spaces on the balconies

a multifunctional space on the balconies, can be used as an individual space for the students

4.5. Primary School in Auer

School defined by the community

Location:
Auer, Italy

School grade
primary

Time of construction
19th century

Years of renovation
2013-2014

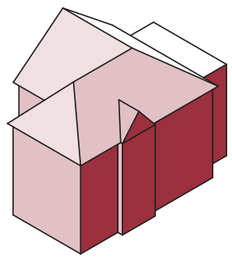
Arch. of renovation project
MoDus Architects, Bergmeisterwolf architekten

Client
The City of Auer

Usable area
3 700 m²

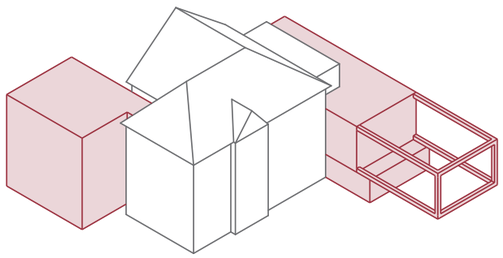
4.5.1. Transformation process

Pre-existing structure

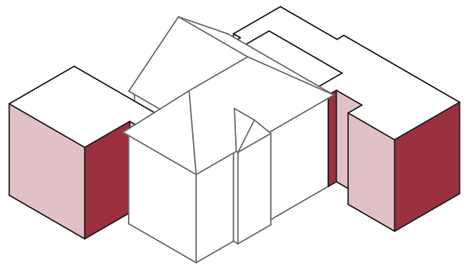


- The school was built in late 19th century or at the beginning of 20th century. It was an important building, of high heritage value. It was in use since its construction.

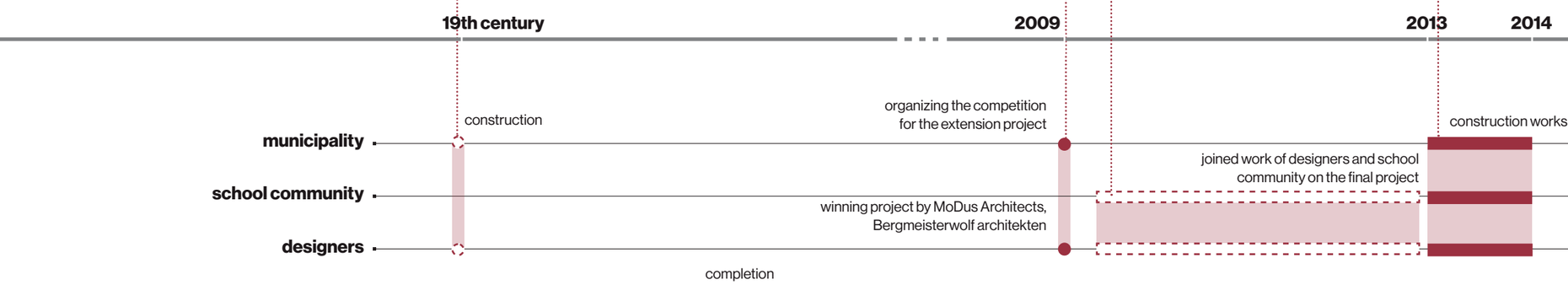
Transformation



- An additional space was needed as the school community increased in number. A competition was organized for a project of extension and renovation of the historic building. The winning project designed by MoDus Architects, Bergmeisterwolf architekten assumed creating two new structures added on the opposite sides of the existing one.

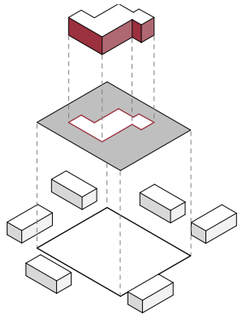


- After the competition, the teachers, headmasters and school community was collaborating with the designers to create a space as suitable for its users as possible. The renovation was also seen as an opportunity to introduce new learning methods. After establishing the final project, the construction works began and lasted from 2013 until 2014.



4.5.2. Spatial analysis

context

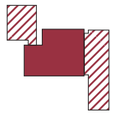


building formed with
three blocks

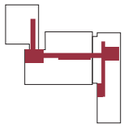
22% plot coverage

town up to 5 000 citizents
low density

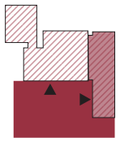
strategies



two extensions
extension divided in 2 buildings,
to preserve tree

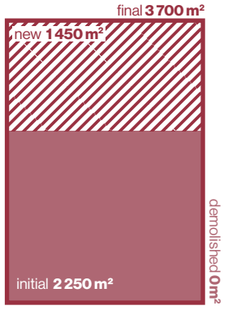


continuous path
corridor that connecrs
everything



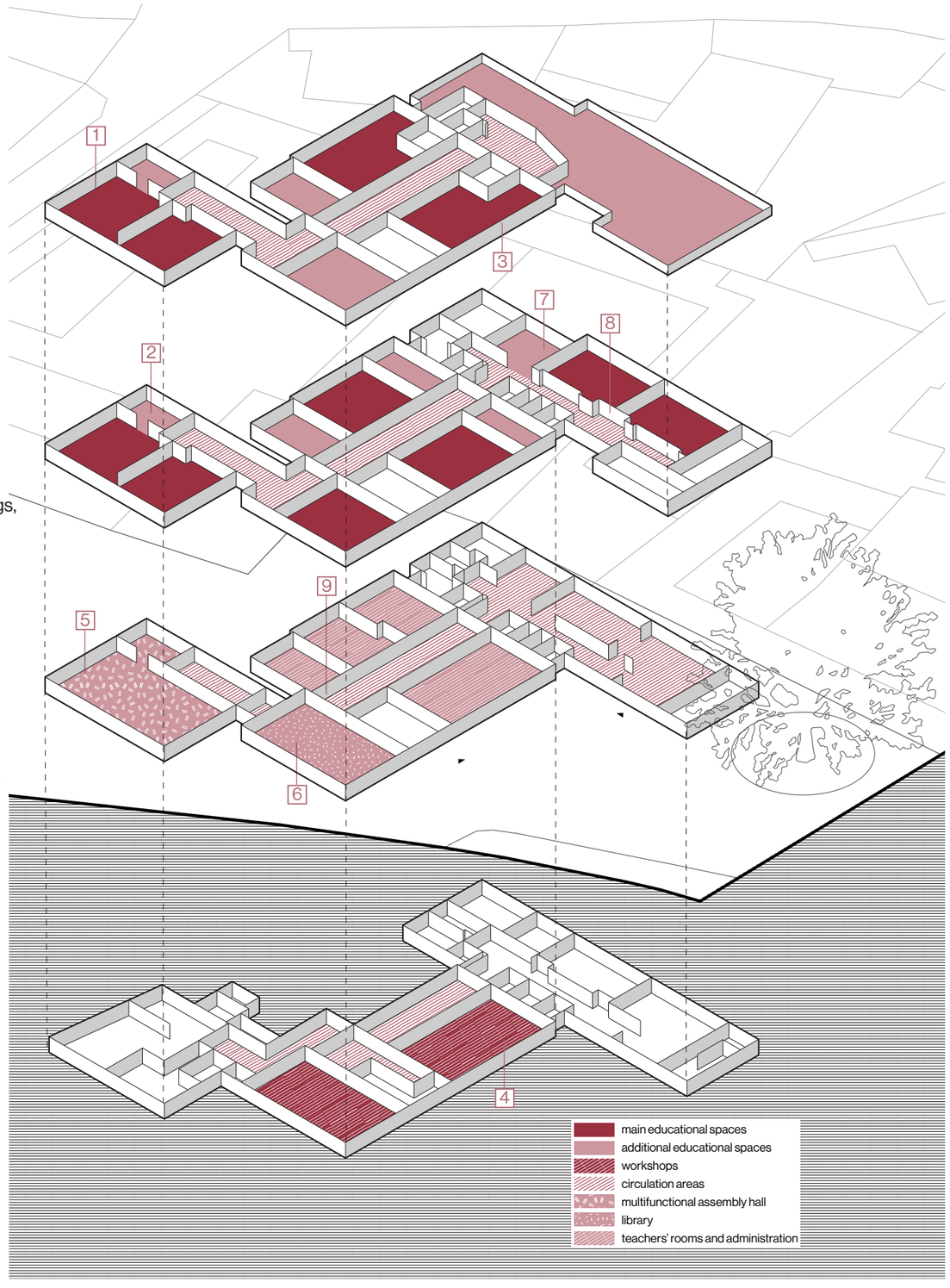
meething place
common courtyard - meeting
point

how big was the intervention



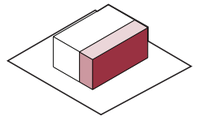
demolished
no demolition, preserving the
entire existing structure

new
two wings with learning
spaces, assembly hall and
library



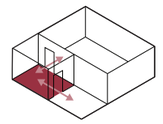
spatial ideas

expansion strategies



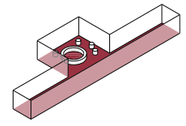
addition
multiple new spaces
attached to the existing
building

additional learning spaces



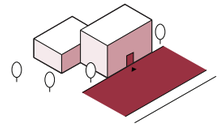
additional rooms divided
from the circulation area,
which can be used during
the lessons

circulation



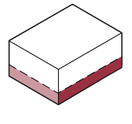
corridors with niches –
informal areas

entrance



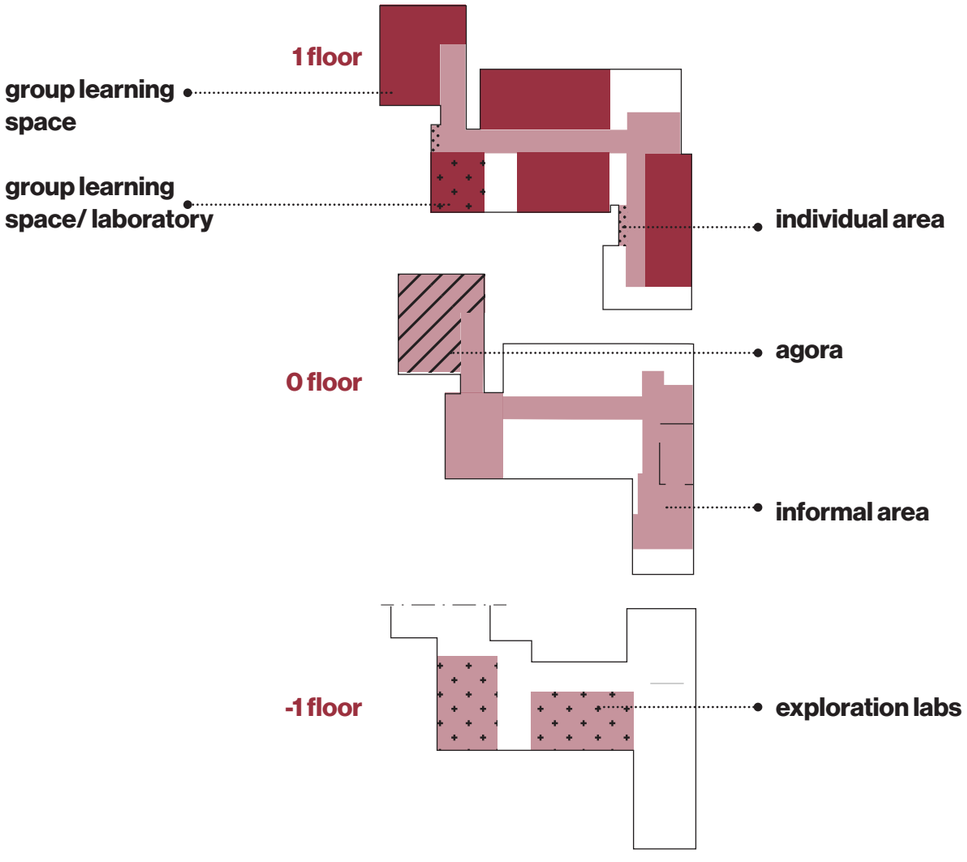
semi-public courtyard, with
two main entrances

civic center



in a part of the ground floor

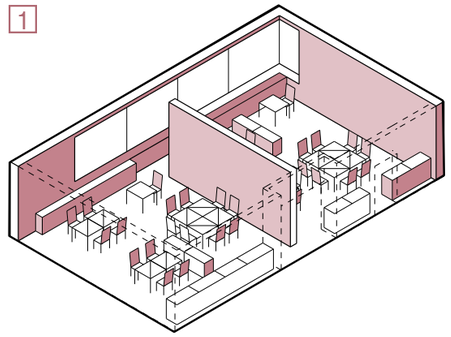
Learning environments: spatial analysis through the 1+4 model



The ground floor has the most informal and open character. It contains welcoming areas, a library, and an assembly hall. The group learning spaces are located on the upper floors, and blended with informal spaces, workshops, and individual areas. The exploration labs (workshops) are located on the level -1.

Group learning spaces

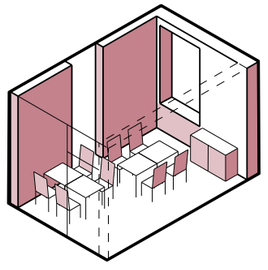
1



two connected classrooms

The two connected classrooms for students of the same grade make it possible to integrate better and create possibilities to introduce shared activities.

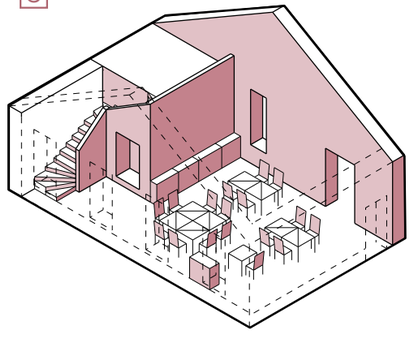
2



additional learning space

Adjacent to classrooms, there is an extra space that can be used in varous different ways, e.g. as an individual work area, as a space for different activity than in the classroom, etc.

3

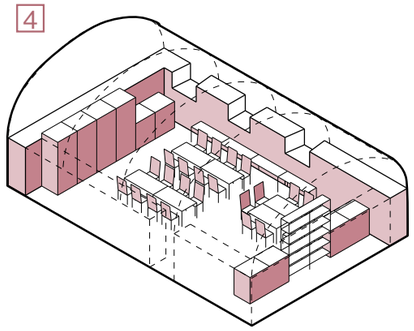


two-level classroom

The big classrooms offer spaces for various types of activities, that can happen at the same time: the main area, niches, serving as individual areas, informal, comfortable space at the top of the stairs, etc.

Exploration labs

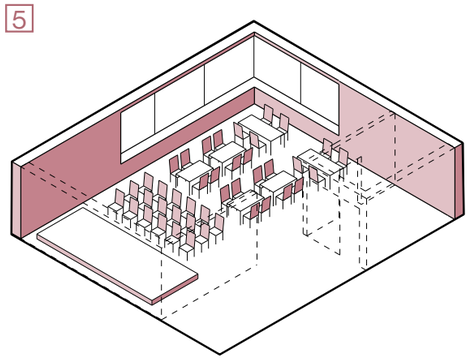
4



manual workshop
The workshops situated in the basement are spaces with primary focus on manual activities, such as sculpting, DIY activities, scrapbooking, and many more.

Agora

5

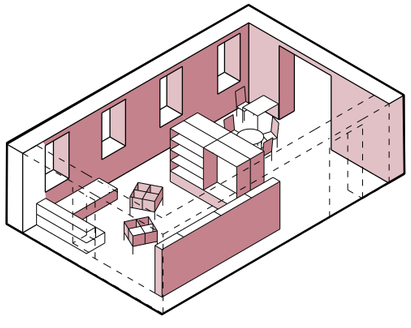


assembly hall

Multifunctional space situated in the new part of the school, used as an assembly room and a gym. It is accessible also form outside.

Informal areas

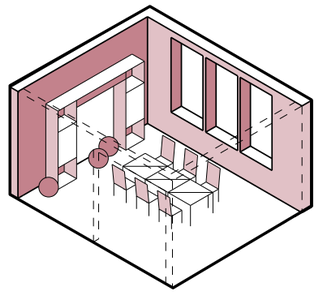
6



library

Informal space, where students can read, relax and play. Additionally, the library is connected to the assembly room.

7

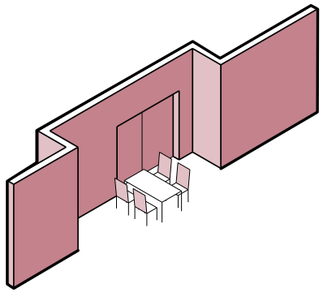


common room

a room where students can wait for their parents, have afterschool activities, play or learn, individually or in a group.

Individual areas

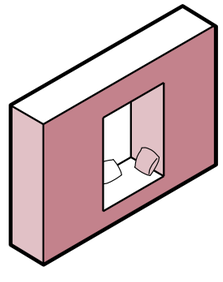
8



niches in the corridor

Zone for indivicual study, which can be used also during the lessons, if additional space is needed.

9

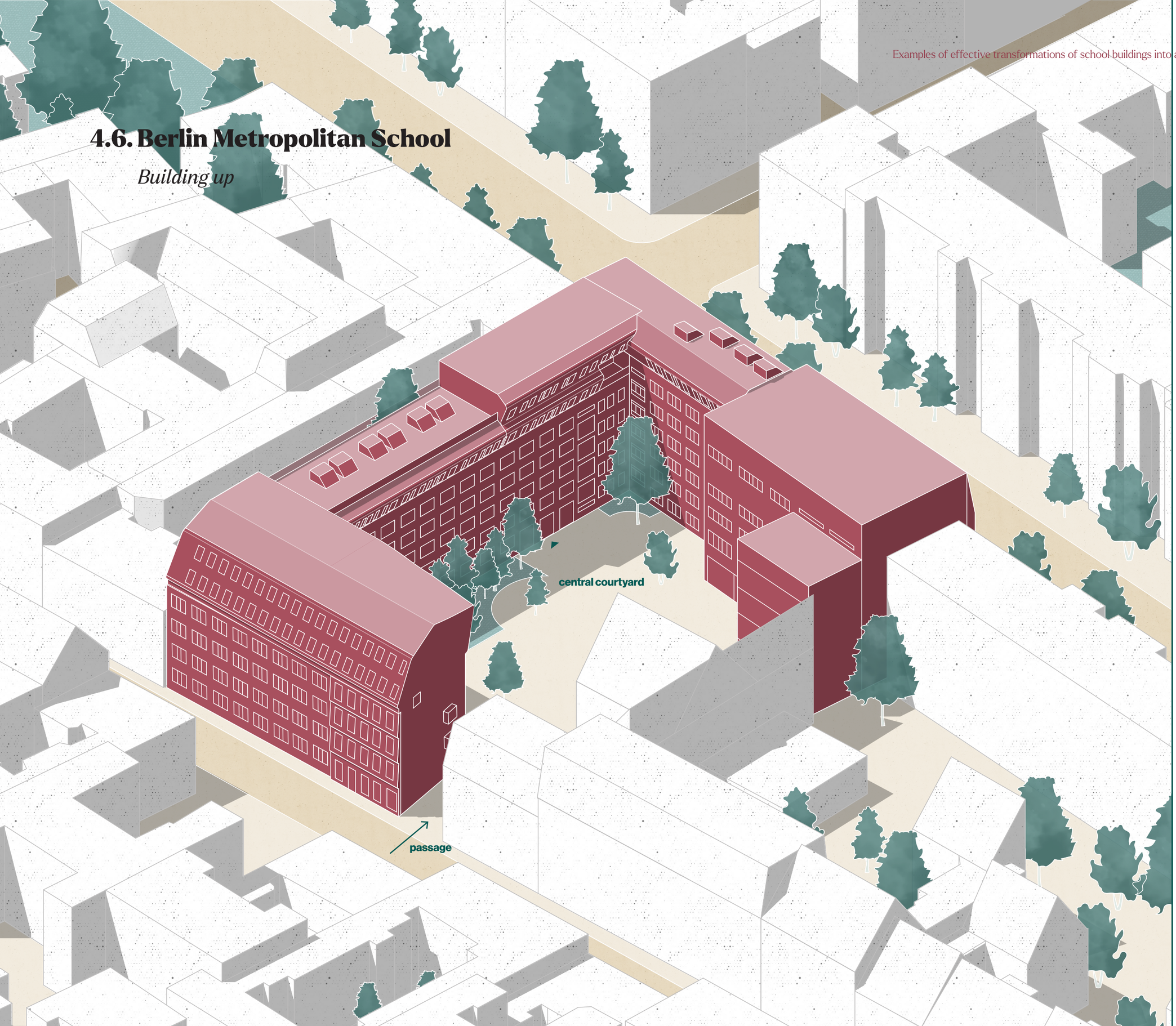


windowsill

cozy, protected seat with cushions

4.6. Berlin Metropolitan School

Building up



Location:
Berlin, Germany

School grade
-- lower secondary

Year of construction
1987

Years of renovation
2014-2020

Arch. of renovation project
Sauerbruch Hutton

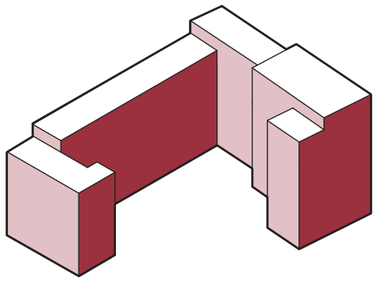
Client
Berlin Metropolitan School (private)

Usable floor area of the extension
3 219 m²

Transformation cost
0.85 Mio. €

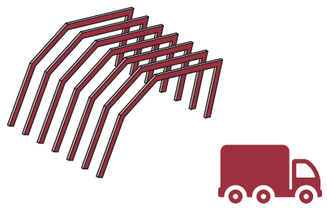
4.6.1. Transformation process

Pre-existing structure

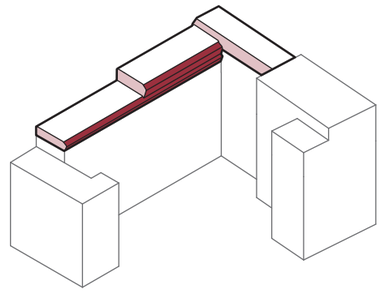


- The original building dates back to 1987. It is a reinforced concrete prefabricated structure with a large courtyard in the middle.

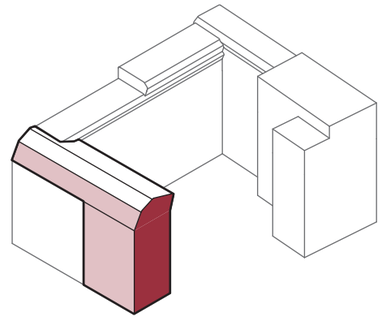
Transformation



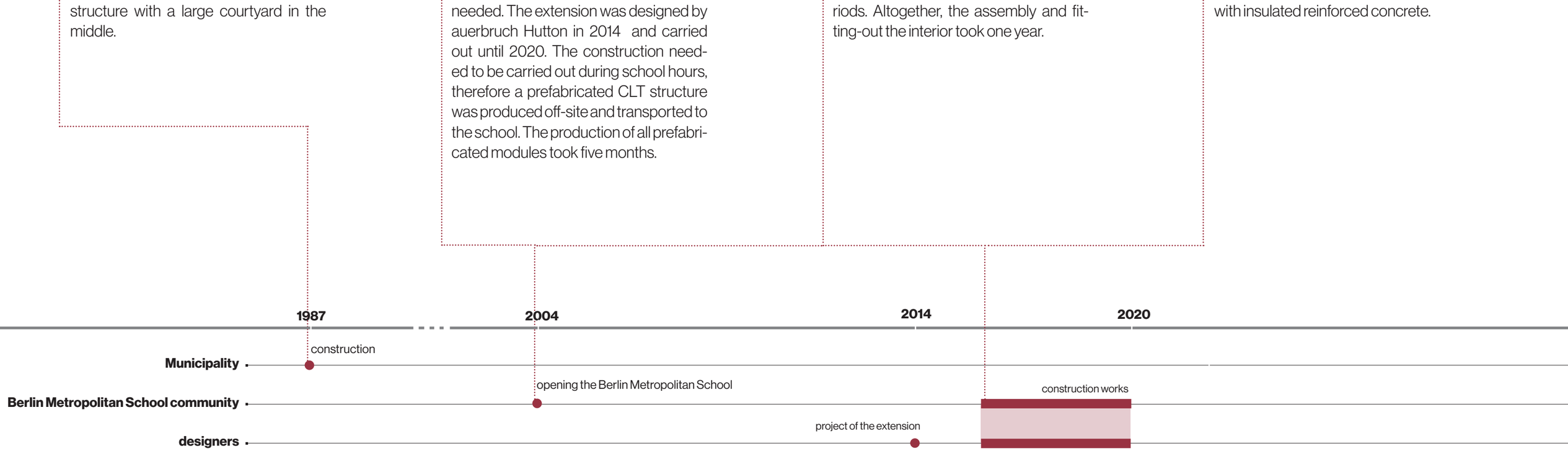
- Soon after opening the Berlin Metropilitan School in 2004, additional space was needed. The extension was designed by auerbruch Hutton in 2014 and carried out until 2020. The construction needed to be carried out during school hours, therefore a prefabricated CLT structure was produced off-site and transported to the school. The production of all prefabricated modules took five months.



- The assembly of the prefabricated modules was undertaken in six weeks periods. Altogether, the assembly and fitting-out the interior took one year.

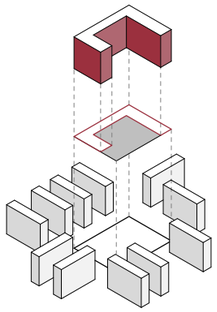


- The last part was the new building at the southern part of the school. It was made with insulated reinforced concrete.



4.6.2. Spatial analysis

context



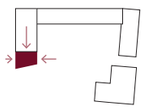
C-shape main building

50% plot coverage

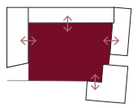
city with over 3 million citizents
near-central district

strategies

expand verically
Extension on top of three existing builings

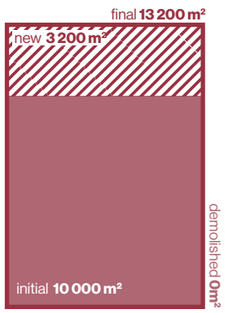


gate
assembly hall - gathering place for school and local community



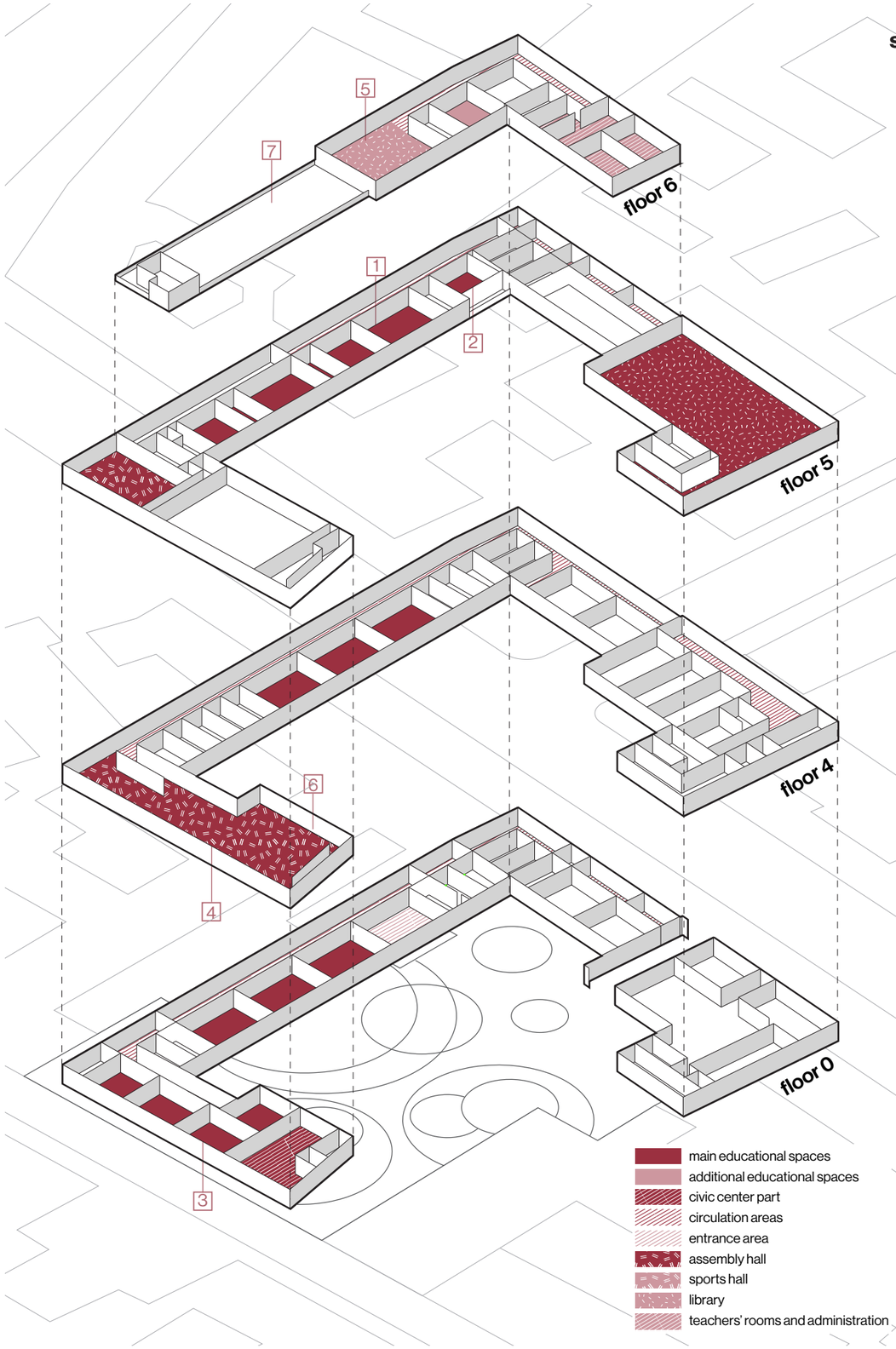
centrality of the courtyard
protected courtyard available from all surroundingbuilings

how big was the intervention



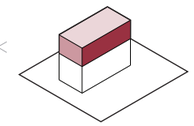
demolished
no demolition, preserving the entire existing structure

new
learning spaces,assembly hall, library

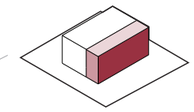


spatial ideas

expansion strategies

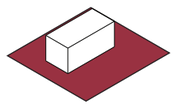


hat
a new lightweight structure, nested on the existing building



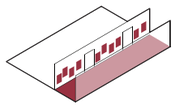
addition
a new lightweight structure, nested on the existing building

additional learning spaces



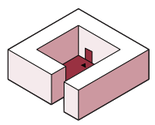
multifunctional outdoor area in the courtyard

circulation



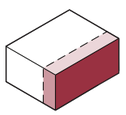
used also as an exhibition of students' works and as a locker area

entrance



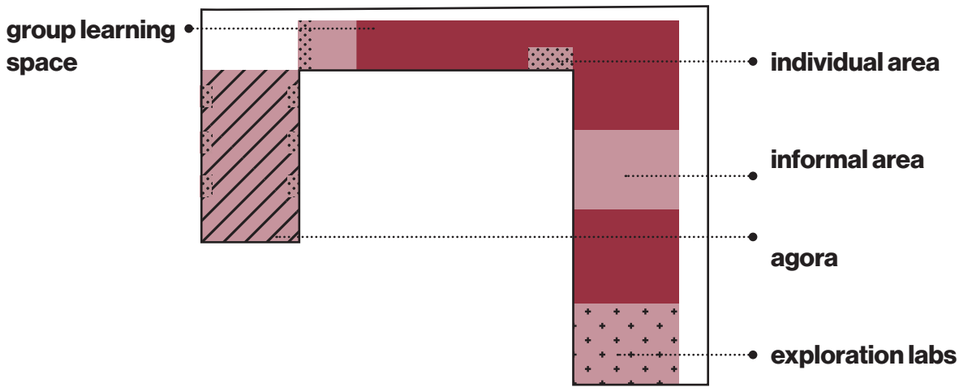
from the courtyard surrounded by the school building

civic center



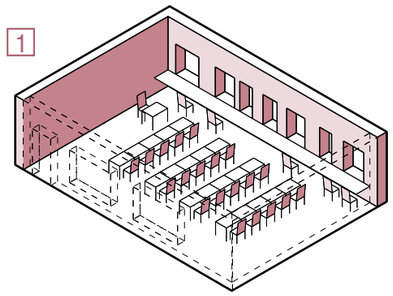
a part of the main building, used in the afternoon by the local community

Learning environments: spatial analysis through the 1+4 model



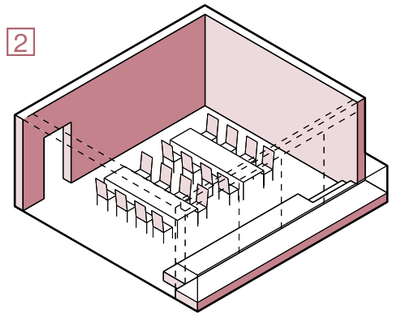
As shown on the simplified spatial diagram, the group learningspaces are distributed along the corridors, and the informal spaces and laboratories are spread between them. The agora is placed on the Southern wing, on the upper floors. Most of the individual spaces are spread across the school building and blended with other spaces.

Group learning spaces



classroom

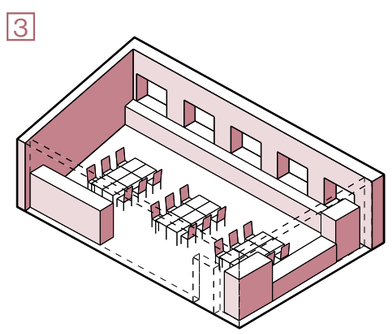
spacious classroom with a wide windowsill, which can be used as a continuous table or as a display space



classroom with balcony

classroom with flexible layout, with an external area on the balcony

Exploration labs

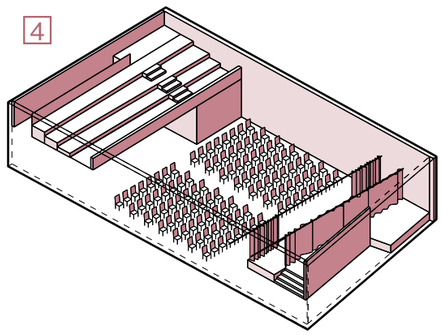


science laboratory

spacious science laboratory with specialistic equipment

Agora

4

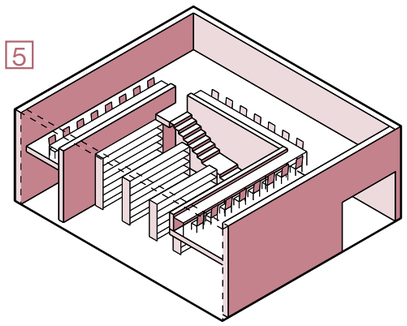


assembly hall

multifunctional assembly hall, open for the local community, designed with special attention to acoustic performance

Informal areas

5

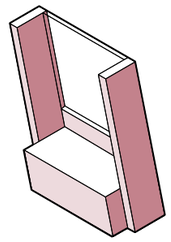


library

two-storey library with spacious individual work area on the upper level and group areas on the lower level

Individual areas

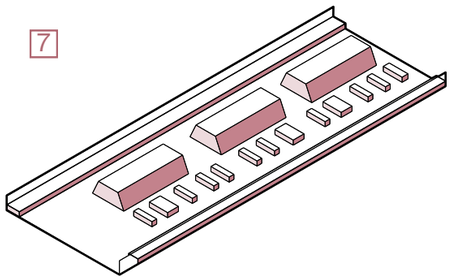
6



niche in the assembly hall

a private space, isolated from a bigger, informal area with small partitions

7

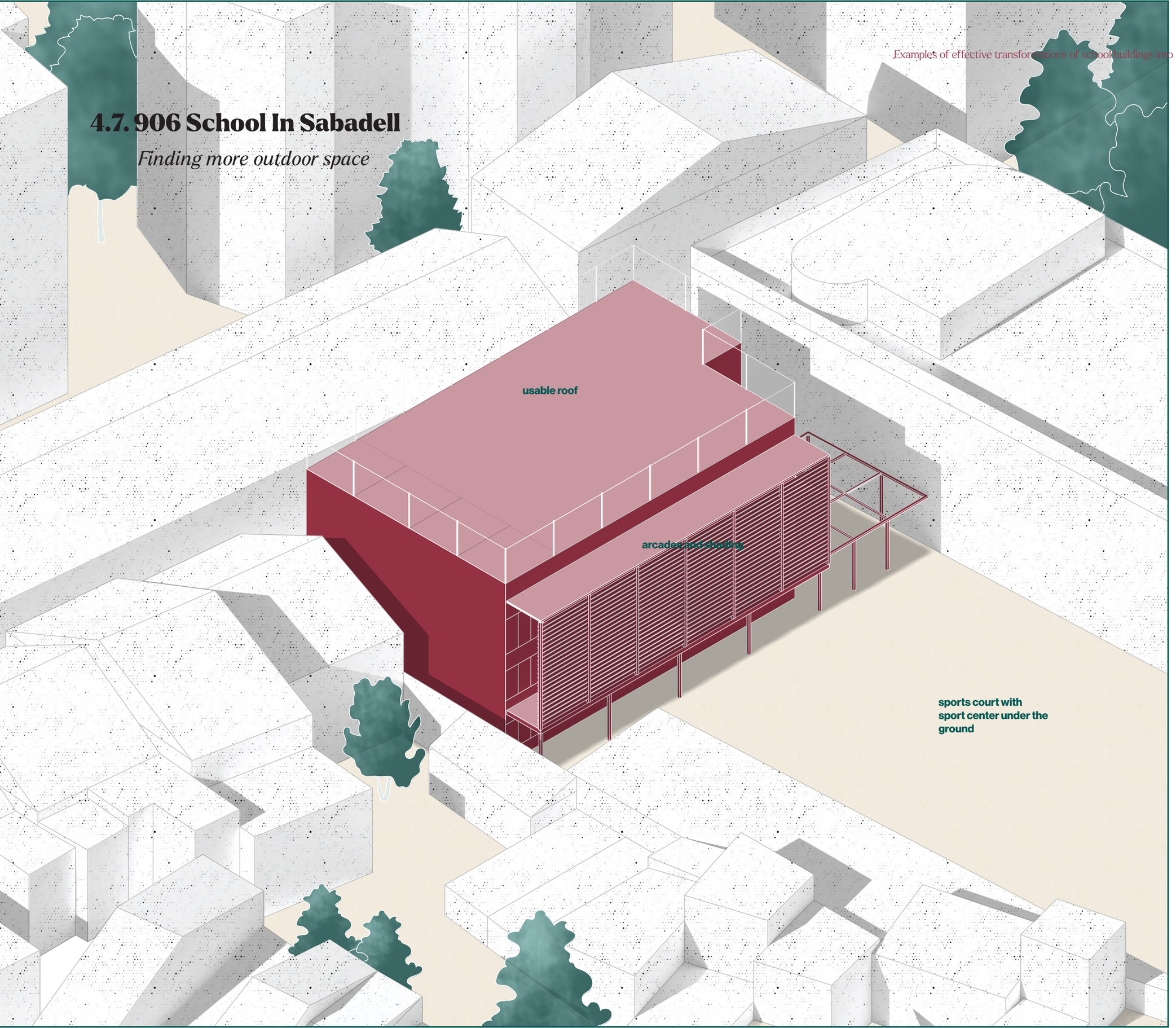


roof connected to the library

spacious roof terrace, which can be used for reading and individual work and as a relax area

4.7. 906 School In Sabadell

Finding more outdoor space



Location:
Sabadell, Spain

School grade
pre-school, primary school

Year of construction
1959

Years of renovation
2014-2015

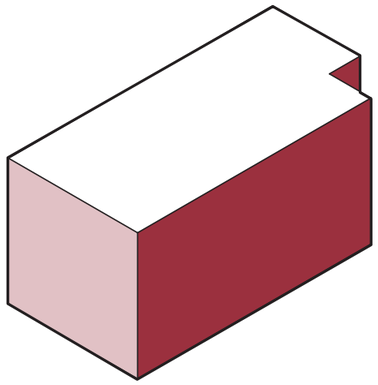
Arch. of renovation project
Harquitects

Client
Agrupació pedagògica Sant Nicolau

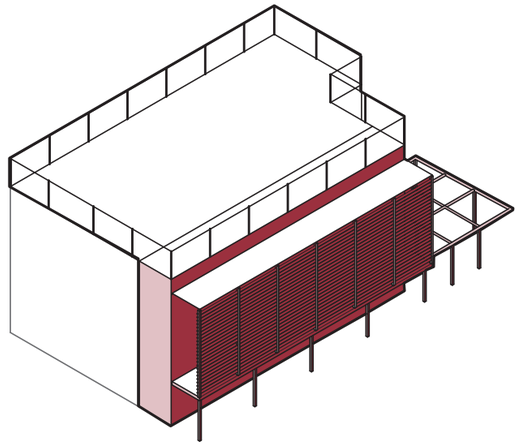
Total area
1 440 m²

4.7.1. Transformation process

Pre-existing structure

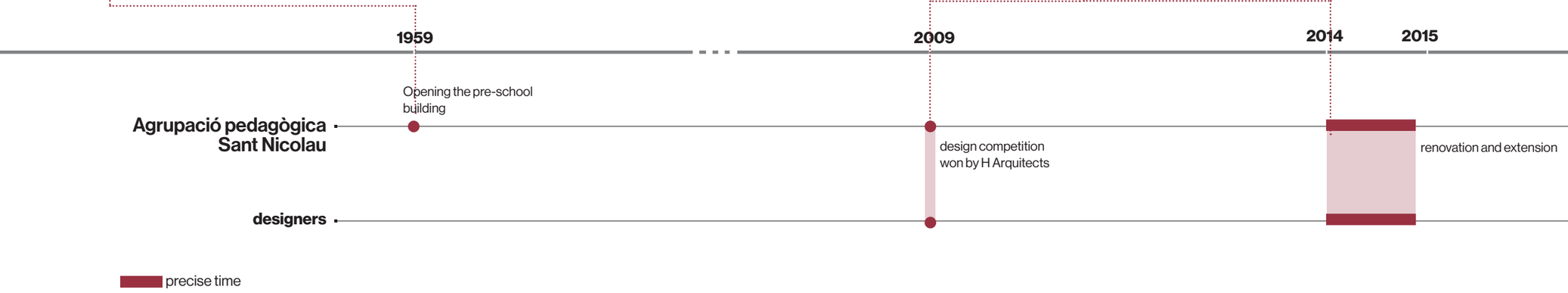


Transformation



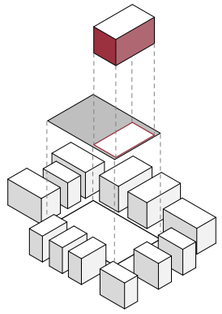
The school is a part of a bigger complex of several school grades. It was built in 1959 for the pre-school and it total area was 240 m². It remained in almost unchanged form until the renovation.

In 2009 the competition was made for the transfromation of the school buildig. The winning project by H Arquitectes assumed leeping the existing building with only minor interventions and the extension of the original building with a parasite structure. The renovation works were finished in 2015.The school was closed for the time of the transformation.



4.7.2. Spatial analysis

context

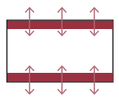


rectangular-shape main building

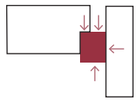
30% plot coverage

city with over 200 000 citizents
central district

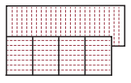
strategies



reinforcing the connections
with the street at the front facade, and with the sports court at the back facade

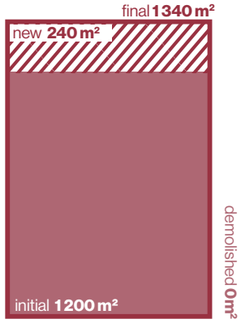


meeting poimt
the entrance area is the meeting point for all of the surrounding facilities



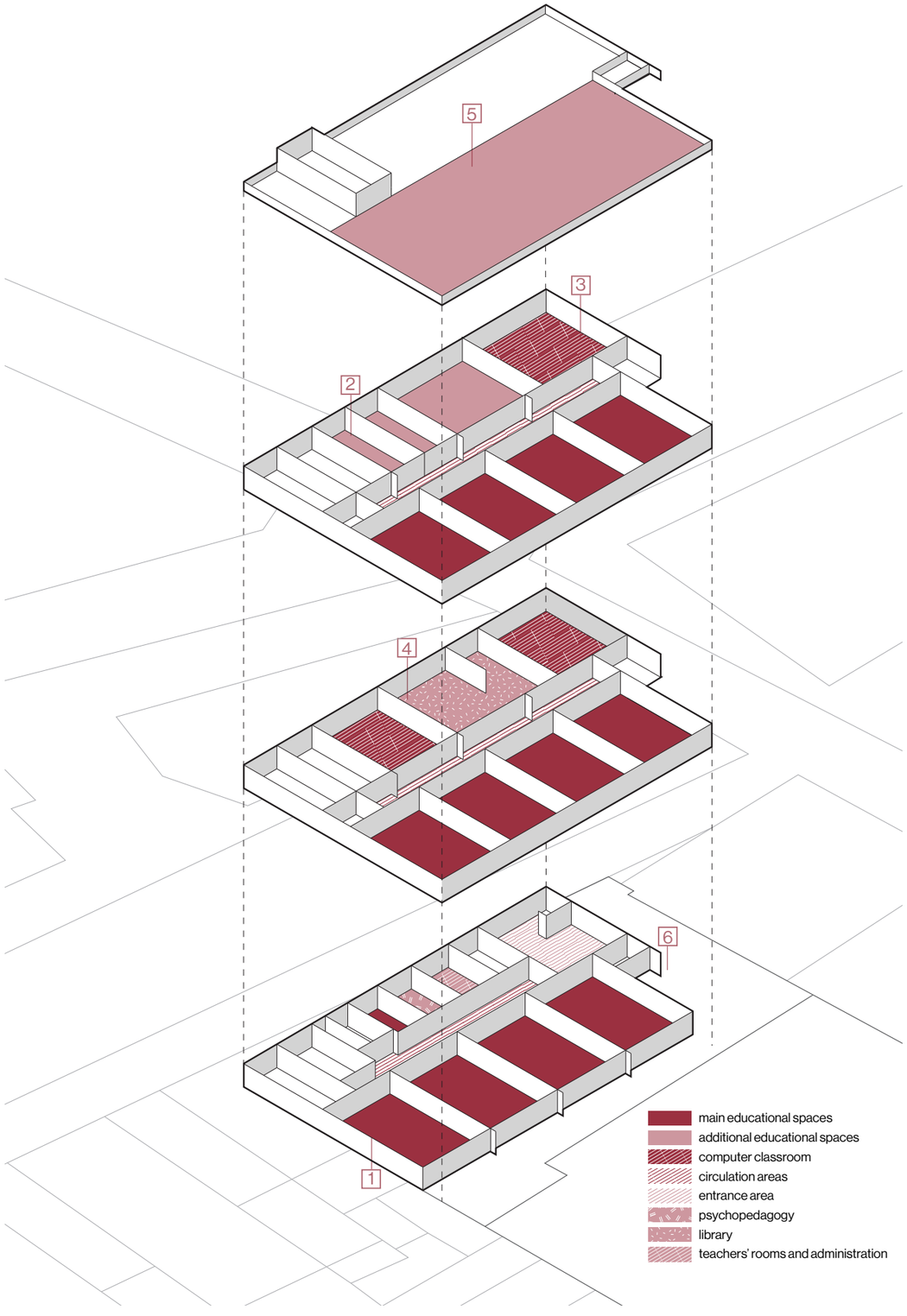
preserving the building
preserving the existing structure and organization

how big was the intervention



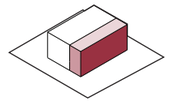
demolished
no demolition, preserving the entire existing structure

new
addition of a “parasite” structure to enlarge classrooms on the first and second floors and create porticos on the ground floor



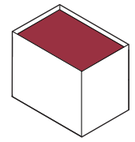
spatial ideas

expansion strategies



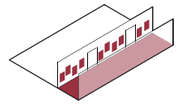
addition
structure widening the existing buildng

additional learning spaces



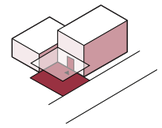
large roof terrace shared with the adjacent school

circulation



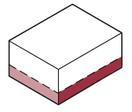
corridor as a space for displaying students’ works

entrance



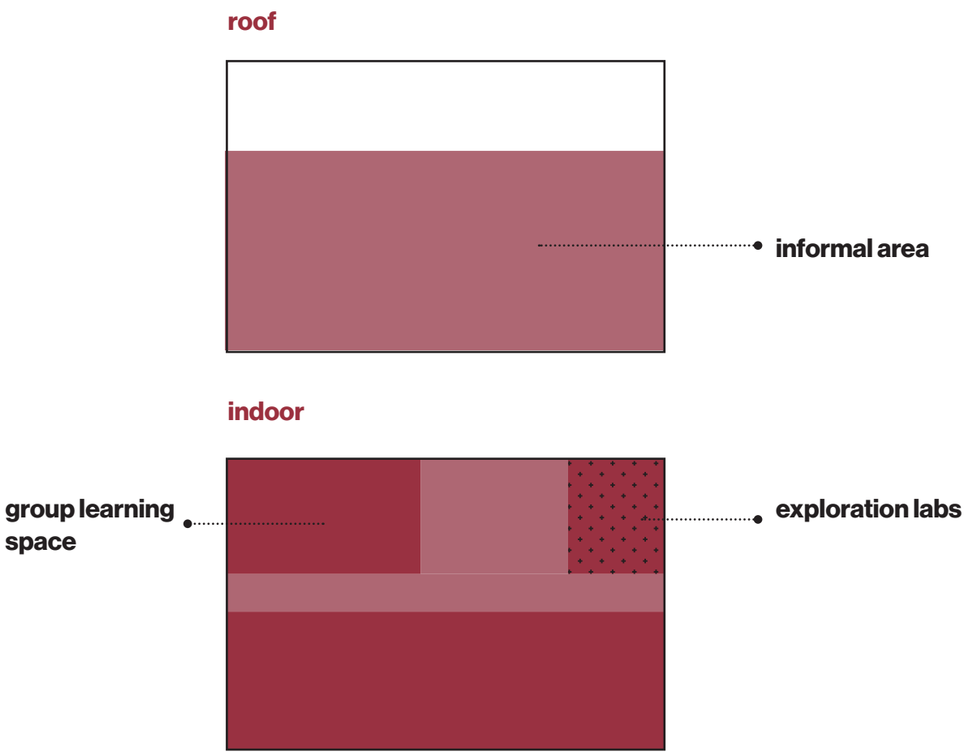
small roofed squre, being also a meeting space for two school buildings, sports court and sport center under the ground

civic center



sport center situated under the sports court

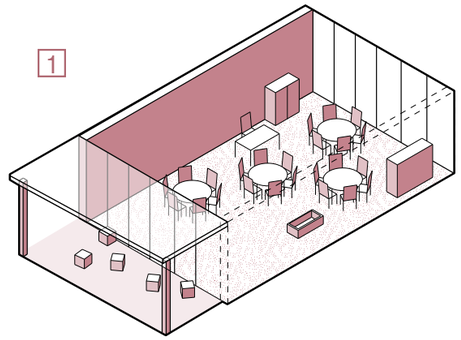
Learning environments: spatial analysis through the 1+4 model



The group learning sapces are distributed on both sides of a corridor, which is also an exhibition space for students' works. On the first floor, the library (informal space) and computer laboratory was placed. On the rooftop, there is a spatious informal area, suilable also as a space for lessons. There is no agora, probably due to vicinity of other schools, and no distinct individual area.

Group learning spaces

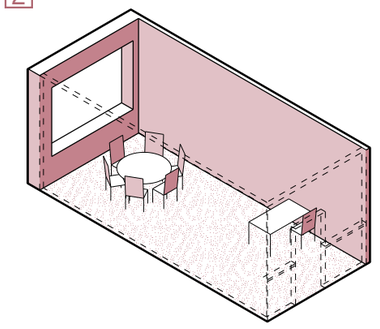
1



classroom

classrooms dedicated to group activities, connected (directly or visually) with external spaces

2

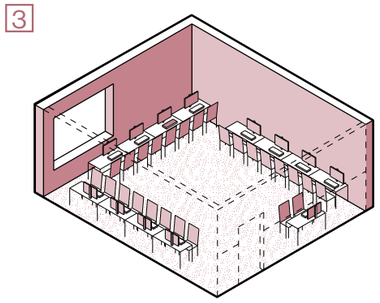


small classroom

small classrooms for small groups and individual study

Exploration labs

3

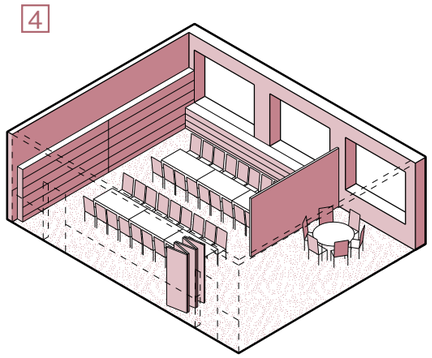


computer laboratory

a space for individual work, with the use of the Internet

Informal areas

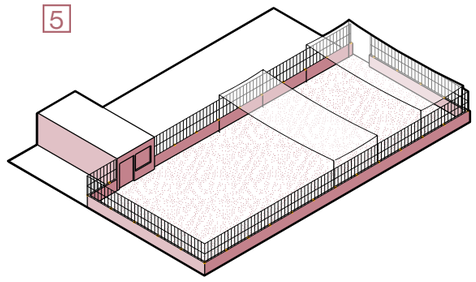
4



library

multifunctional library which can be divided into two smaller rooms, dedicated to group activities

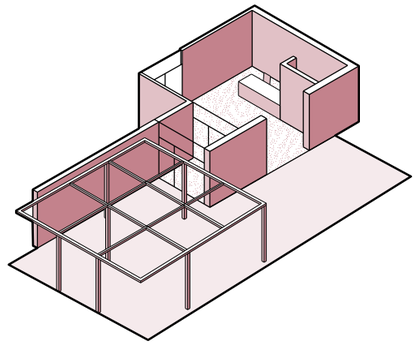
5



roof

multifunctional area with removable shading, which can be used during the lessons in a variety of ways, accessile also to the neighbouring school

6

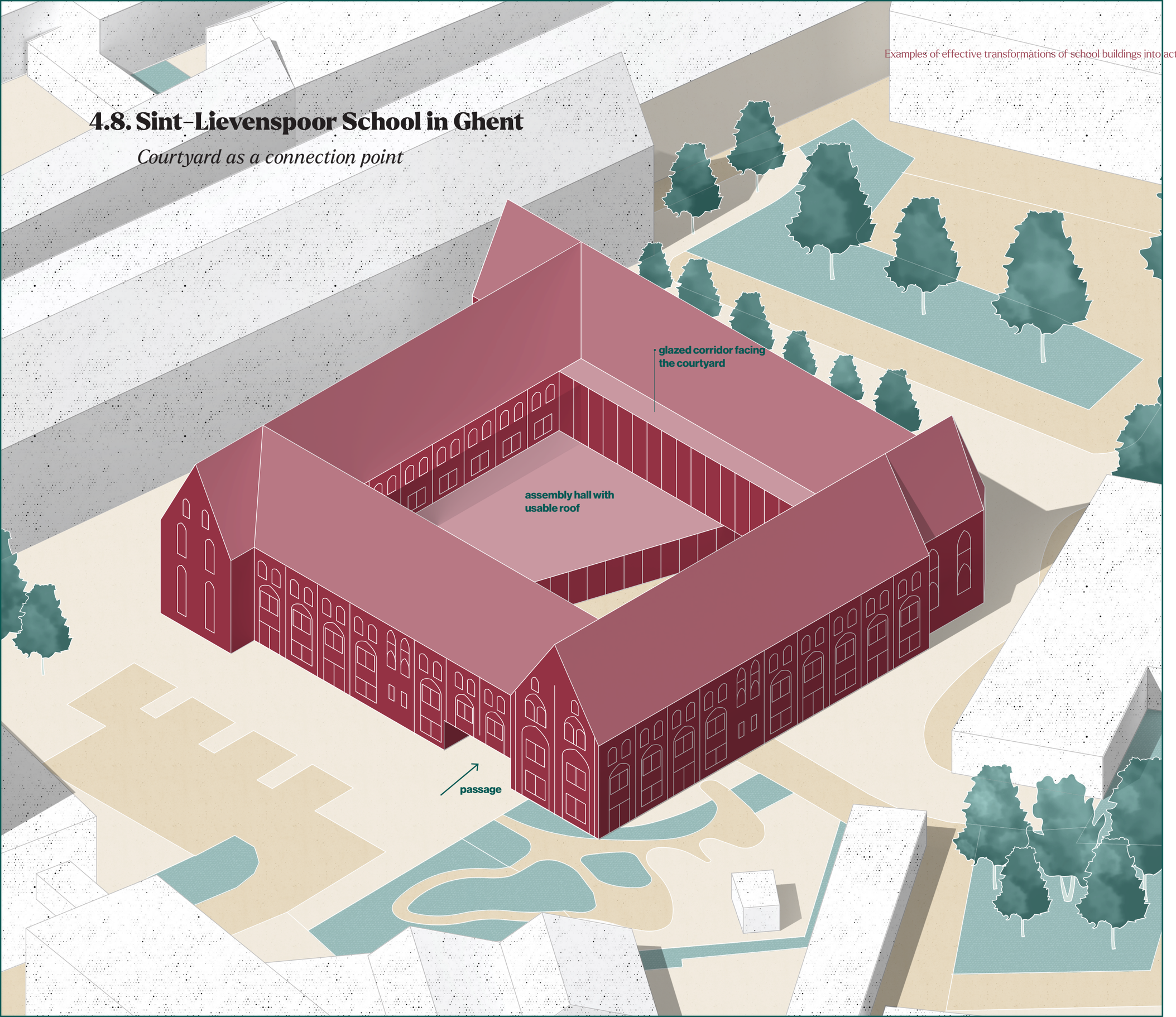


entrance area

a roofed meeting point for students of two schools, connected with the sports court and sport center under the ground

4.8. Sint–Lievenspoor School in Ghent

Courtyard as a connection point



Location:
Ghent, Belgium

School grade
primary and lower secondary

Year of construction
1873

Years of renovation
2017-2019

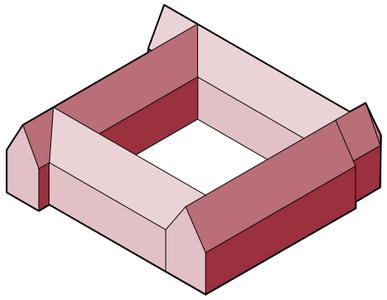
Arch. of renovation project
evr-architecten

Client
Catholic Education Flanders

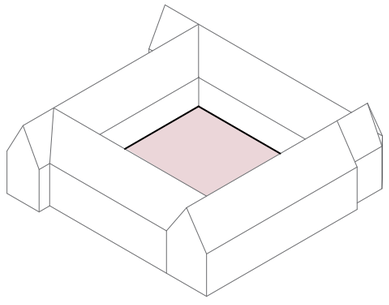
Effective floor area
4 500m²

4.8.1. Transformation process

Pre-existing structure

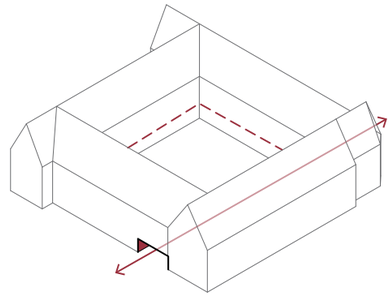


The history of the former Convent of the Sisters of Love dates back to 1873. In the beginning, the neogothic structure designed by Arthur Verhaegen was a house for children from families unable to provide for them. Shortly after it became a nursing school. The facility was closed in 1956.

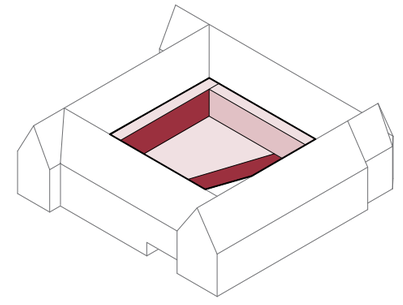


Afterwards, the building was adapted for a house for girls with hearing and speach difficulties. Since then, it was reshaped several times. The biggest intervention was a building in the central courtyard constructed in the 1970s.

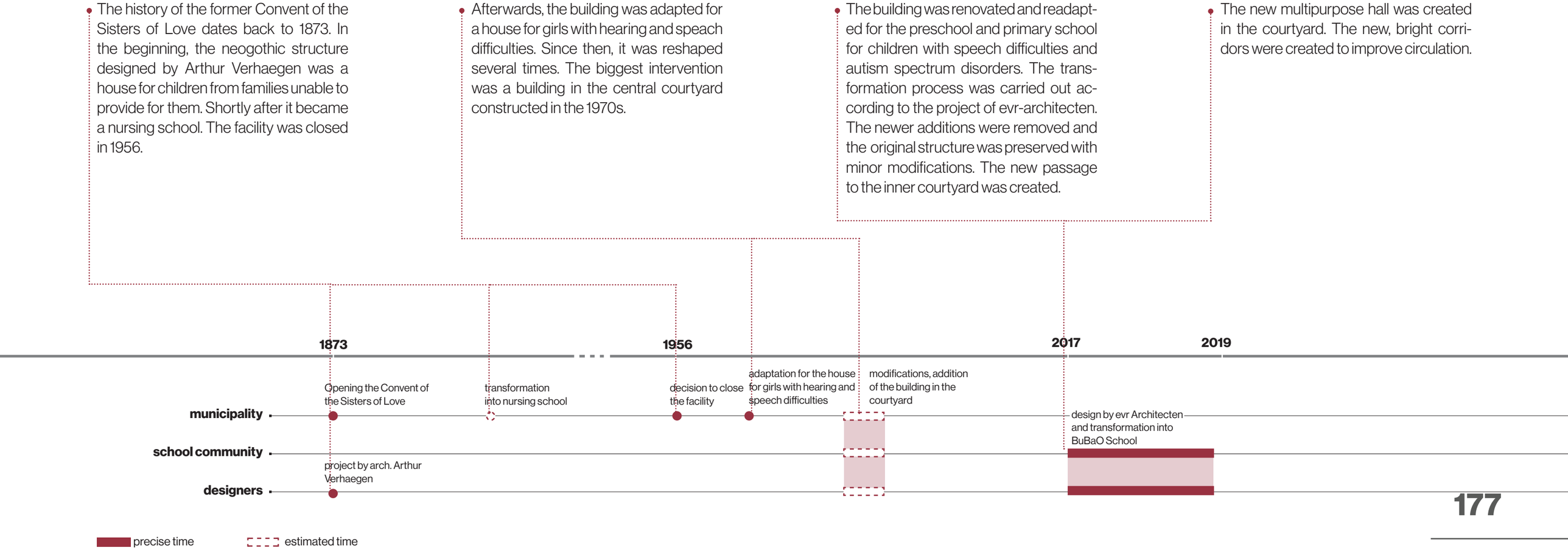
Transformation



The building was renovated and readapted for the preschool and primary school for children with speech difficulties and autism spectrum disorders. The transformation process was carried out according to the project of evr-architecten. The newer additions were removed and the original structure was preserved with minor modifications. The new passage to the inner courtyard was created.

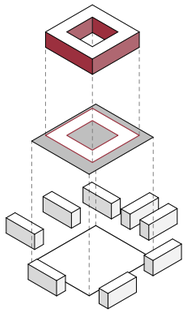


The new multipurpose hall was created in the courtyard. The new, bright corridors were created to improve circulation.



4.8.2. Spatial analysis

context

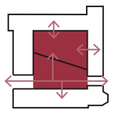


building with central courtryard

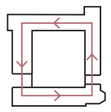
46% plot coverage

city with over 200 000 citizents

strategies



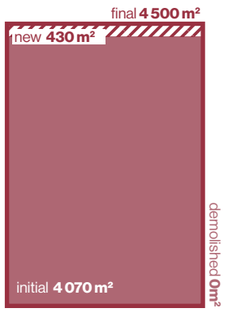
central meeting point
the inner courtyard becomes a central point of the school, and the school is organised around it



clear organization
the school has avery clear and transparent organization, and the spaces are designed in a way to avoid distraction

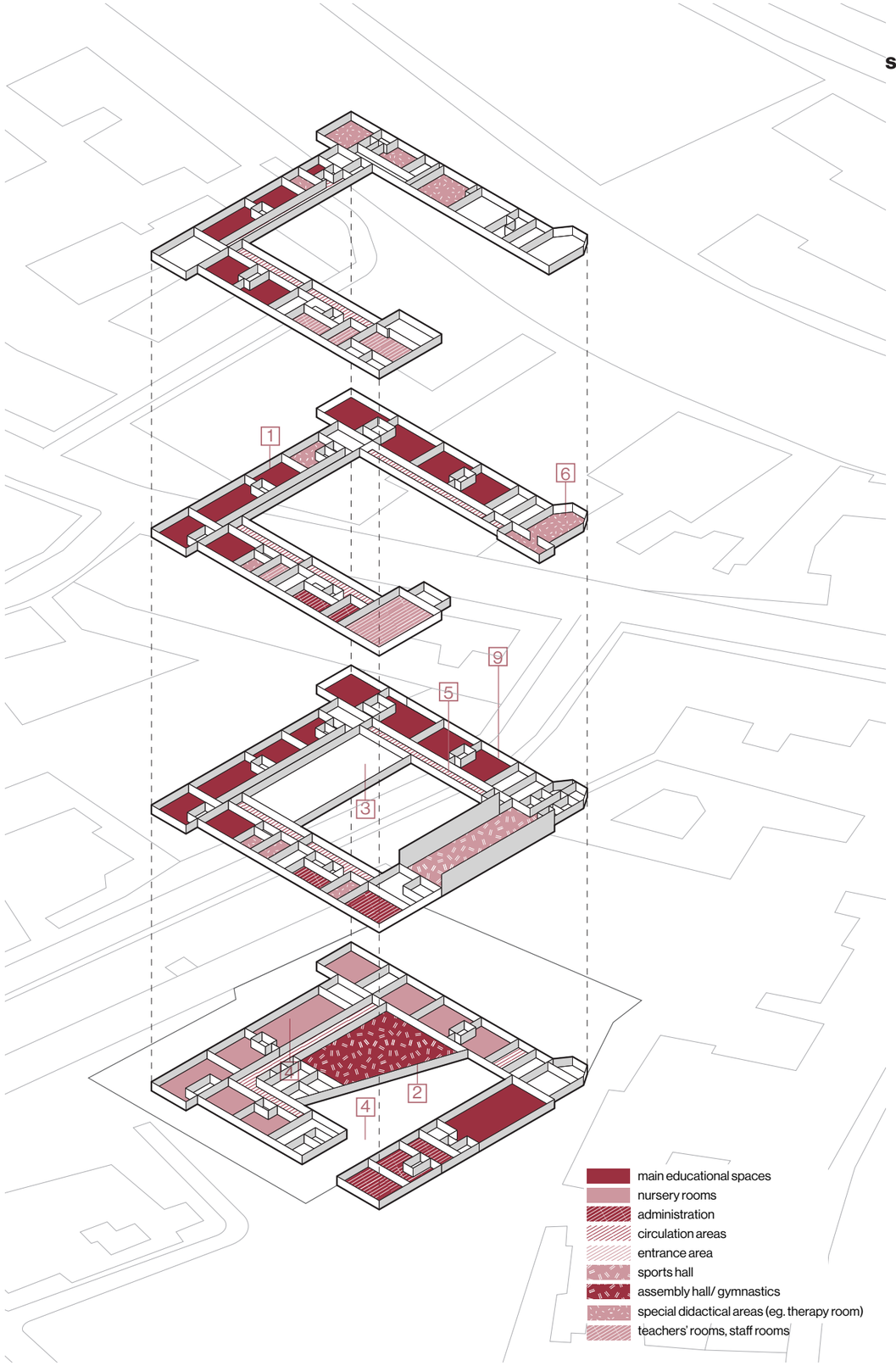
minimum intervention
the existing structure was preserved, with minimum modifications, additional functions were added in the adjacent structures

how big was the intervention



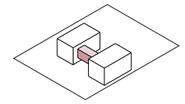
demolished
no demolition, preserving the entire existing structure

new
assembly hall, corridors on the first and second floor

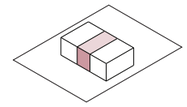


spatial ideas

expansion strategies

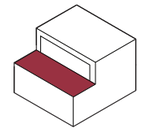


bridge
a new structre attached to the existing building, with a terrace on the roof



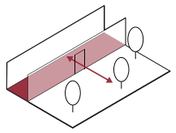
insertion
a new structre attached to the existing building, with a terrace on the roof

additional learning spaces



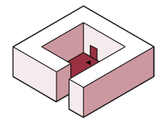
on the roof of the new building, accessible from the first floor and from the courtyard

circulation



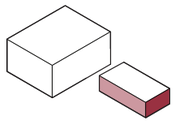
corridors with visual connection with the courtyard

entrance



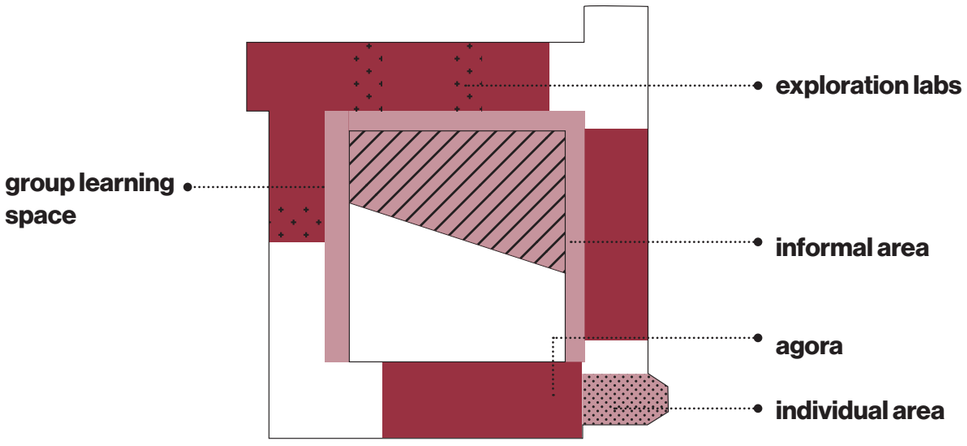
safe, private courtyard surrounded with the school building

civic center



health center - a part of learning complex, in a free-standing building

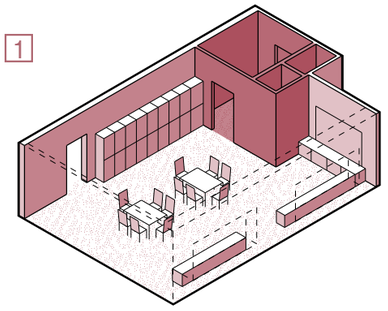
Learning environments: spatial analysis through the 1+4 model



The organization of learning sapces in the BuBaO school is regular and simple, as all the spaces are distributed along a corridor that surrounds the agora, which can be used not only as an assemply hall, but also as gymnastics room, ect. The group learning spaces are dedicated to small groups of studnets. Additionally, there are special rooms such as interactive mathematics room, therapy rooms, etc. In the old chapel there is an individual space, where students can find peace and rest from other activities.

Group learning spaces

1

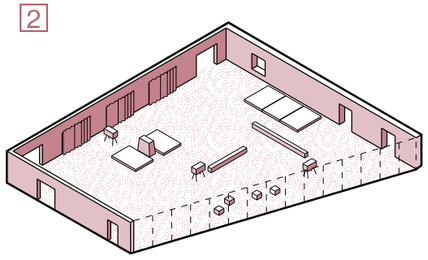


classroom with sanitary unit

spacious classroom for a small group (up to 10 students) with a sanitary unit shared by another classroom

Agora

2

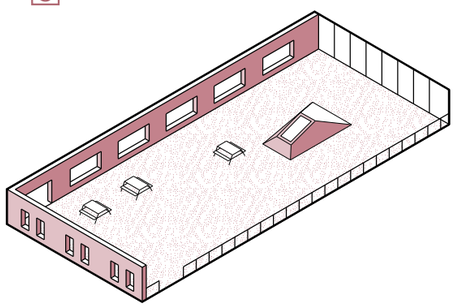


multifunctional central area

the central multifunctional area, well-connected with the rest of the school and with an outdoor space, which can be used as an assembly hall, a sports hall or for the events organised for the parents and local community

Informal areas

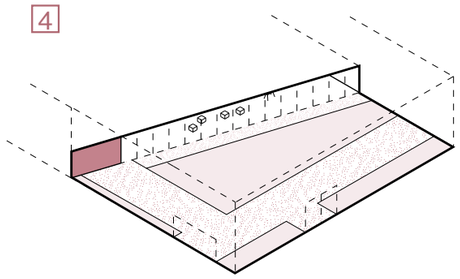
3



terrace

outdoor area which can be used to study and play, connected with he courtyard and the corridor on the first floor

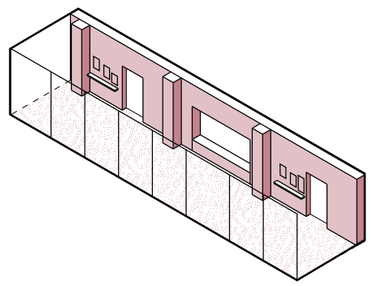
4



protected courtyard

a courtyard accessible from three sides to the streets and from one side to the assembly hall. Well protected and private

5

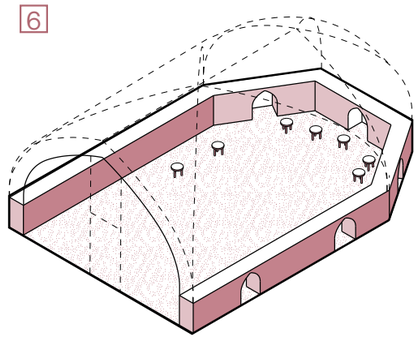


corridor

bright and simple corridor with a visual connection to the courtyard, and hooks to leave backpacks and coats

Individual areas

6



quiet room

a cozy and peaceful area above the old chapel, used for individuals or small groups as a quiet, meditation area

4.9. Learning not limited to classrooms

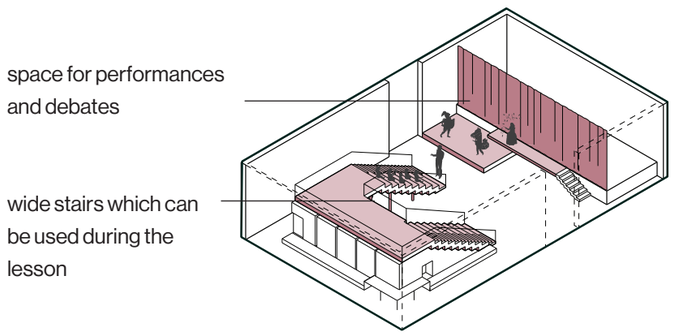
4.9.1 Spatial analysis

The analysed school builddings are expamples of innovative learning enviroments, different from a traditional pattern of a learning space. They seem to go in paralell with the principles of Montessori architecture, which is based on the principle of allowing the students to explore their own interests and potentials, as well as developping social skills, rather than just feed them with knowledge (Hertzberg, H. 2008). Therefore, the following strategies repeat in the analyzed school spaces:

Environment that stimulates learning
"The school for which we are to find a form is on of less education and more learning. What is needed is is an environment that stimulates and incites learning by asking questions, a climate that provokes exchange and confrontation, intellectually, culturally, and politically" . (Hertzberg, H. 2008)

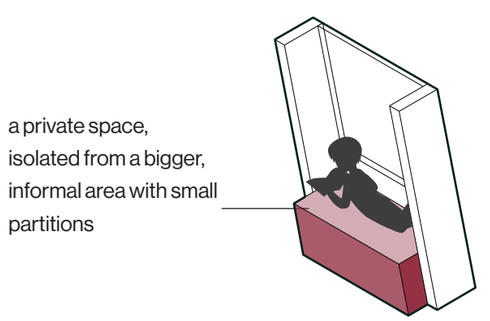
The traditional layout with classroom-compartments for studying and other areas as complementary services has been transformed in the analyzed learning environments into learning environments that expand beyond classrooms, ecompassing circulation areas, multifunctional rooms, external spaces, ect. Therefore, the learning process is not constrained to a limited room, but is a natural part of all activities, which inspires and stimulates students to discover and continue the learning process, even outside the school bouundaries.

- **lessons not limited with classroom's boundaries**
The analyzed schools offer a wide range of complementary spaces, where lessons can be held. The teacher may decide to go to the library, cinema room, a niche in a circulation area, etc., if they fit better the lesson's purposes. This make it possible to enrich a didactical offer of schools and open a variety of learning strategies, impossible to implement in a traditional school environment.



example: assembly hall and library of Munkegaard school

- **Space for individual activities**
An important aspect, present in most of analysed educational spaces, are areas dedicated to individual discovery, where students can go when they feel overstimulated,or want to focus alone and read, or simply think alone, without distractions.

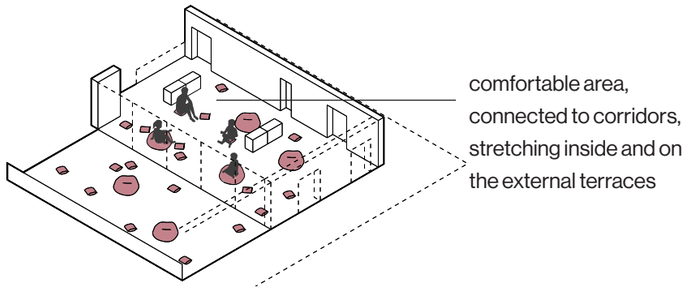


example: niches in Berlin Metropolitan School

- **Space for informal meetings**

The analyzed educational landscape contain a space for informal learning, where students can integrate within a group, rest and de-stress. The spaces can also be used as a additional learning spaces during the lessons.

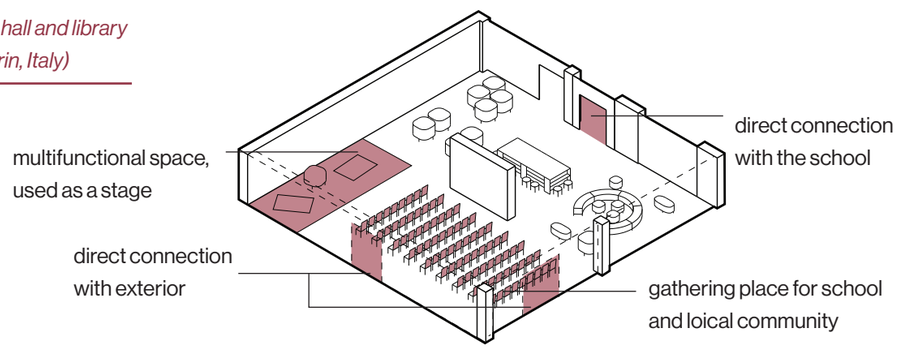
example: informal areas of Leoben School



- **Space that builds group identity**

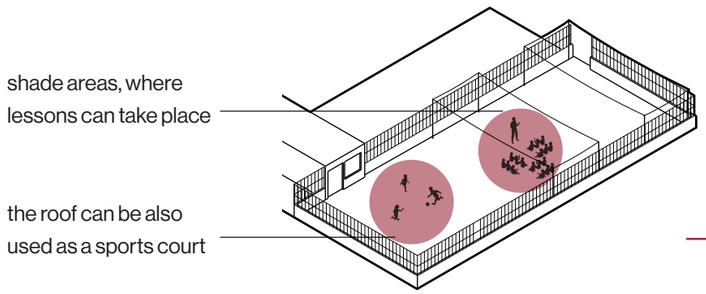
In most of the analyzed examples there are spaces dedicated for whole school community gatherings, which aims to build group's identity. They are located in the important places usually at the center, or in the front of the builidng. Although they can be found also in traditional school spaces, in the analyzed ones, they are used in a variety of ways - sometimes being connected with a library (e.g. Fermi School in Turin), sometimes offering spaces, which can be used during the lessone, or in the afternoons by the local community (e.g. Berlin Metropolitan School).

example: assembly hall and library in Fermi School (Turin, Italy)



- **Connected outdoor spaces**

External sapces play an important role in the analyzed schoool builidngs. They can be an extension of classrooms (e.g. Munkegaard School), or they can be used as a separate learning area (e.g. School in Sabadell), offering an informal and stimulating environment. The important aspect of these spaces is their multifunctioanlity - they can be also used for instance as sports area or gathering spaces.



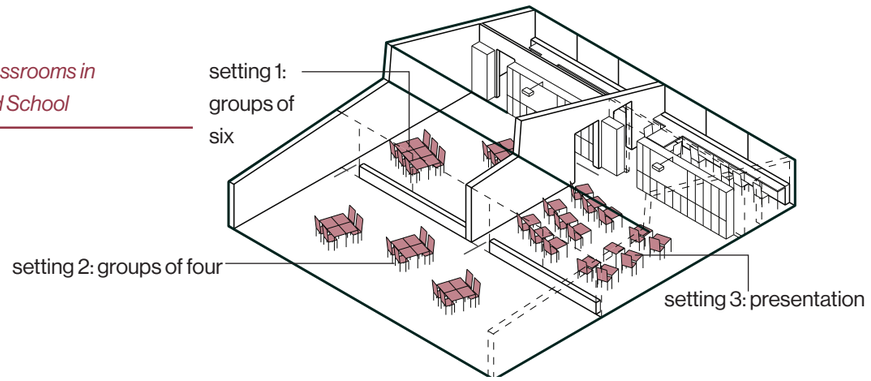
example: roof of the shool in Sabadell

Classroom ambiences
"The classroom with its traditional military disposition of pupils opposite a teacher with the blackboards as dominant focal point can cede to a more informal layout of tables formed into groups of those who want to sit together in a more homely ambience"

- **Space for an active engagement**

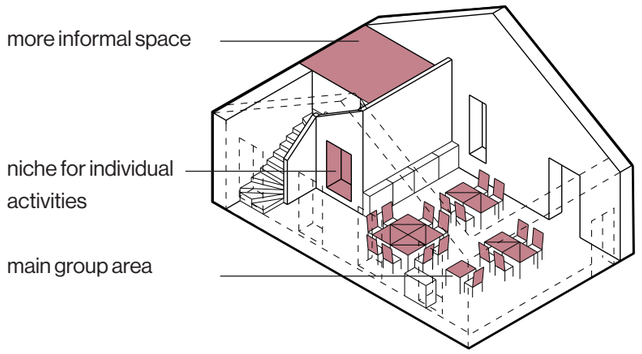
In the analysed examples, the old classroom layout dedicated to passive listening has been replaced with spaces, which prioritise more active types of activities, such as work in small and big groups, discussions or presentations prepared by students. Consequently, the layout has to be enough flexible to accommodate a variety of lesson scenarios.

example: classrooms in Munkegaard School



- **Diversed classroom**

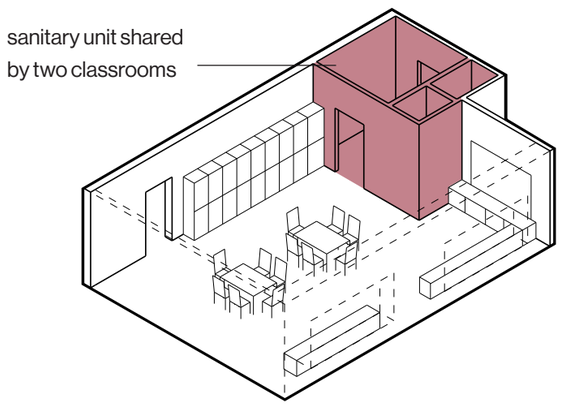
In big classrooms (around 50 m^2 or more) of the analysed school buildings, there can be found several different zones, which makes it possible to host more than one activity at the same time. This facilitates more individualised approach to each student.



example: classroom in the International school in Auer

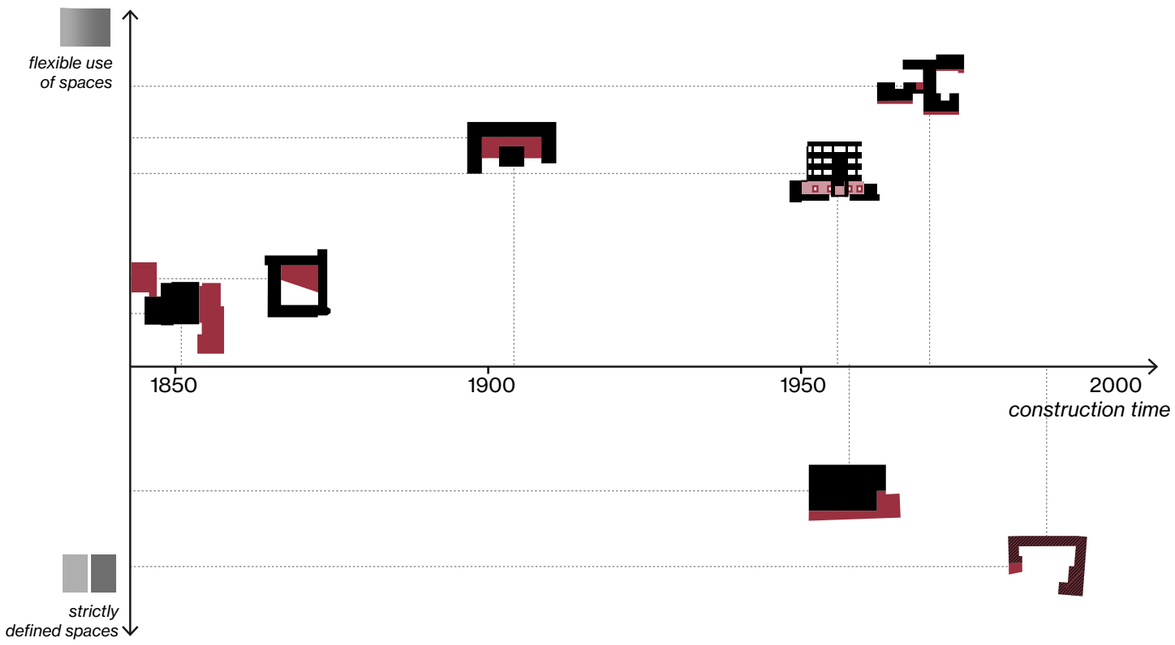
- **Space designed for and with the school community**

Especially in the school buildings which were designed in collaboration with the school communities, the learning spaces have unique properties, in order to meet their needs in the best way. For instance, in the international school in Auer, after collaboration with teacher, additional small classrooms were created. In BuBaO school in Ghent, classrooms are equipped with sanitary units.



example: classroom in BuBaO School (Ghent, Belgium)

The analysis of the relationship between construction time and the flexibility of renovated spaces shows that, regardless of the initial structure, flexible use of spaces can be achieved. For example, the primary school in Leoben displays a highly flexible layout, which was achieved by renovating a structure over 100 years old. However, in older buildings, different means may be necessary to achieve this due to the rigid wall construction that dominated in the 19th and early 20th centuries. In the analyzed school buildings from this period, additions have been made to accommodate more open spaces.



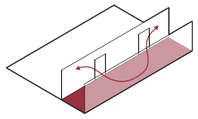
Breaking the long corridor

The analysis of the corridors of the case studies has revealed the alternatives to long, dark, tunnel-like spaces, still common in numerous school buildings.

Strategies for diversifying the corridors:

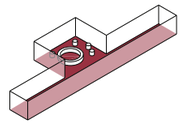
- perforated corridors, blended with informal areas, and additional learning spaces

  example: School in Leoben



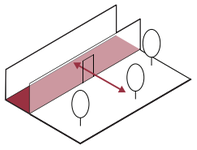
- corridors with niches – informal areas

  example: Fermi School, International School in Auer



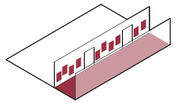
- corridors with visual connection with external areas

  example: Munkegaard School, BuBaO School



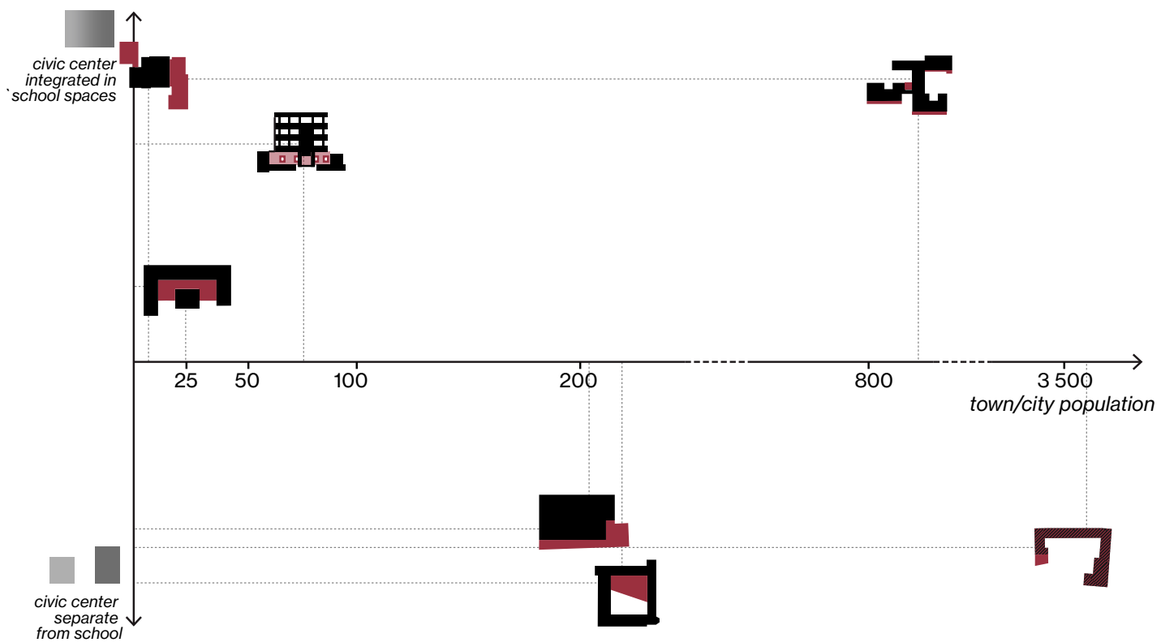
- corridor with a new function (e.g. gallery of students' works, lockers area)

  example: School in Sabadell, Berlin Metropolitan School



According to the analysis, schools in smaller towns often blend civic centers with school spaces, while in bigger cities, civic centers tend to be more separate. One reason for this could be the smaller size of buildings in smaller towns, which makes it practical to share spaces between education and community activities. Another factor is the smaller population in these towns, making it easier to coordinate and utilize shared facilities effectively.

In contrast, larger cities face more diverse needs and higher populations, which might lead to a preference for keeping civic centers distinct. This separation allows for better management and control of resources tailored to meet the varied demands of a larger and more complex urban population.



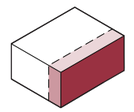
Civic center

Civic centers, or other facilities for the local communities, are present in all of the analysed school buildings. They have been integrated with other educational spaces to a various degree – from being a part of the main structure, to being placed in a separate building.

- **a part of a building**

civic center strongly merged with the rest of the school spaces. Usually, the spaces are available only in the afternoon, after the school activities

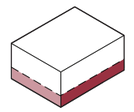
example: Munkegaard School, Berlin Metropolitan School



- **ground floor dedicated for afternoon activities**

the ground floor has an open and more public character, while the rest of the floors are accessible only for students

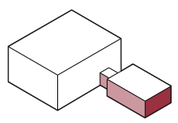
example: International School in Auer, School in Sabadell



- **separate sturcture, connected to the main building**

civic center can work independently from school, if needed, at the same time as the lessons. The separate structure is also well connected with the rest of the school and is in integral part of the learning environment

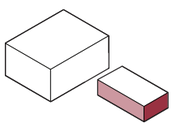
example: School in Leoben



- **separate building**

the civic center (or other facility for the local community) works independently from the school building, but some activities can be shared by school and the facility

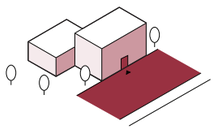
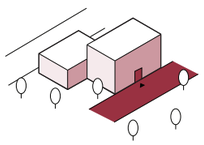
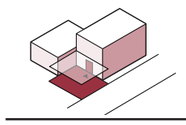
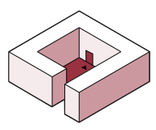
example: BuBaO School



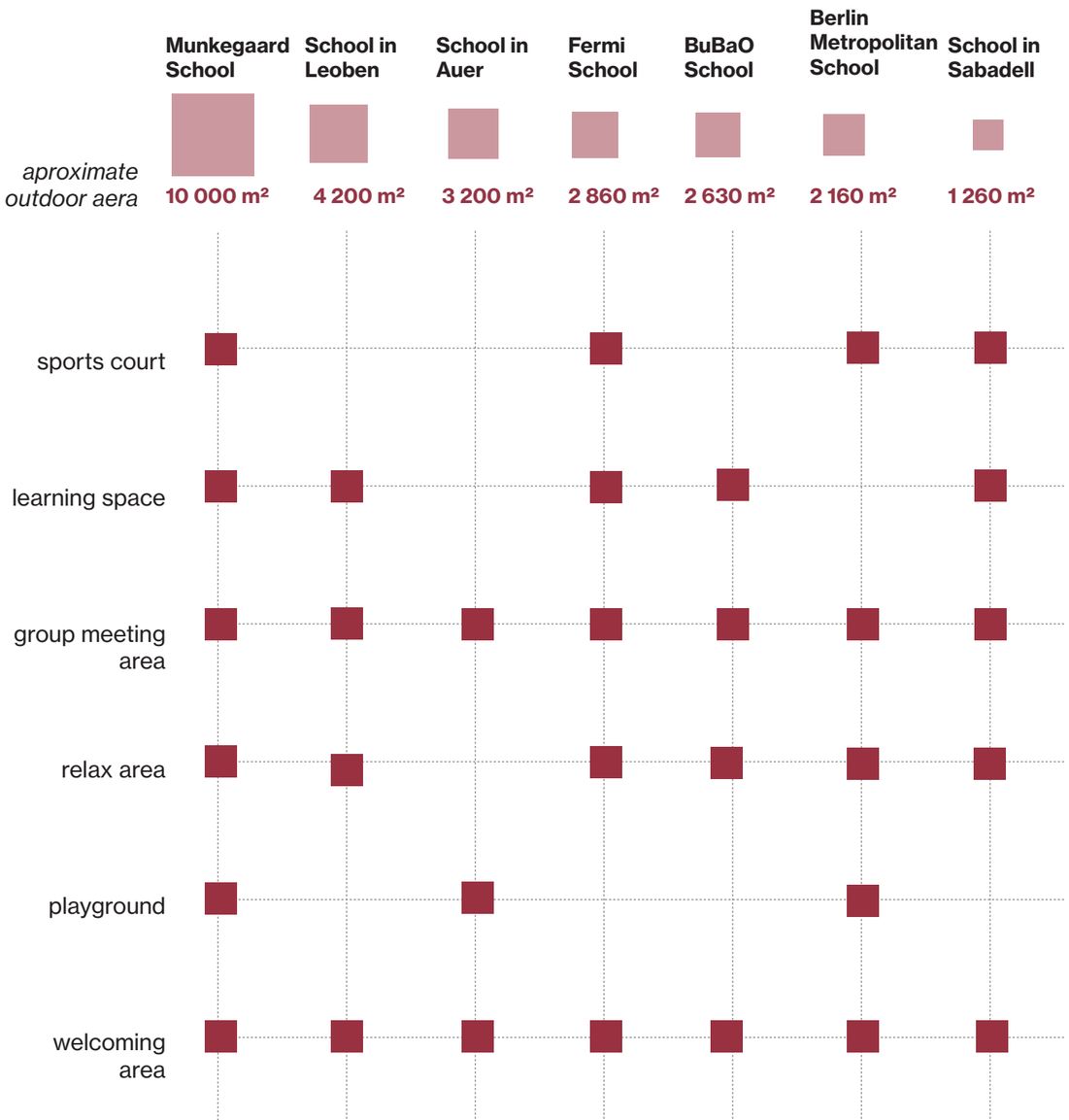
Outdoor spaces

- **Entrance areas**

The entrance area plays an important role in all of the analysed school buildings. Although different in forms, it is always a place where students can meet and spend time with their friends, undisturbed by the traffic and noise.

type of the entrance area	analysed school buildings	context	other functions	school grade	conclusions
open courtyard 	Munkegaard School	town up to 50 000 citizents medium density	playground, relax area	primary school	→ This type of entrance area creates a public or semi-public square. Well connected to the surrounding
	International School in Auer	town up to 5 000 citizents, low density	semi-public square	primary school	
private pathway 	School in Leoben	town up to 50 000 citizents medium density	adjacent multifunctional green area shared by several facilities	primary and lower secondary school	→ Gives some extent of privacy, at the same time being well connected to the surrounding, often an important space for the local community
	Fermi School	city with over 800 000 citizents, semi-peripheral district	adjacent green areas	lower secondary school	
roofed courtyard 	School in Sabadell	city with over 200 000 citizents central district	–	preschool and primary school	→ Strategic for school buildings in high-density contexts. Protects from noise and provides privacy and security
protected courtyard 	Berlin Metropolitan School	city with over 3 million citizents near-central district	relax and sport areas	lower secondary school	→ Provides high degree of privacy and well-protected areas, protected from traffic and noise
	BuBaO School	city with over 200 000 citizents	learning spaces, games area	special primary school	

- **Multifunctional outdoor spaces**



The area of the outdoor space and the anumber of functions outside do not have a direct correlation in the analysed school facilities. In order to accommodate all the necessary functions on smaller plots, the spaces tend to be multifunctional, rather than having only one function assigned to each space.

In all the analysed case studies, there is a welcoming area, which, as mentioned before plays an important role in the schools' lives. Additionally, each of them have space for informal group activities, for example during the breaks.

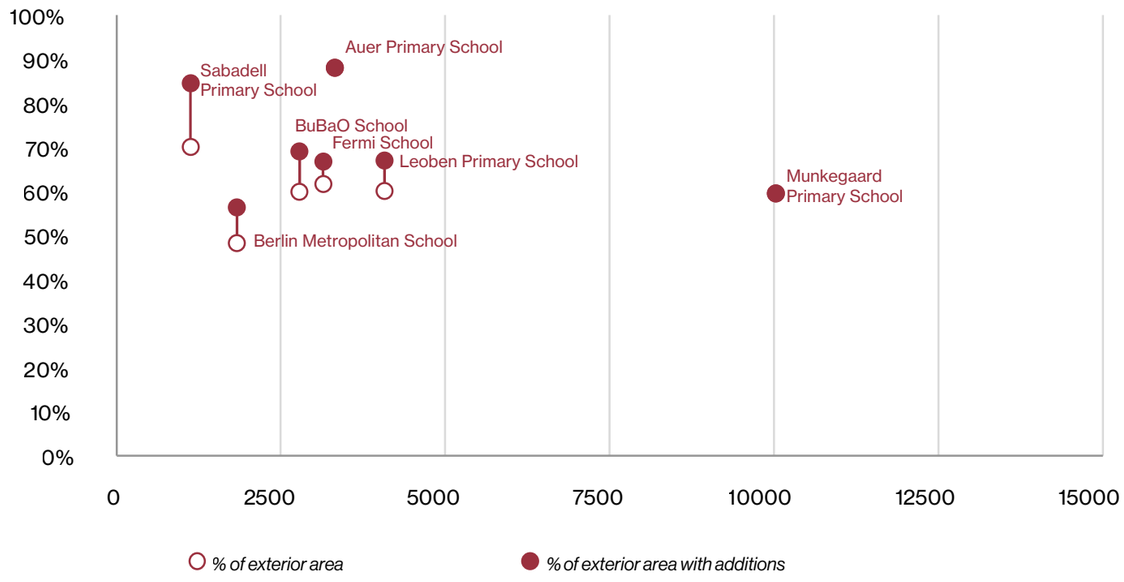
Six out of seven outdoor has also a more individual relax areas, for more quiet activities, where students can read a book, relax and rest.

Most of them provides also spaces, which can be used during the lessons for group activities. Some of them are directly connected to indoor learning spaces and work as their extension, e.g. in the Munkegaard School.

Facilities such as sports court or playground are not available in all of the analysed spaces, as they require big, dedicated areas. These functions are in some cases available near the school. For example, the lack of sports court in the outdoor area of the school in Leoben is compensated with a neighbouring sport center.

- **Density – in search for additional outdoor space**

Analysing case studies, it can be noticed that with an increase of density, decreases the external area. In those cases additional external areas were particularly important. The usable roofs and balconies provide extra outdoor space, which can be direct extensions of classrooms, circulation areas, or other spaces within school facilities, or independent spaces which can be used as sports courts, learning spaces, relax areas, etc.



4.9.2. Process

Expansions

Extentions are often necessary in the transformation process of educational spaces due to structural limitations, historical value of a building, or insufficient space. Among the analysed school buildings, there can be noticed that with the age of the existing structure, the size of the expansion increases (as shown on the diagram XX).

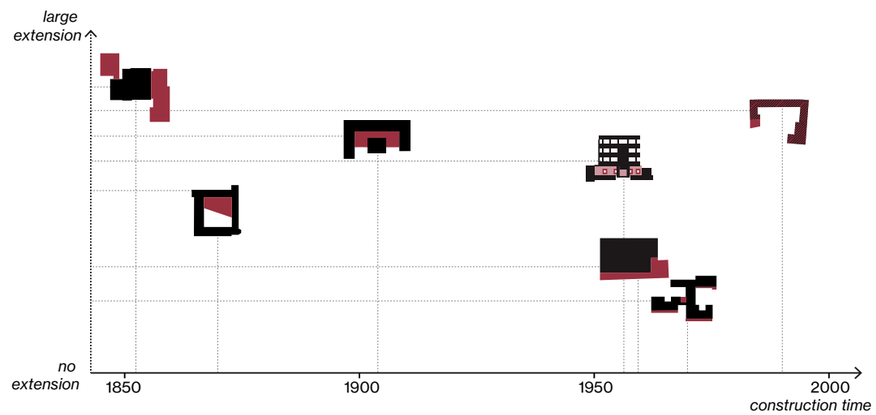
- **Functions of the expansions**

In the analysed school buildings, extensions of the existing structures can be divided into three categories, according to their function:

- **extensions providing additional learning spaces**
  example: International School in Auer

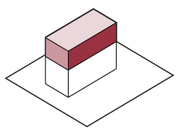
- **extensions providing new types of spaces**, e.g. assembly hall or flexible, open-space learning areas which can be impossible to provide in the existing building without strong interventions in the existing structure
  example: Munkegaard School, Primary School in Leoben

- **extensions enlarging esisting spaces**, or providing their external spaces
  example: Fermi School

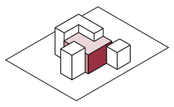


Transformation strategies

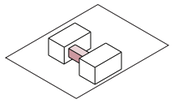
In the analysed case studies, various transformation strategies were used, depending on specificities and needs of each school building. They have been classified according to a type of intervention. The following classification has been based on the intervention types created by T. E. White (1999).



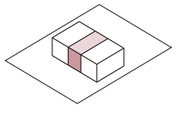
Hat
Provide additional space in high density areas
Due to structural reasons, not always possible, may require using lightweight structure



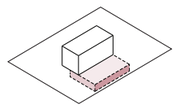
Infill
Allows to connect previously detached elements by creating a space between them



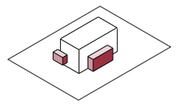
Bridge
Creates a linear connection between two buildings or arts of a building



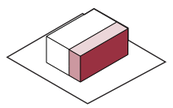
Insertion
Fills the gap between two structures, and merges two, previously separate spaces inside them



Underground
Provides additional space below the building, not changing its form seen from the outside



Parasite
Additional structures attached to the exterior of the building, e.g. balconies

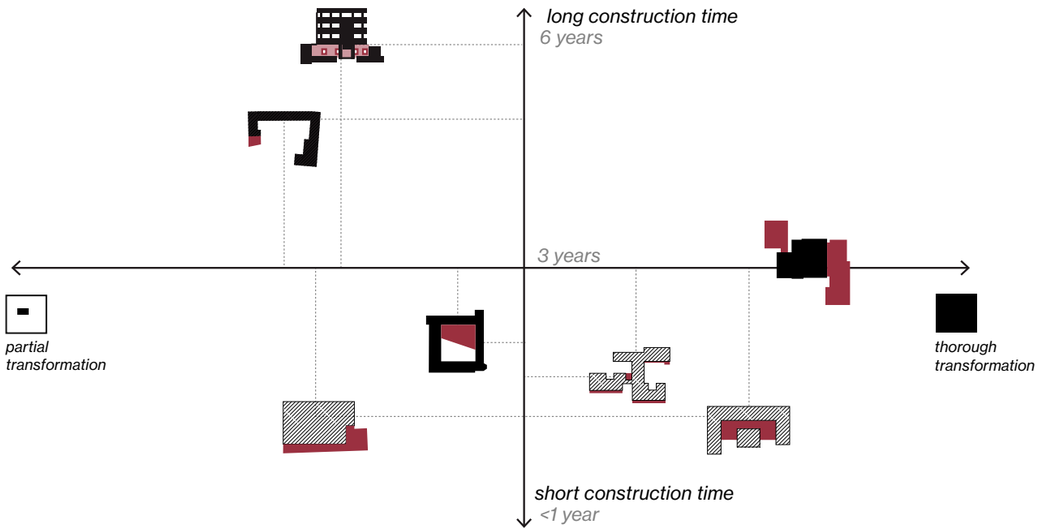


Addition
New volume added to a building to provide extra space

Duration of the transformation process

The duration of the transformation process in the analyzed school buildings is primarily depedant to the way in which the school operated suring the construction works. Short construction time may require closing the building, at least temporarily (e.g. like in case of Fermi School in Turin).

Many of the analysed case studies have heen operational during the construction works, which extended the consturction time.

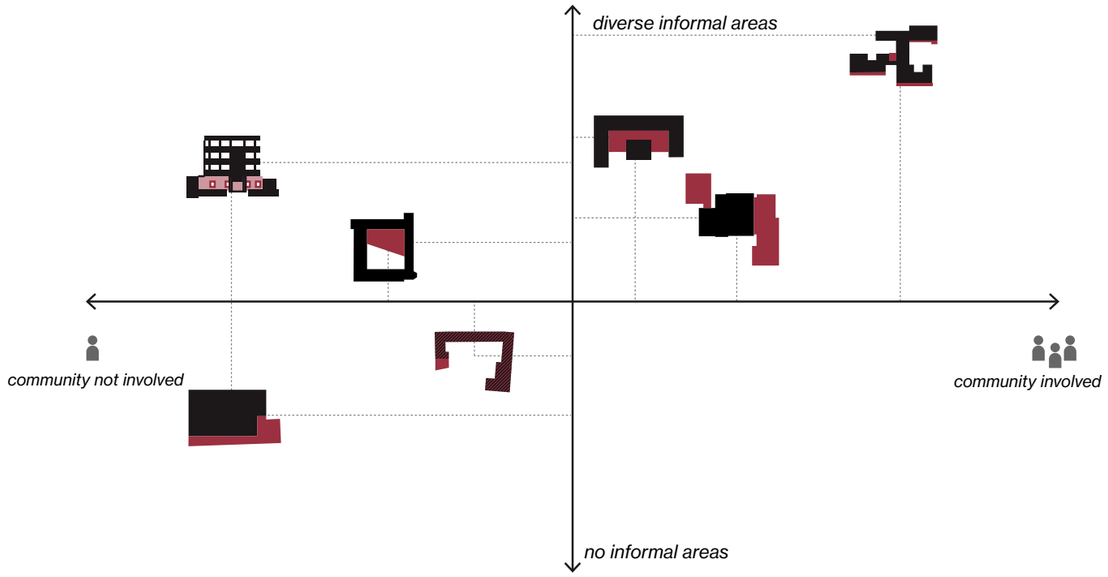


school closed during the transformation school operational during the transformation

Involvement of the community

Community plays an important role in the cdecisionmaking process during the design of the learning spaces. The users of the spaces indicate their needs and the ways in which they use the space.

The analysis has shown that the school spaces, which has been developped in collaboration with the school and local community, tend to be more diversed and contain more informal spaces, crafted especially for the needs of the users.



Ch. 5

New learning environment in the middle school Ugo Foscolo in Turin

Introduction

This chapter describes the design proposal for the renovation of a primary and middle school, within the Educational Institute Ugo Foscolo in Turin, located in the region of Piedmont. This region is characterised by old school buildings, with an average age of 64 years. Many of these buildings date back to the 1970s-the time of the demographic boom, constructed predominantly by technical offices under the City of Turin. Today, they require extensive renovations and rethinking due to the declining school enrolment.

The buildings of the Foscolo Institute represent typical school infrastructure from this time. They exhibit a rich history, marked by various adaptations typical of their era, such as:

- **Spontaneous additions of new school buildings on the plot, if more learning spaces were needed**: the primary school was built in an empty space next to the middle school building, in a place originally designated for a swimming pool
- **Adaptation to a new school type**: the building occupied by the middle school was previously a technical school
- **Merging of two separate schools**: the middle school was formed by merging two separate middle schools
- **Regulatory adjustments, especially for fire security**: fire doors, walls, and evacuation stairs were added to meet technical requirements, which resulted in numerous divisions

The school buildings present also many potentials, including ample natural light inside, a large outdoor area with a connection to public space and a park, and an initially clear spatial organization (that has undergone many modifications over time).

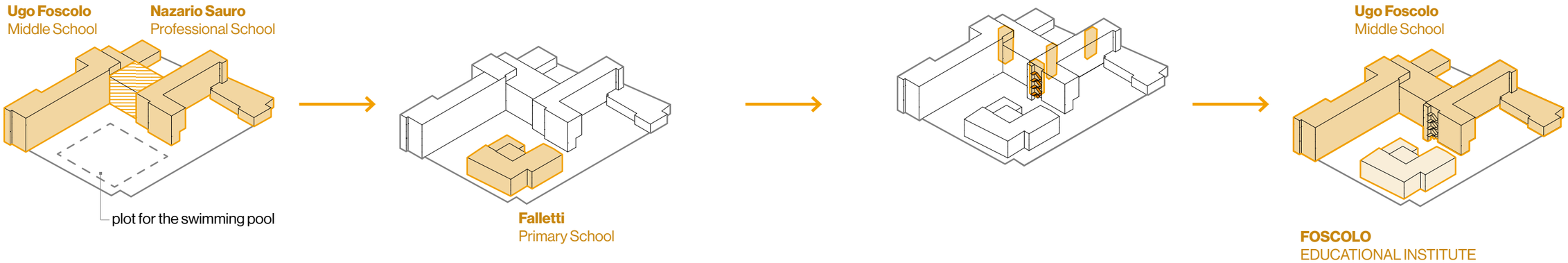
However, the learning environments face many challenges. The spaces seem strongly divided, particularly in the middle school where divisions still persist between its different parts. The spaces are also used inefficiently, which is best visible in the way how the plot is divided between two schools – the large portion of the middle school is unused, while the primary school plot is overcrowded. Additionally, several spaces inside are unused or underused. For example, some classrooms are excluded from use and became spontaneous storage spaces.

The main objective of the project was to reintegrate divided spaces and rethink the spatial connection between primary and middle schools and between parts of each building, especially two parts of the middle school. Another important goal was to optimize the use of spaces: considering unused and underused spaces. The design of the learning spaces was based on the designed with the 1+4 learning spaces model, which was adjusted to the specific needs of these school buildings.

The project was developed in collaboration with the school staff to ensure alignment with their educational goals. Several spaces, such as the tinkering room, art workshop, and assembly room, were designed to accommodate resources from the existing or anticipated funding programmes. The project aims to provide a framework for future decisions for managing resources from the funding programmes, facilitating a holistic transformation towards a more innovative and active learning environment over time.

5.1. Analysis of the transformation history

Space that does not keep up with organizational changes



1957
Opening of the middle school Ugo Foscolo

1958
Opening of the professional education school Nazario Sauro

- The schools share the central part with the assembly hall
- A public swimming pool planned on the same plot

1960
Opening of the primary school Falletti at the time of the demographic boom

1962
The school Nazario Sauro becomes the middle school

1987-2000
Regulatory adjustments and modernization

- accessibility: adding ramps for the users with disabilities
- fire safety: closing staircases, adding evacuation staircases, adding separations and fire doors

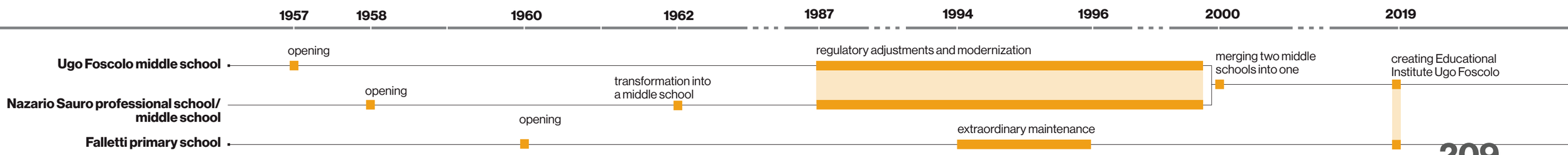
1994-1996
- extraordinary maintenance of the primary school

2000
Merging two middle schools under the name Ugo Foscolo

- the school start to be managed together

2019
Creating Ugo Foscolo Educational Institute (with both of the schools included)

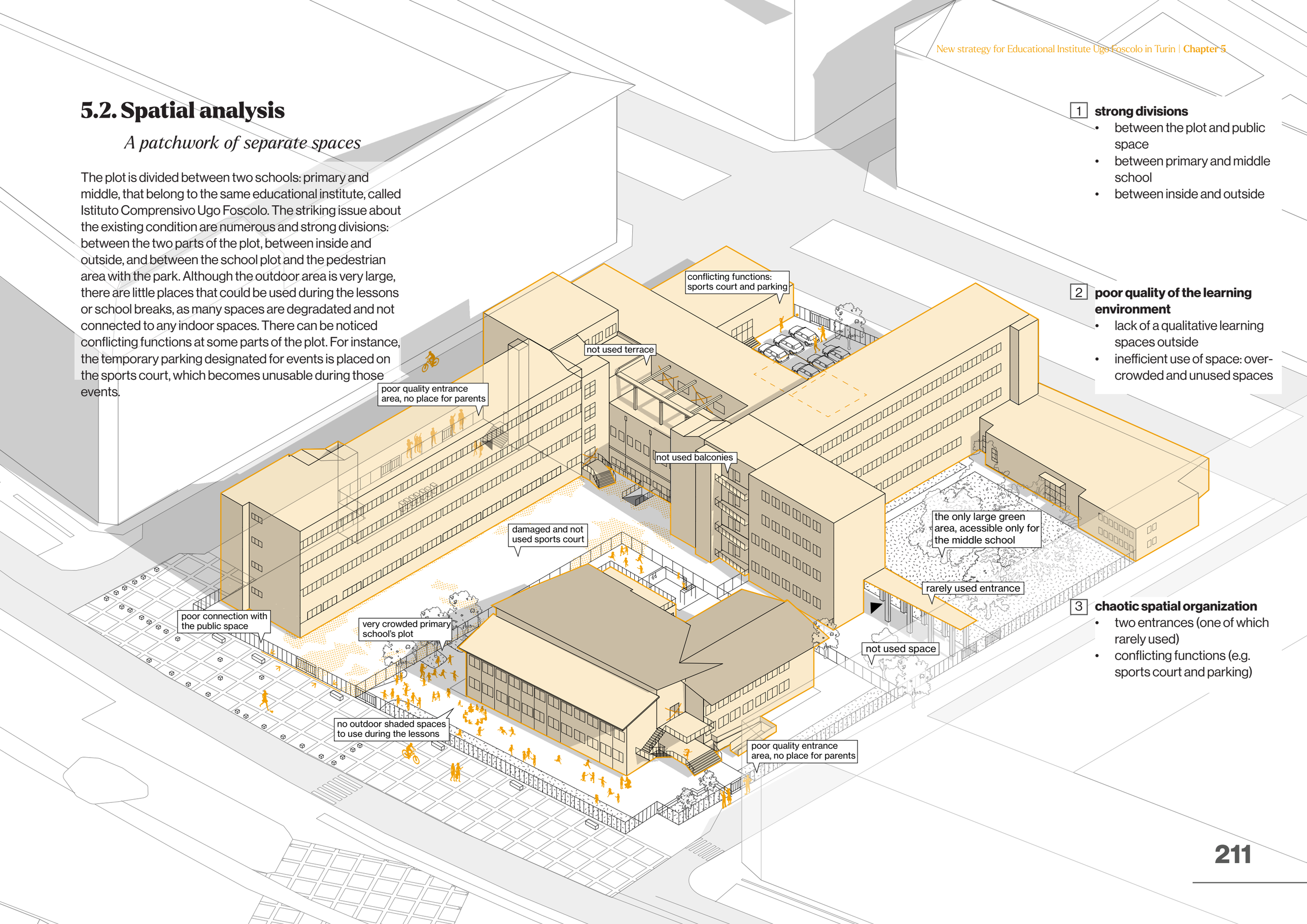
- the two parts being previously separate schools are still strongly divided
- the connection between the primary and middle school remains weak



5.2. Spatial analysis

A patchwork of separate spaces

The plot is divided between two schools: primary and middle, that belong to the same educational institute, called Istituto Comprensivo Ugo Foscolo. The striking issue about the existing condition are numerous and strong divisions: between the two parts of the plot, between inside and outside, and between the school plot and the pedestrian area with the park. Although the outdoor area is very large, there are little places that could be used during the lessons or school breaks, as many spaces are degradated and not connected to any indoor spaces. There can be noticed conflicting functions at some parts of the plot. For instance, the temporary parking designated for events is placed on the sports court, which becomes unusable during those events.



1 **strong divisions**
- between the plot and public space
- between primary and middle school
- between inside and outside

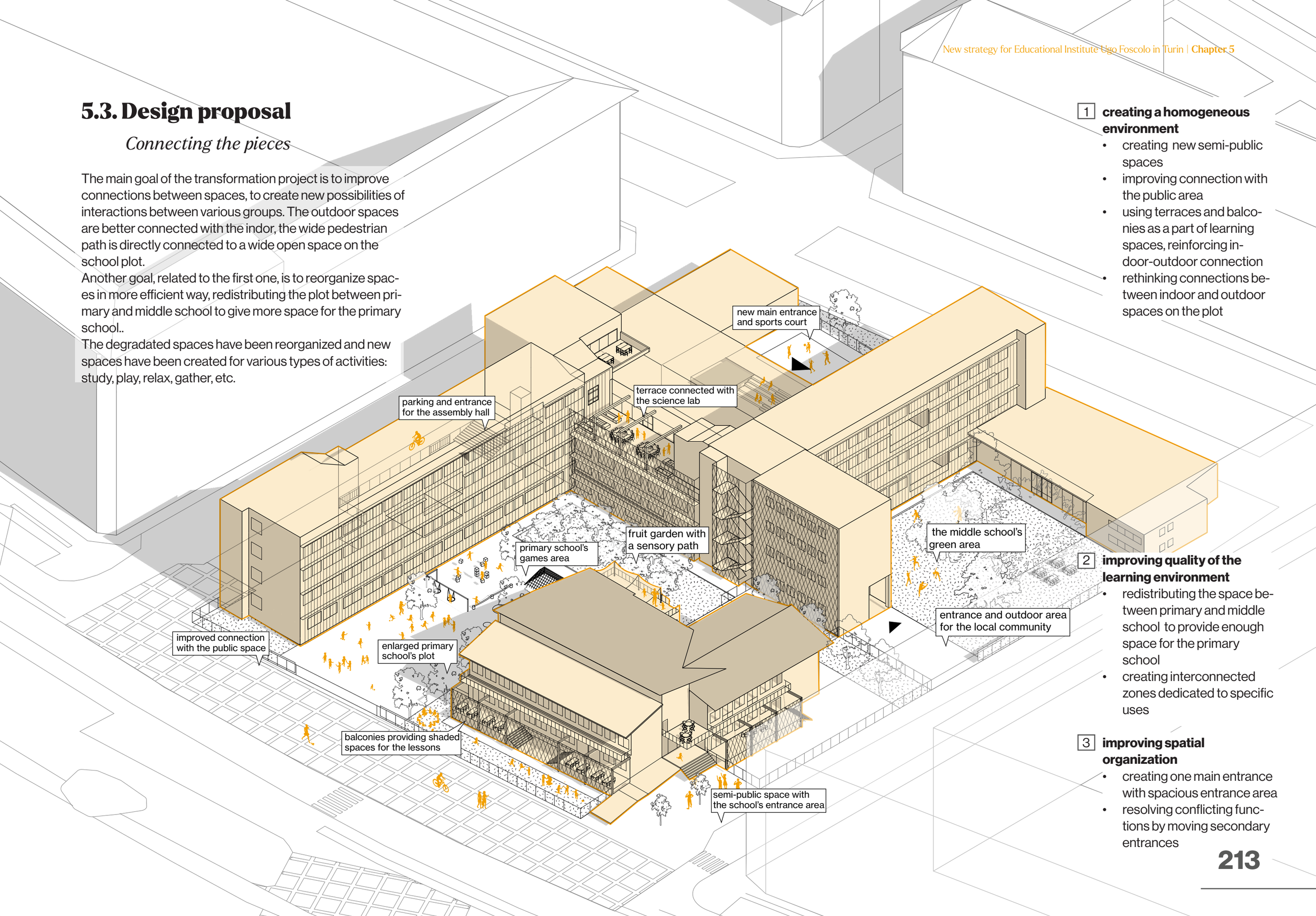
2 **poor quality of the learning environment**
- lack of a qualitative learning spaces outside
- inefficient use of space: over-crowded and unused spaces

3 **chaotic spatial organization**
- two entrances (one of which rarely used)
- conflicting functions (e.g. sports court and parking)

5.3. Design proposal

Connecting the pieces

The main goal of the transformation project is to improve connections between spaces, to create new possibilities of interactions between various groups. The outdoor spaces are better connected with the indor, the wide pedestrian path is directly connected to a wide open space on the school plot.
Another goal, related to the first one, is to reorganize spaces in more efficient way, redistributing the plot between primary and middle school to give more space for the primary school..
The degradated spaces have been reorganized and new spaces have been created for various types of activities: study, play, relax, gather, etc.



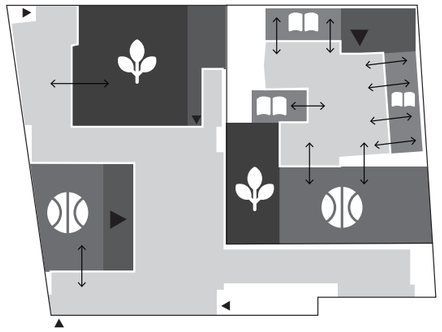
1 **creating a homogeneous environment**
- creating new semi-public spaces
- improving connection with the public area
- using terraces and balconies as a part of learning spaces, reinforcing indoor-outdoor connection
- rethinking connections between indoor and outdoor spaces on the plot

2 **improving quality of the learning environment**
- redistributing the space between primary and middle school to provide enough space for the primary school
- creating interconnected zones dedicated to specific uses

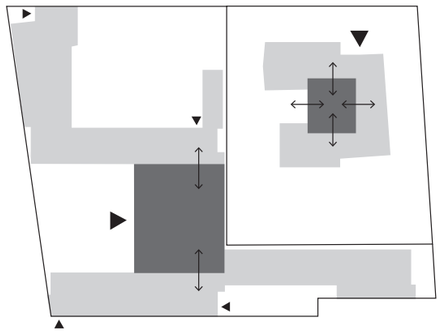
3 **improving spatial organization**
- creating one main entrance with spacious entrance area
- resolving conflicting functions by moving secondary entrances

Main design objectives

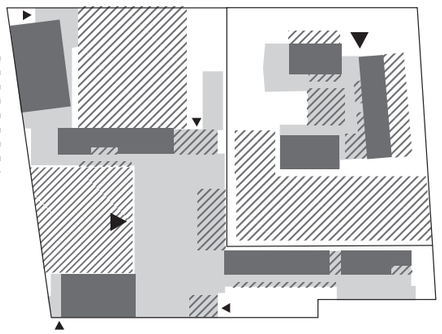
Homogeneous learning environment
connection with the external areas

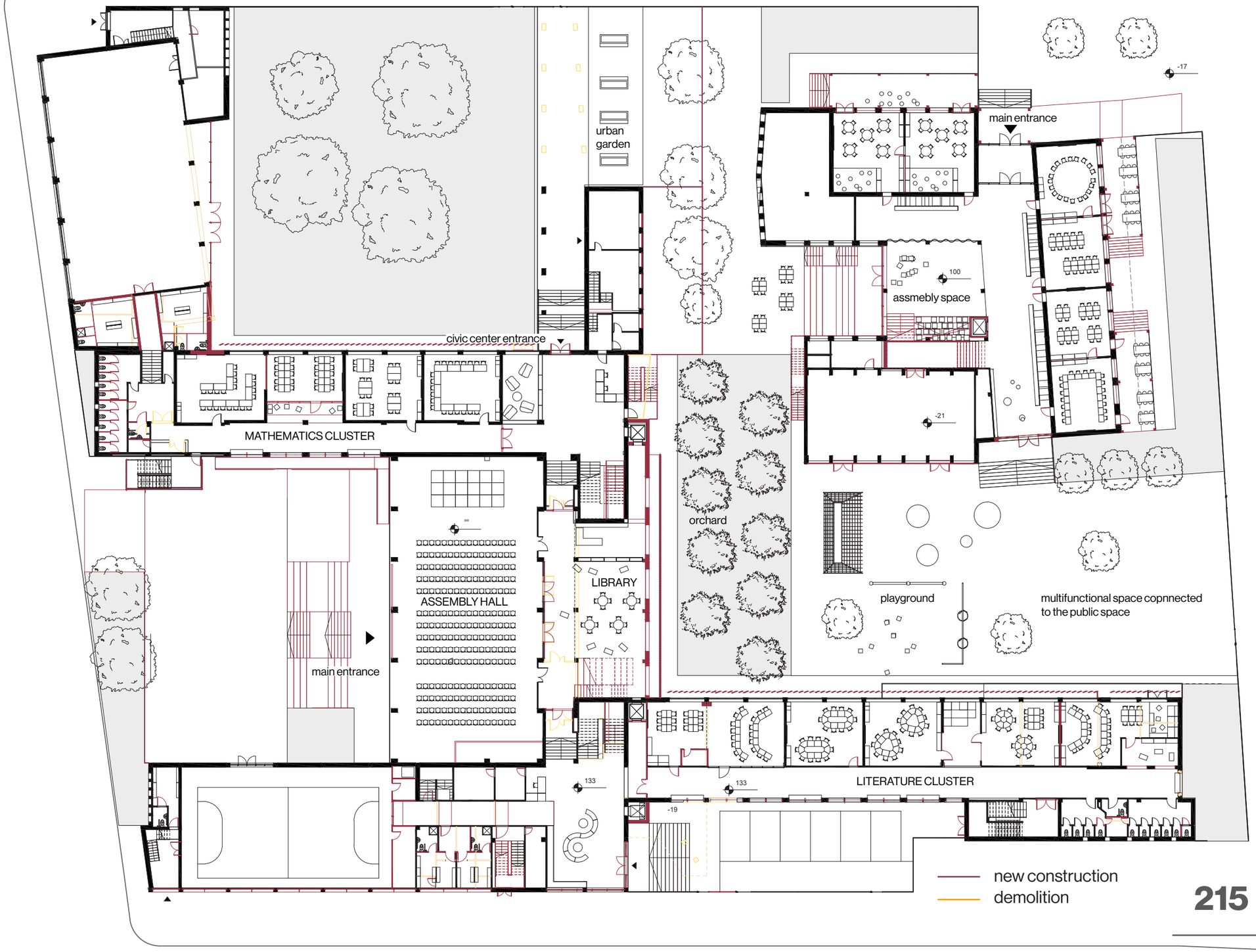


Improved spatial organization
main entrances and central spaces



Diversed leaarning environemnt
with formal and informal spaces





5.4. Design proposal for the middle school

Clusters as the potential to create active learning environments

The transformation project for a middle school building proposes creating a more active learning environment by allocating spaces to subjects and establishing clusters dedicated to similar activities. Additionally, it aims to better connect fragmented parts of the building and create a multifunctional central space that would serve as an important meeting place — the heart of the school.

Design strategies

The main goal of the transformation process is to create a dynamic learning environemnt, which can be easily modifies according to changing sues. The following strategies were used:

flexible, multifuctional layout to provide diverse learning settings

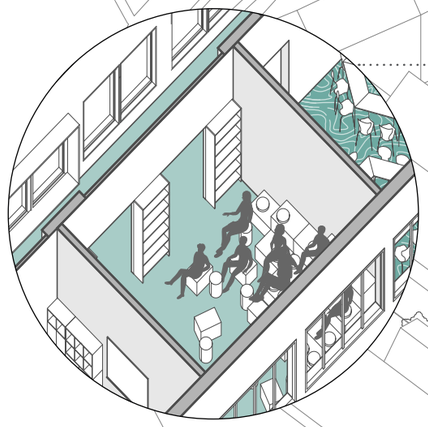
integrating outdoor spaces with other learning spaces

diversified spaces for specific needs of each subject

interconnected spaces that can be used togeth-er (e.g. classrooms and informal areas)

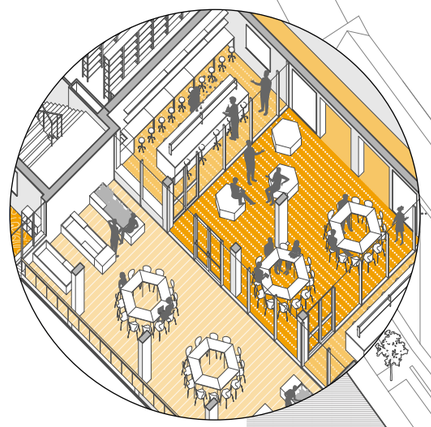
multiple gathering spaces uniformly distributed across the floors

organization prioritizing movement where students move from one space to another



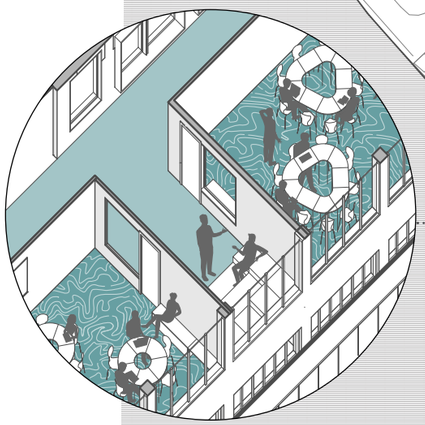
cinema room

outdoor classroom



science lab

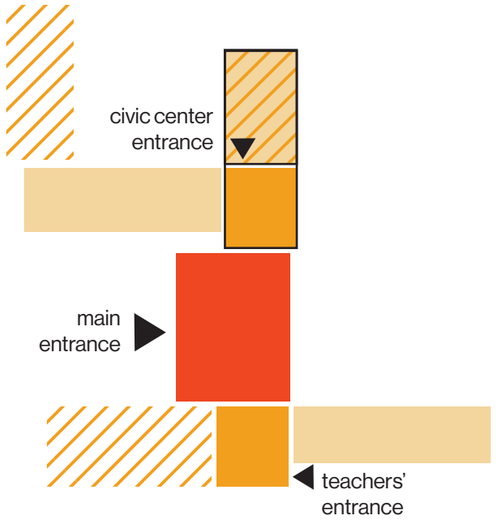
gym and outdoor area



informal area connected with classrooms

main entrance

Spatial distribution



central area
atrio

workshops
cluster

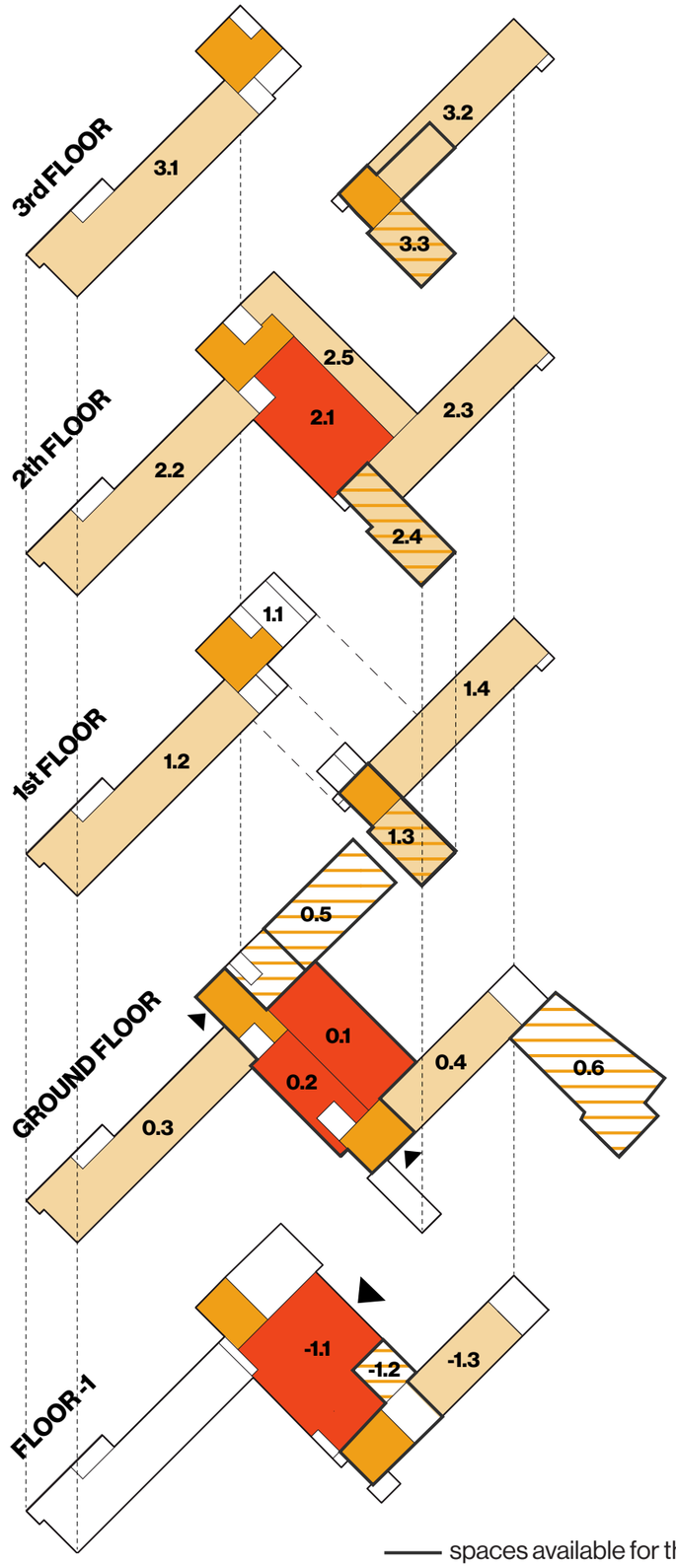
gym
available for the local
community

The central point of the middle school is a gathering place, with large open informal spaces,assembly hall, library and a laboratory complex. It is also a connection between the two wings, that were previously poorly connected.

The main learning spaces are located in the clusters in the two wings. They are connected to the central areas with indoor atrios serving as a multifunctional space for exhibitions, informal meetings, etc.

The part accessible for the civic center is available from the entrance at the eastern side. In contains specialized laboratories and workshops, which during school hours are used by students.

The entrance has been boved to the cental area. It is accessible from a large outdoor space that is connected to the lockers area, where students first leave the books and outdoor clothes before going to their lessons.



3.1 languages cluster
3.2 music cluster
3.3 music workshops

2.1 multipurpose workshop area
2.2 history and geography cluster
2.3 science cluster
2.4 robotics and technology work
2.5 additional classrooms

1.1 teachers' room
1.2 offices, administration
1.3 art workshops
1.4 mathematics cluster

0.1 assembly hall – canteen
0.2 library
0.3 literature cluster
0.4 mathematics cluster
0.5 gym 2
0.6 gym 3

-1.1 entrance area with lockers
-1.2 gym 1
-1.3 technical cluster

—— spaces available for the local community

Spaces other than classrooms

There are multiple spaces that enrich didactical offer of the school.They are distributed across the whole building, according to the needs of each cluster. There can be distinguished the following types of spaces:

external spaces, such as terraces,outdoor classrooms, and a botanical laboratory. They are well connected to the indoor areas and can be used together with them.

multifunctional classrooms situated at the central area on the second floor, not assigned to any particular subject

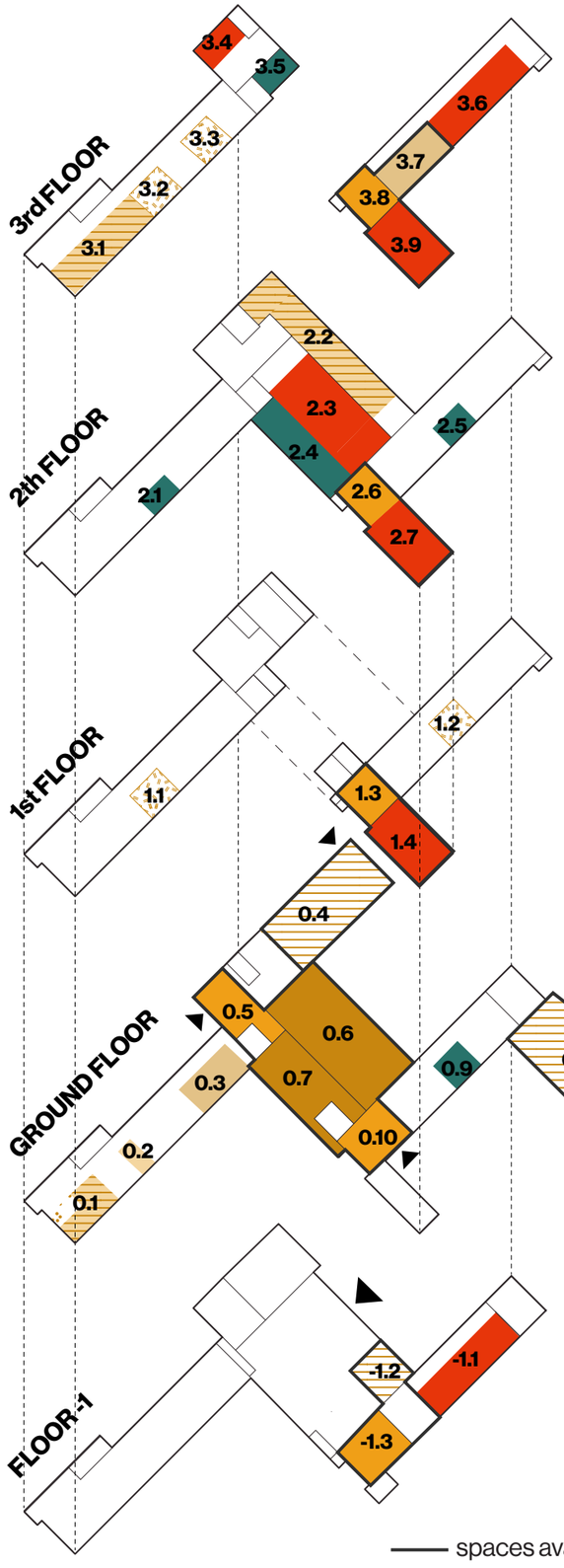
small assembly rooms – large classroom or parts of circulation areas, where parts of a school community can gather for guest lessons, workshops, etc.

big informal areas – open spaces connected with circulation areas, where students can meet, relax, etc. They can be also used during lessons

workshops and laboratories, placed according to needs of the clusters. Some of them are accessible for the local community

assembly hall and library at the center of the school, where its whole community can gather. The two spaces can be used together or separately, according to the needs of users

sport facilities: two gyms and one small gym, with separate changing rooms for the school and for the local community, connected with the outdoor sport areas



3.1 connected classrooms
3.2 cinema room
3.3 conversation room
3.4 music cluster
3.5 outdoor classroom
3.6 linstrument rooms
3.7 performance room
3.8 music atrio
3.9 music workshops and recording room

2.1 outdoor classroom
2.2 multifunctioonal classrooms
2.3 science laboratories
2.4 outdoor laboratory
2.5 outdoor classroom
2.6 robotics atrio
2.7 robotic workshops

1.1 informal space
1.2 informal space
1.3 art atrio
1.4 art workshop

0.1 large classrooms
0.2 informal area
0.3 meetings room
0.4 gym
0.5 guests' entrance
0.6 assembly hall
0.7 library
0.8 gym
0.9 outdoor classroom
0.10 civic center entrance

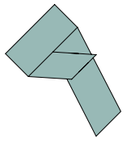
-1.1 tinkering workshops
-1.2 gym
-1.3 sports atrio

—— spaces available for the local community

Circulation

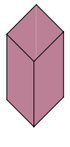
The indoor atrios are the connection points between floors. The main vertical connection is organized through open stairs and elevators accessible from the atrios. The entire building is accessible for the users with disabilities through elevators.

The main entrance is located at the central part of the building and it leads to lockers area, connected with the atrios. There is a separate entrance for the locla community, situated in the east, where most spaces of the civic center are located. There is also the entrance for the guests of the assembly hall in the west, accessible from a small parking lot.

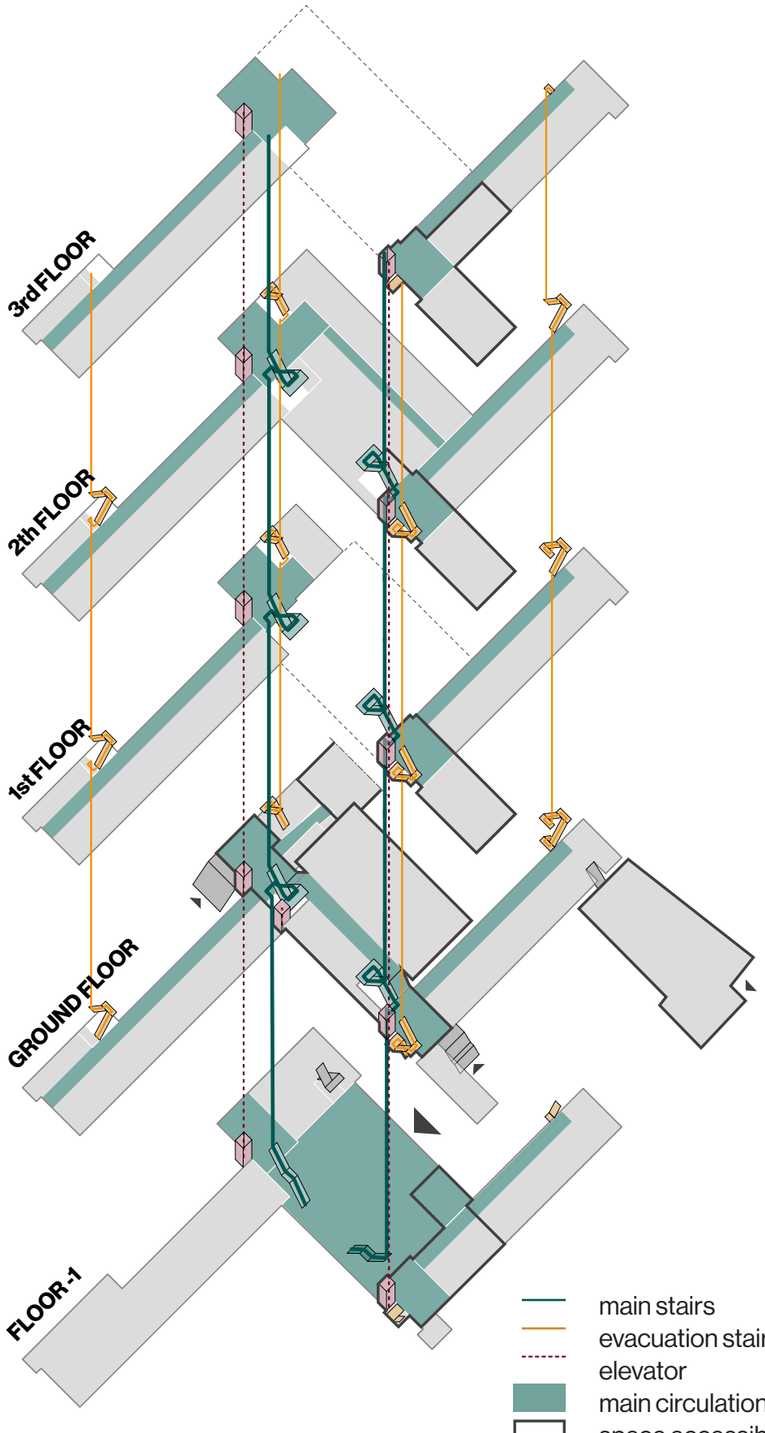


The open stairs connecting the atrios, are the main connectors between floors. They start ath the floor -1 at the entrance area with lockers and continue until the last floor.

There are four evacuation staircases, two for each wing

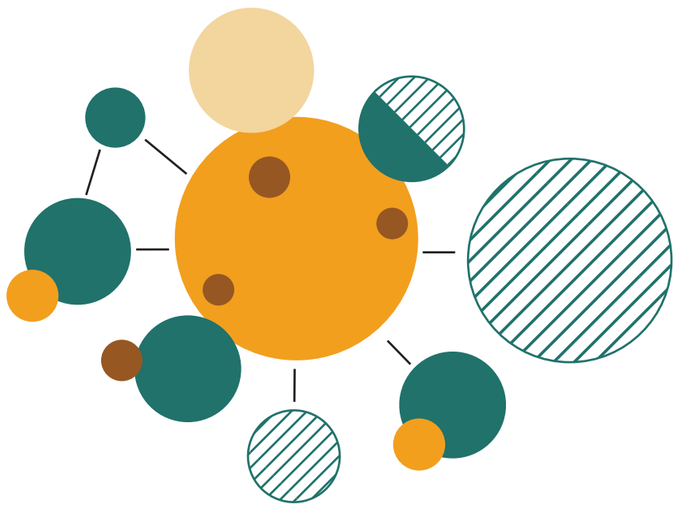


The elevators provide access to all of the didactical areas, including the central area with the library and assembly hall



Learning spaces

Diagram: connections between spaces in cluster



direct connection

indirect connection

The organization of the learning spaces in Foscolo School is based on the 1+4 model, described in the Chapter 3. The model has been adjusted to specificities of the existing structure of the Ugo Foscolo School.

The informal areas are essential in the learning environment, as they provide connection between other spaces, and are a primary meeting point.

Other types of spaces, such as group learning spaces, exploration labs, gathering rooms, and services.

The individual areas are scattered in other spaces.

group learning space

Each cluster offer group learning spaces designated for specific subjects, therefore their form, side and arrangement vary to andwer specific needs more efficiently. The group learning spaces are assigned to one or two teachers, who manage and personalize them.

exploration lab

There are various types of exploration labs: they can be merged with group learning spaces, forming a classroom-laboratory spaces, as well as stand-alone laboratories dedicated to specific subject, or multifunctional workshop spaces, places within cluster, or outside, available for students and for the local community.

informal area

The informal space is at the center of each cluster, as well its connection with the rest of the school. The informal areas consist of an atrium, corridors with informal gathering niches and facilities, ope classrooms, which can be used during breaks, and balconies, accessible from common areas of from classrooms.

agora

The main assembly hall is located at the central part of the building. Besides, at least one of two clusters on each floor is equipped with a large assembly space – a large classroom, spacious circularion area, large multifunctional workshop area, etc. They can be used as gathering places for bigger groups of students.

individual area

The individual areas are scattered in common areas and some group learning spaces. They provide space to rest from stimuli, relax, focus study alone, etc.

Examples of learning spaces

The following pages show the examples of learning spaces according to their character. They have been classified using the 1+4 Learning Spaces model. Although most of the spaces can accommodate several functions together, the main functions were highlighted to show the diverse character of spaces. They have been analyzed according to the following categories:

connections

To show with which spaces thei interaact, and to what extens, and if the space can be used together with other spaces. The followeing scale was used:

weak connection
direct connection
strong direct connection and visual connection
spaces can be used together
spaces are merged together

context

The context was taken into cinsideration to decide the function of spaces

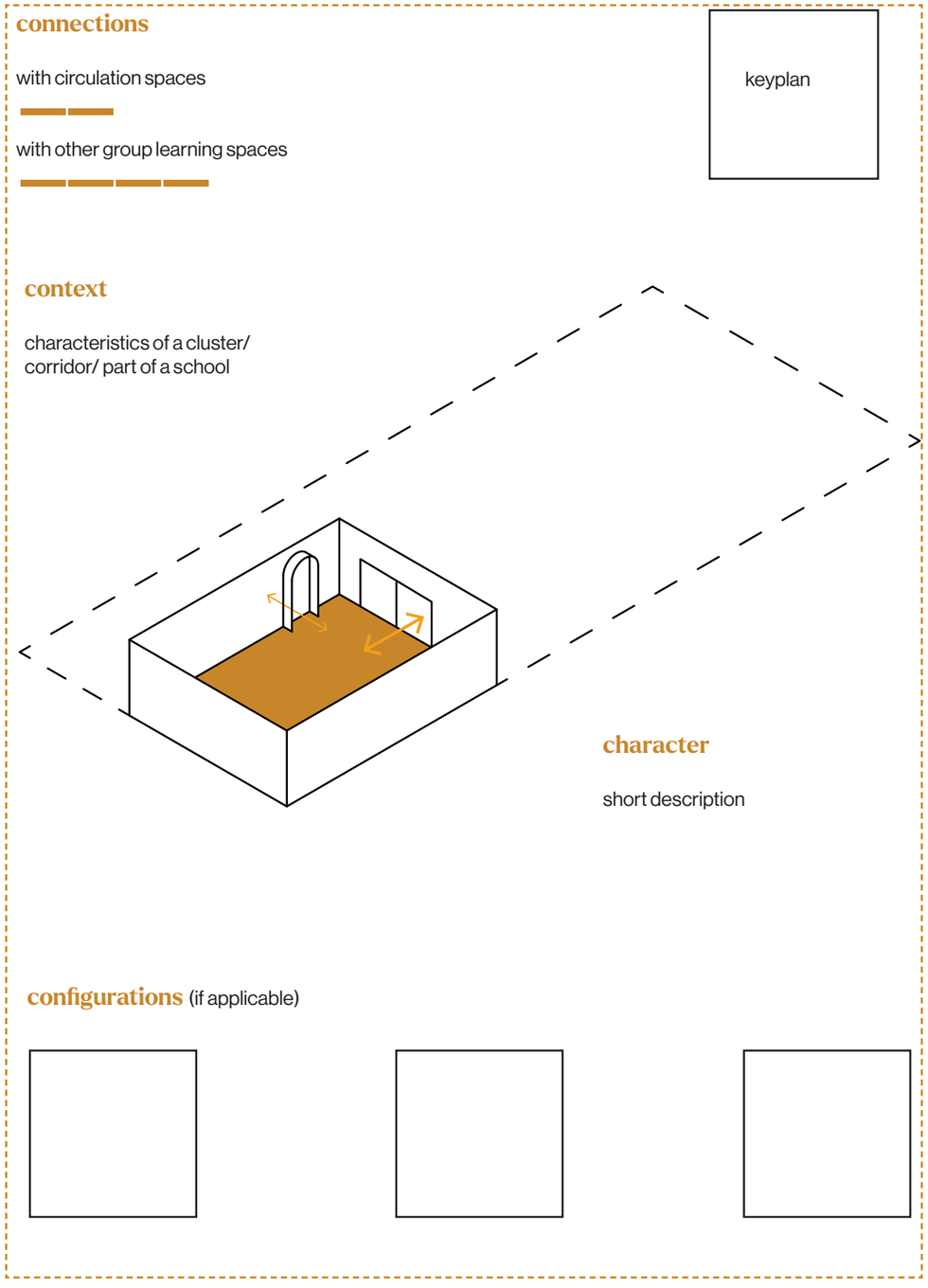
character

The character describes the characteristics of each space, as well as in what ways it can be used

configurations

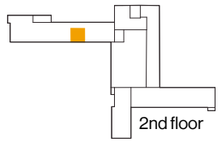
identicates exemplary uses of the spaces

Exemplary space



Group learning spaces

Basic classroom



connections

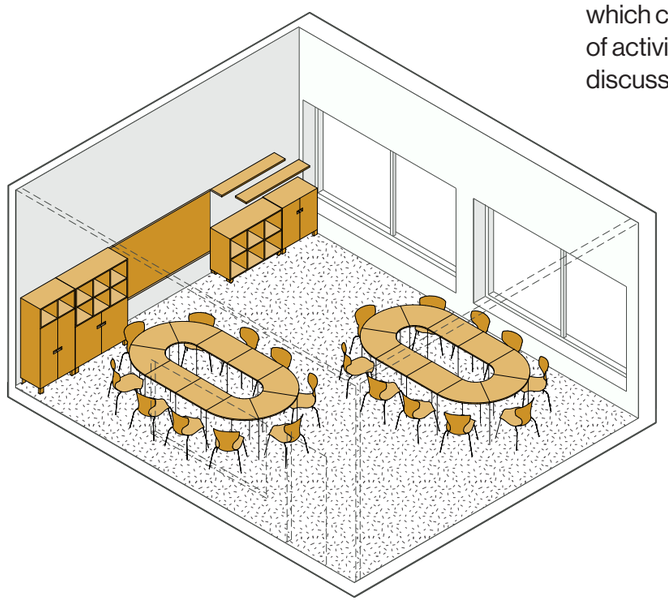
with the common area

context

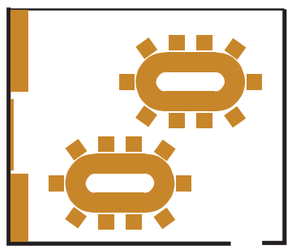
Within clusters, assigned to subjects and teachers, students move from classrooom to classroom

character

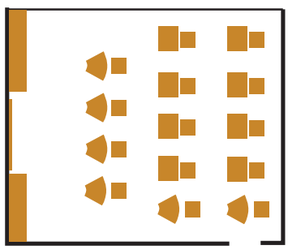
Classroom with flexible layout, which can be used for various types of activities, such as group work, discussions, presentations, etc.



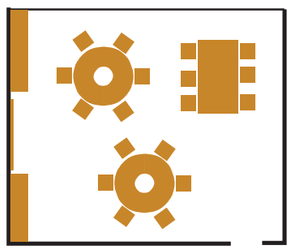
configurations



discussion

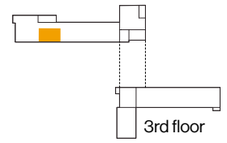


test



group work

Connected classrooms



context

In the language cluster, where there is a need for small learning spaces

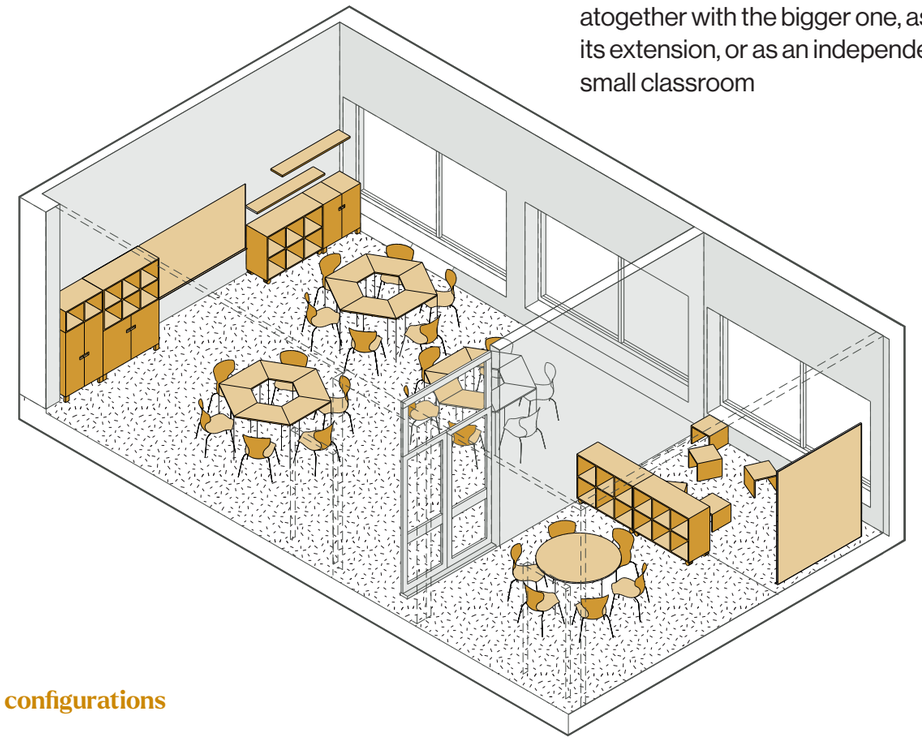
connections

with the common area

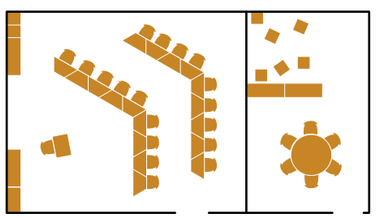
between the two classrooms

character

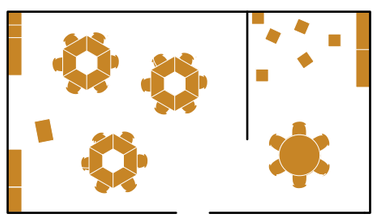
The small classrooms can be used atogether with the bigger one, as its extension, or as an independent small classroom



configurations

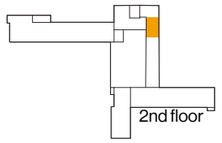


two separate lessons



one lesson

Multifunctional classroom



connections

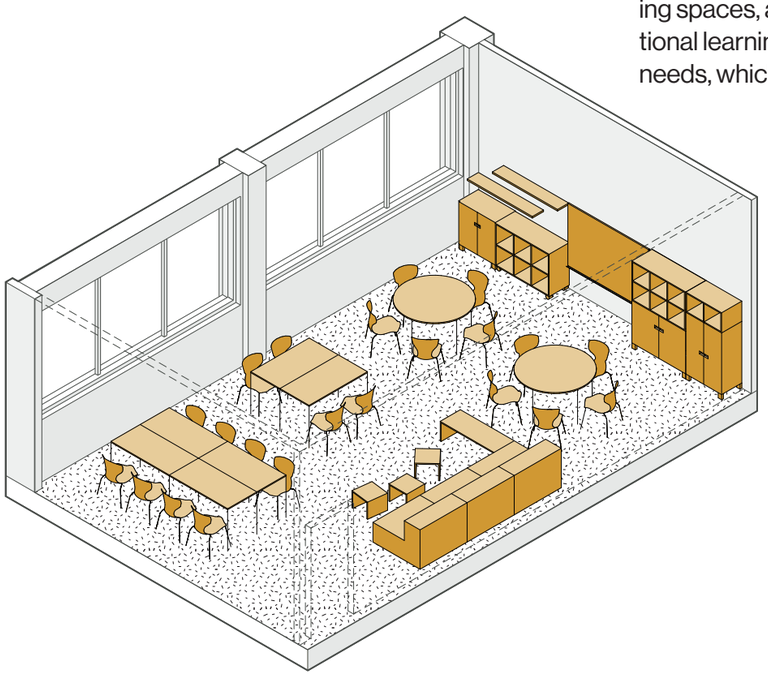
with the common area

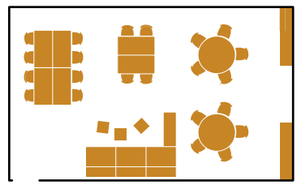
context

Situated in the central area on the second floor, not assigned to any specific subject

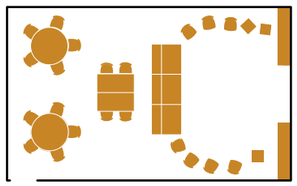
character

The spacious classrooms can accommodate diverse types of learning spaces, and serves as an additional learning space, according to needs, which can change each year



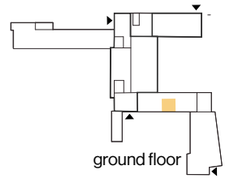


group activities



various activities at

External classroom



connections

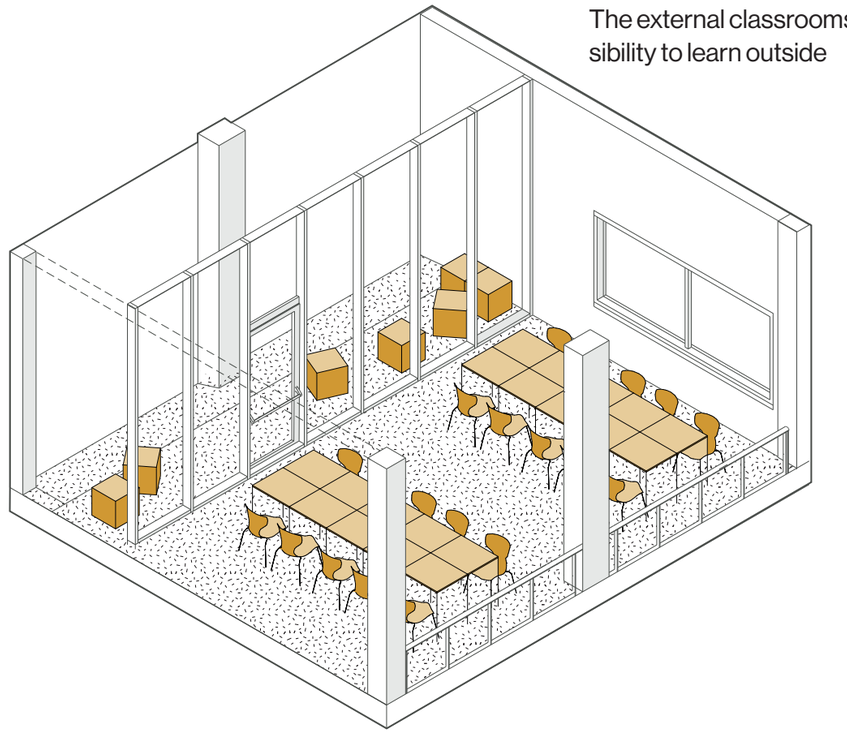
with the common area

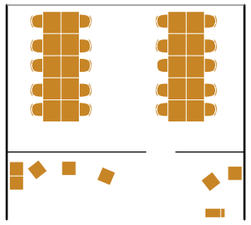
context

Inside clusters, cut off the main voume

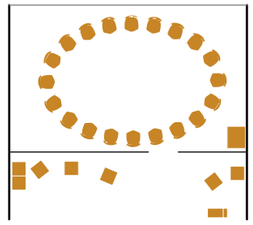
character

The external classrooms give a possibility to learn outside



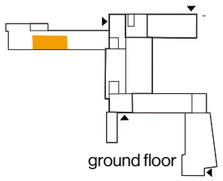


group work



discussion

Classroom connected to the informal area



connections

with the common area

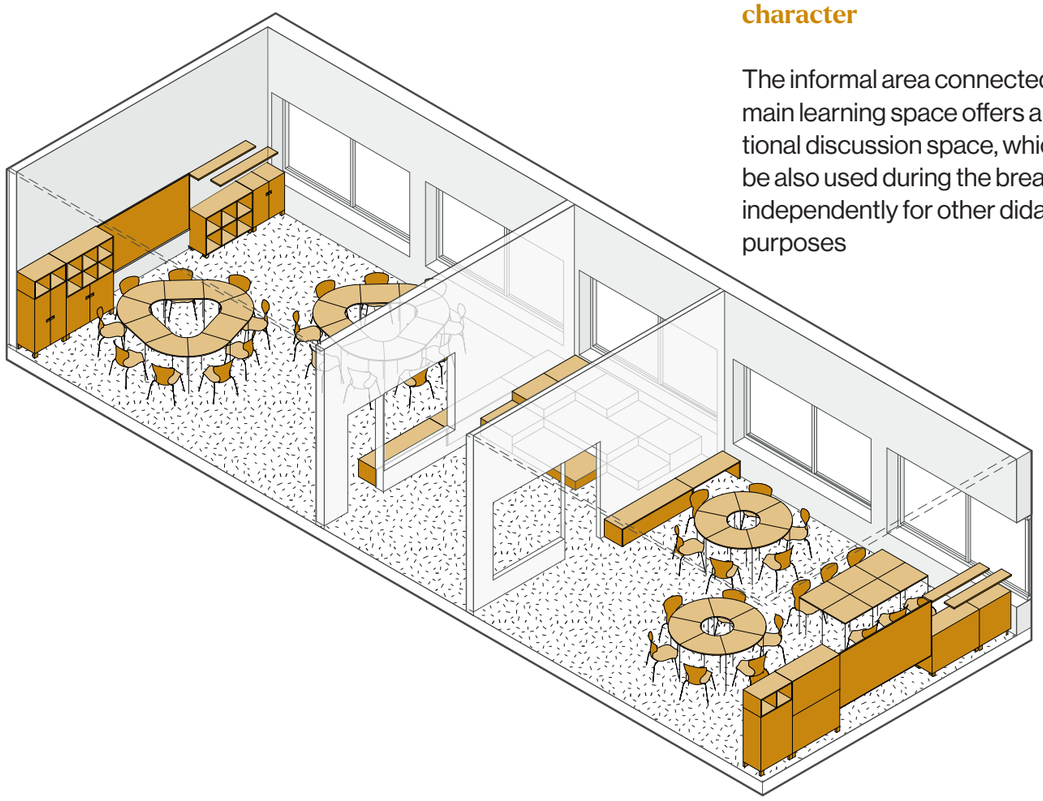
between formal and informal areas

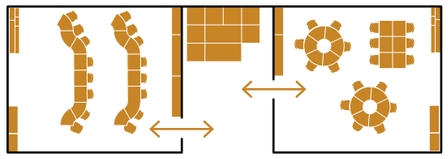
context

Inside the clusters, especially those dedicated to subjects which re-quirelarge space for discussions

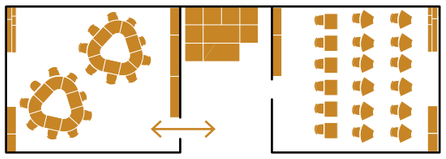
character

The informal area connected to the main learning space offers an addi-tional discussion space, which can be also used during the breaks, or independently for other didactical purposes



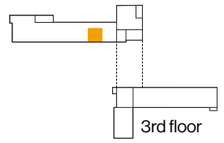


three different zones working togeth-er (presentation, informal discussion, group work)



two activities working together (group work, informal discussion) + separate ac-tivity in the third space (individual work)

Classroom with a balcony



connections

with the common area

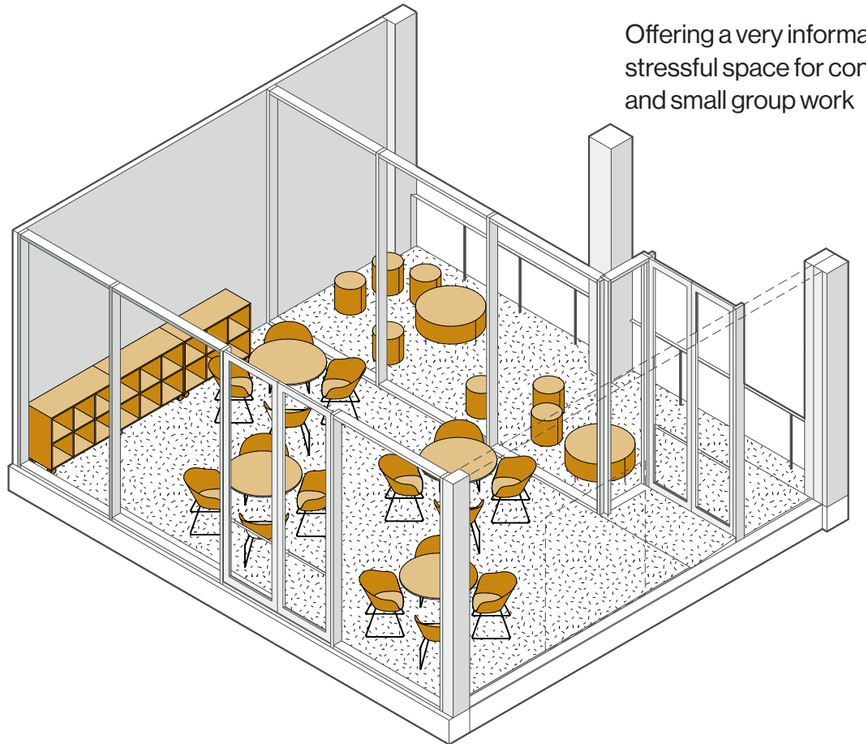
with the outdoor space

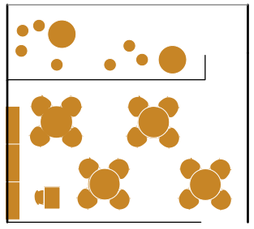
context

Inside language cluster

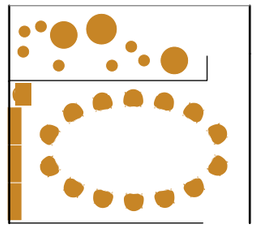
character

Offering a very informal and not stressful space for conversations and small group work





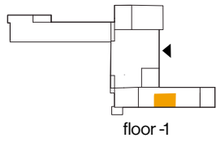
small groups discussion



informal discussion

Exploration labs

Tinkering lab



connections

with the common area

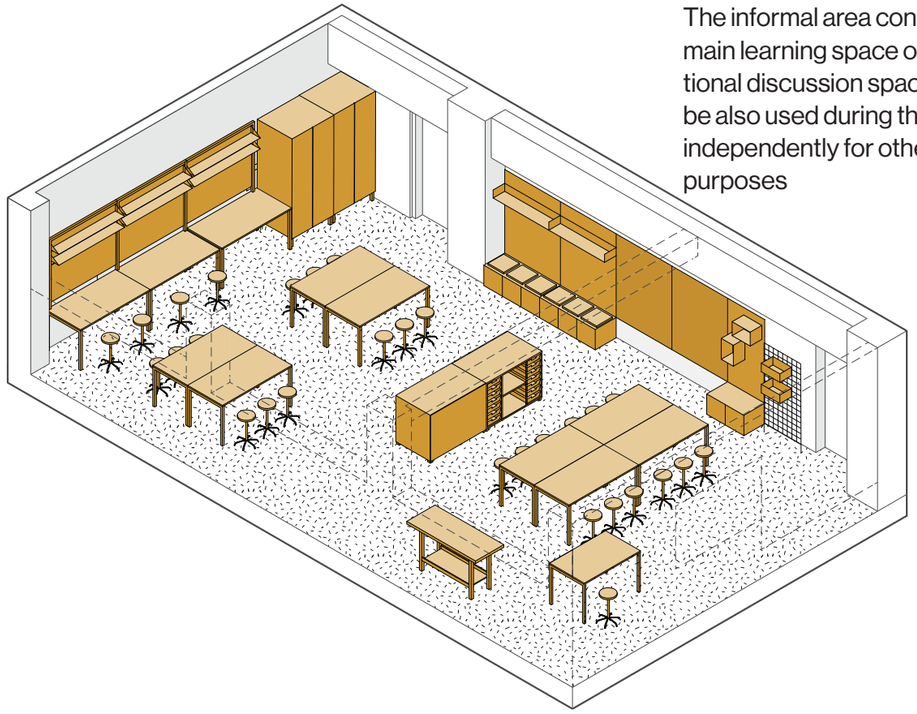
between formal and informal areas

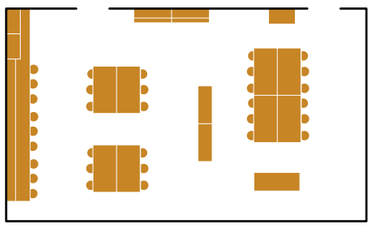
context

Inside the clusters, especially those dedicated to subjects which re-quirelarge space for discussions

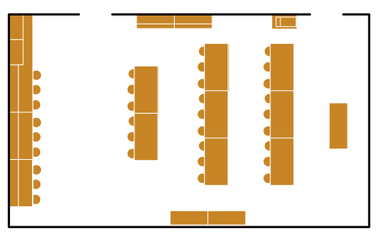
character

The informal area connected to the main learning space offers an addi-tional discussion space, which can be also used during the breaks, or independently for other didactical purposes



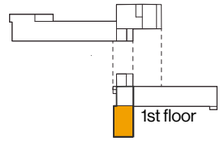


group activities



interactive follow-through presentation

Art lab



connections

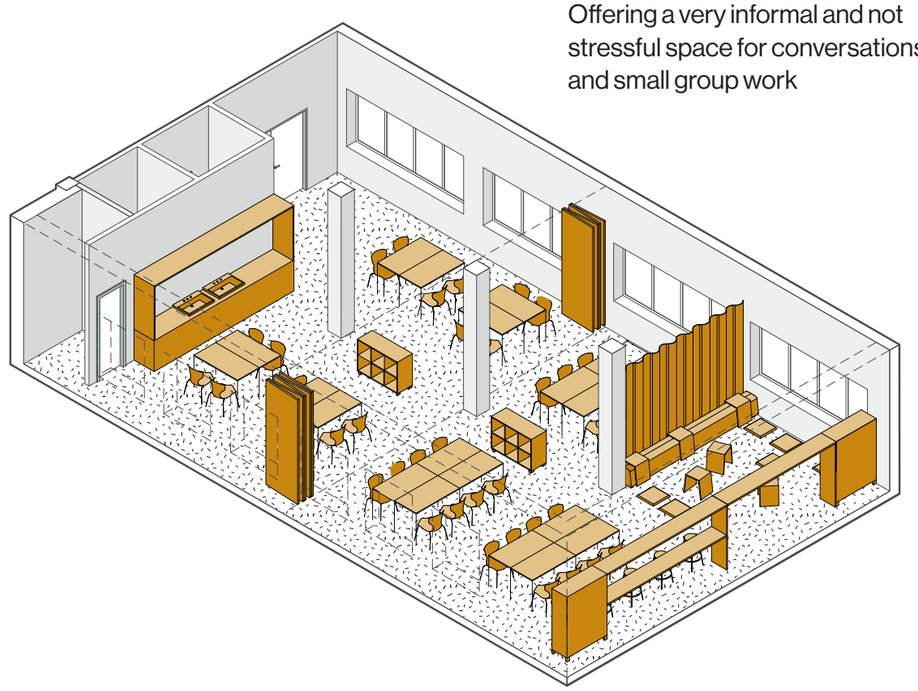
with the common area

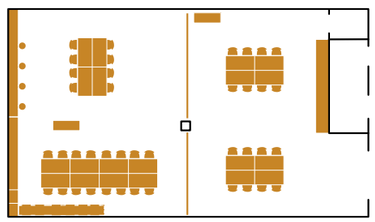
context

Inside language cluster

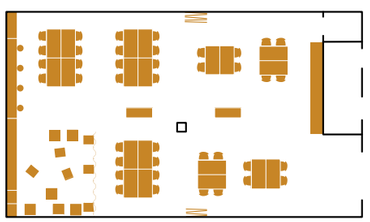
character

Offering a very informal and not stressful space for conversations and small group work



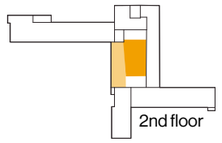


two separate workshop (e.g. painting and paper crafts)



one big workshop, where everyone cho-ses their activitiy

Science lab with the multifunctional area



connections

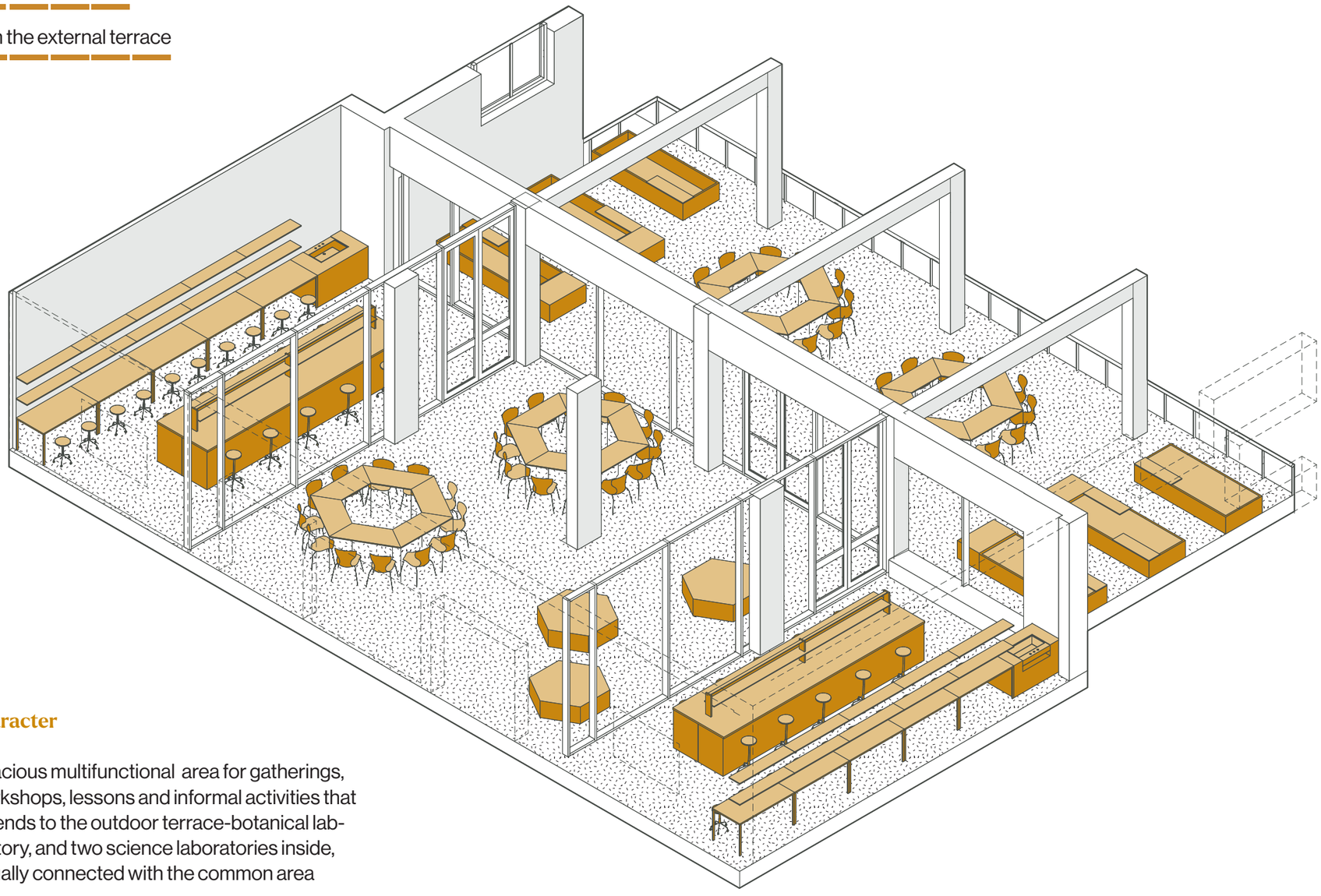
with the circulation area

between the multifunctional area and laboratories

with the external terrace

context

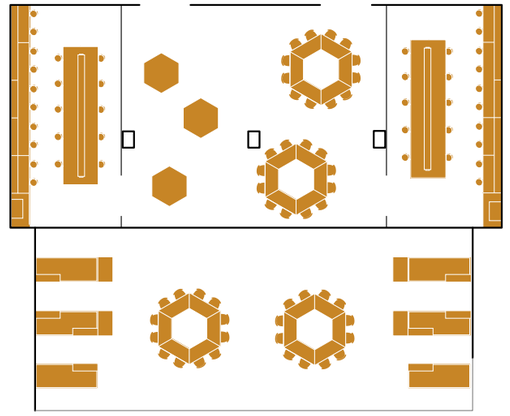
In the central part of the building, on the second floor, near the science cluster



character

Spacious multifunctional area for gatherings, workshops, lessons and informal activities that extends to the outdoor terrace-botanical laboratory, and two science laboratories inside, visually connected with the common area

configurations



group work on the external terrace and in the multifunctional area

an event in the multifunctional area, an informal area on the terrace to be used during the breaks

Agora

Central area: library and assembly hall

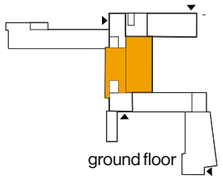
connections

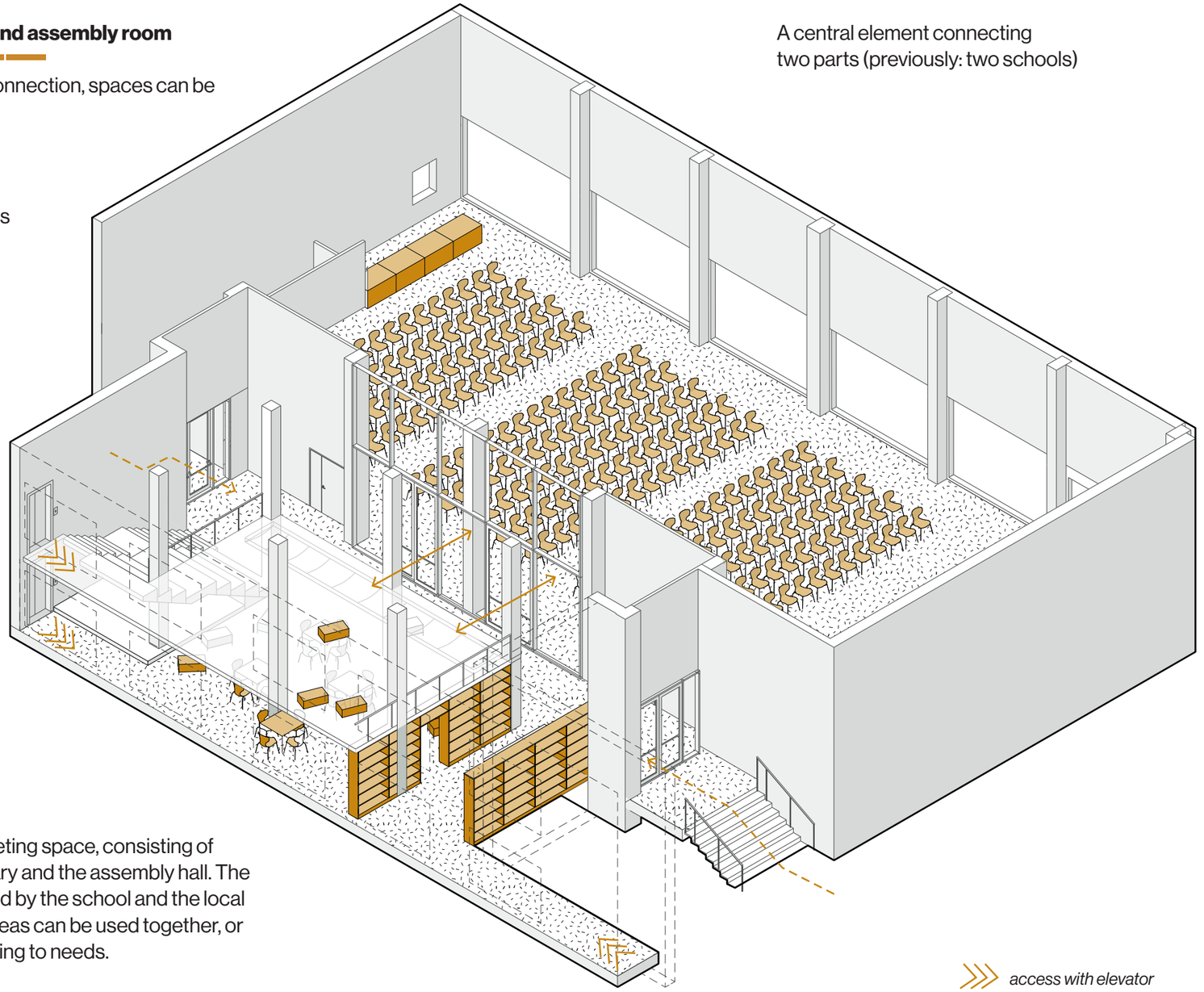
between library and assembly room

direct and visual connection, spaces can be used together

with atrios

connected by stairs and elevators





context

A central element connecting two parts (previously: two schools)

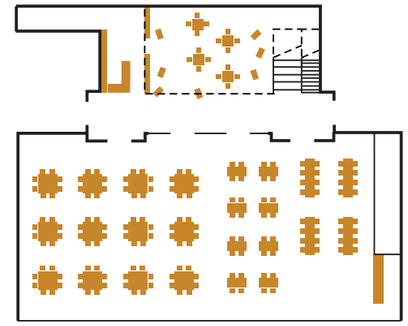
character

Gathering and meeting space, consisting of two areas: the library and the assembly hall. The spaces can be used by the school and the local community. The areas can be used together, or separately, according to needs.

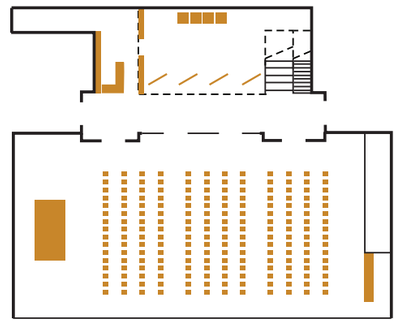
A multifunctional library space has been situated at the center of the school to highlight the importance of informal and individual study in the learning process.

access with elevator
access with stairs
direct connection

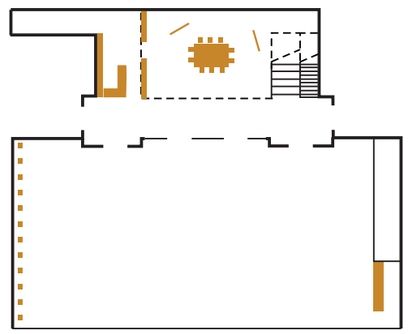
configurations



normal day: library activities and canteen

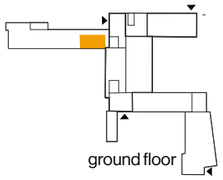


event in the assembly hall and library as a welcoming area



afternoon activities: meeting in the library and dance classes in the assembly hall

Double classroom

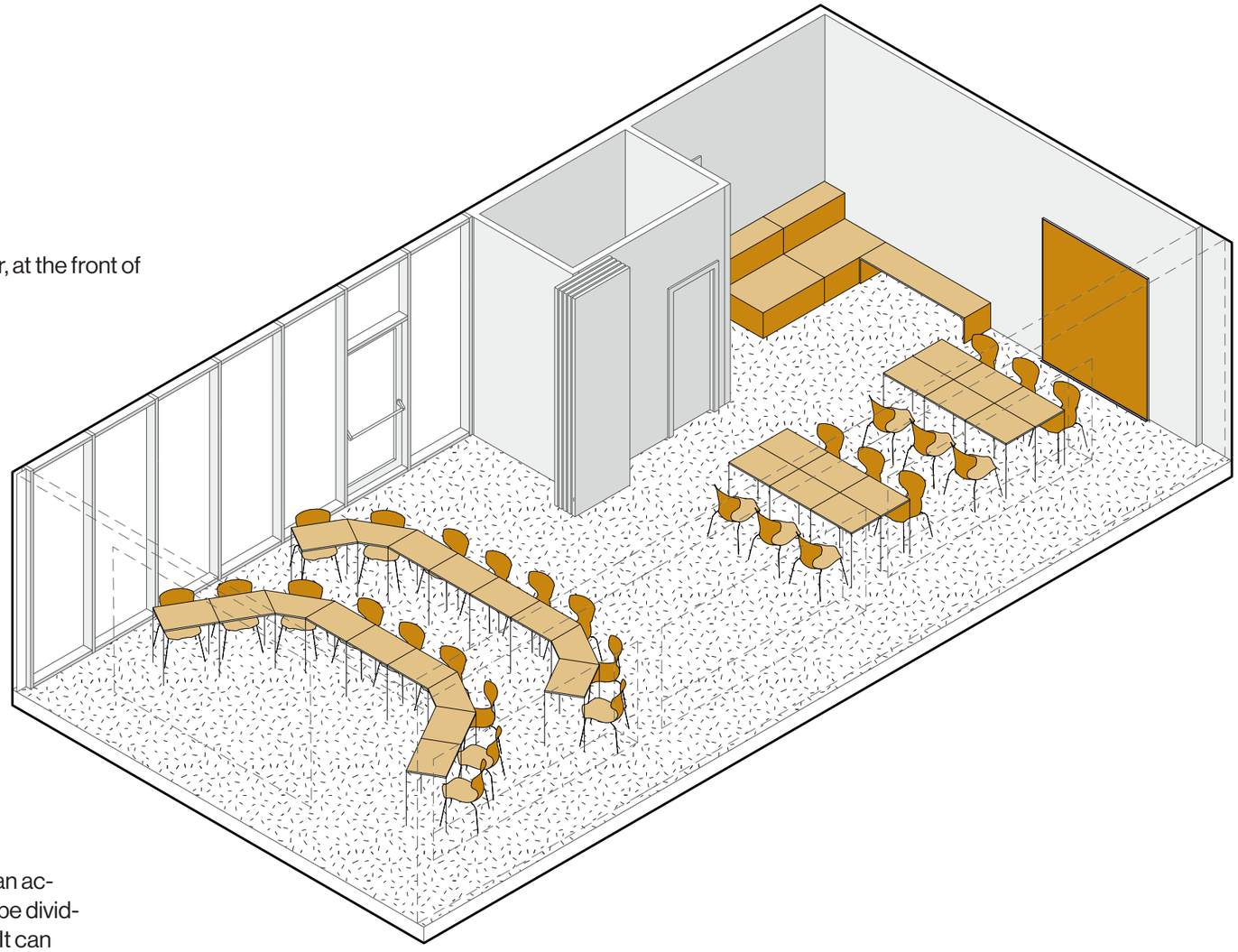


connections

with the common area

context

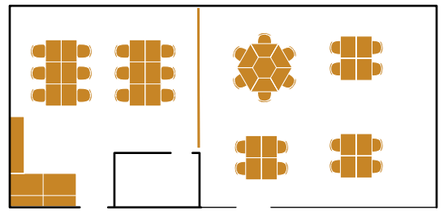
Situated on the ground floor, at the front of the literature cluster



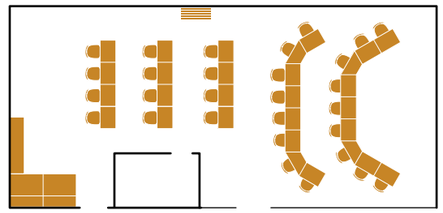
character

The spacious classroom can accommodate one lesson or be divided into two spaller spaces. It can also be used during the small events

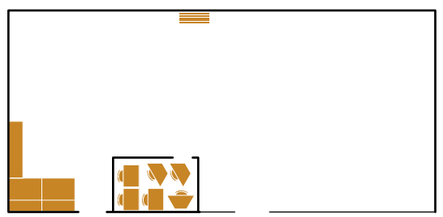
configurations



two separate group activities

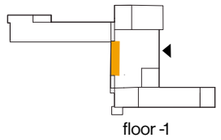


presentation



dance workshop

Informal areas



Relax zone in the entrance area

connections

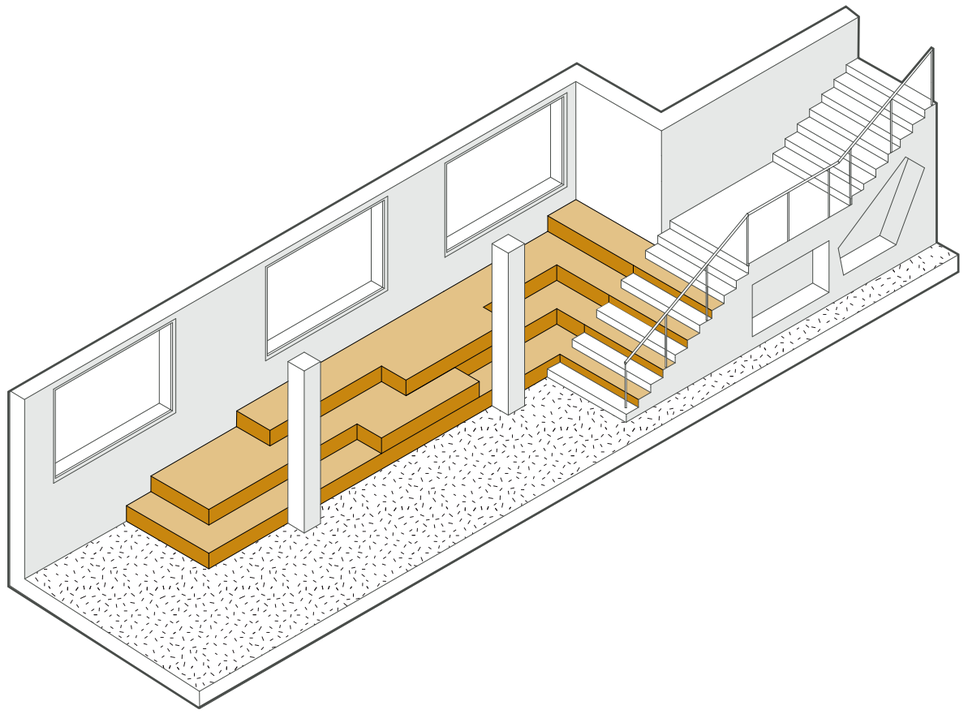
with the common area

context

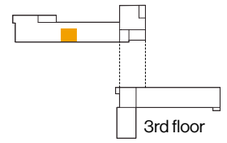
An informal space in the lockers area

character

The informal area is an extension of the stairs leading to the ground floor. It is a meeting space, where students can talk and relax



Cinema room



connections

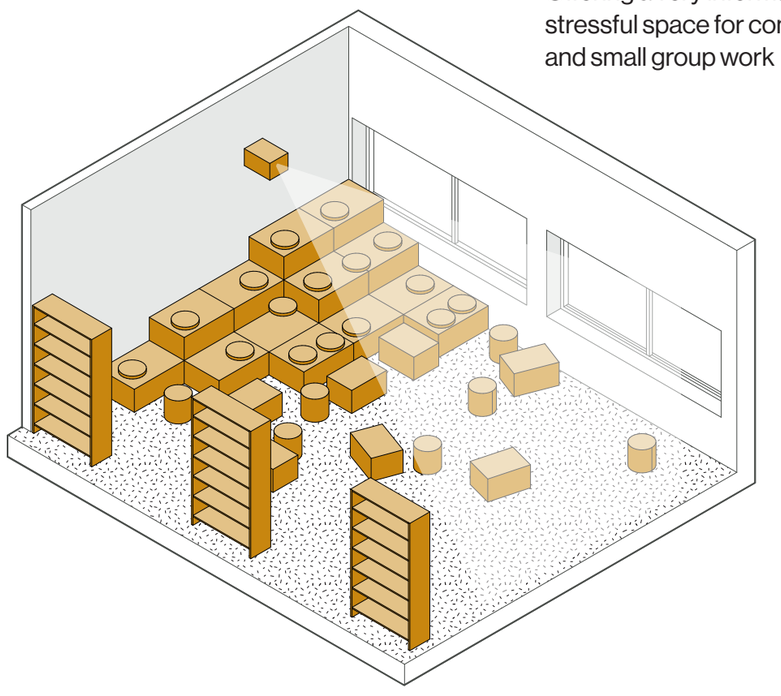
with the common area

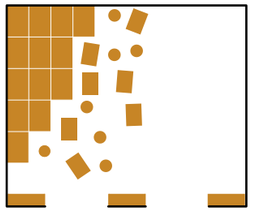
context

Inside language cluster

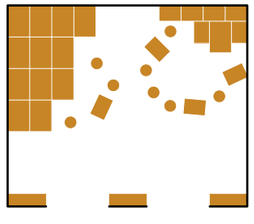
character

Offering a very informal and not stressful space for conversations and small group work

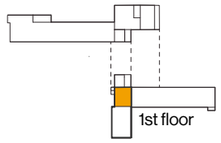




cinema



informal space



Art atrio

connections

with the circulation area

with the art workshops

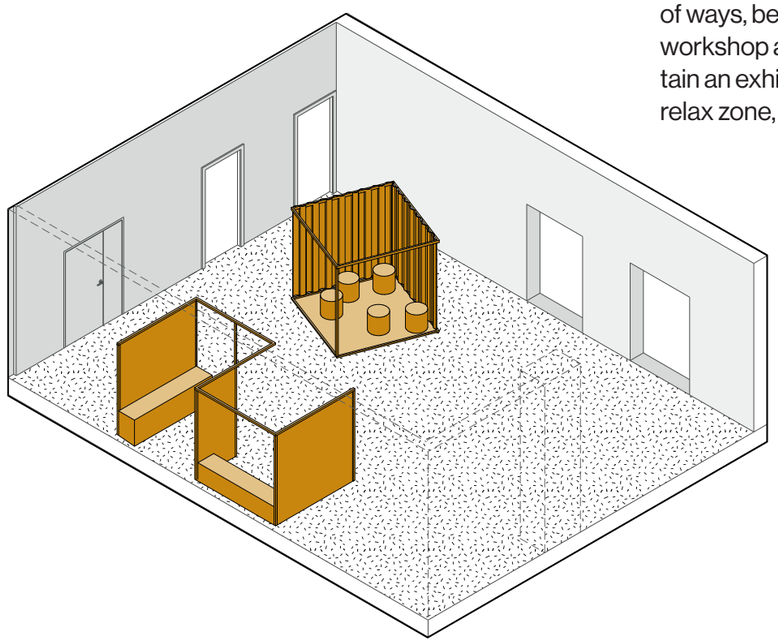
with the mathematics cluster

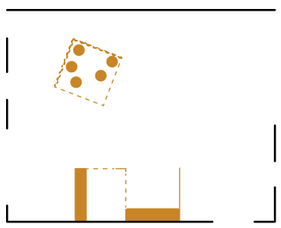
context

An atrio on the first floor, with open stairs and elevator, connected with the art workshops and the mathemiatics cluster

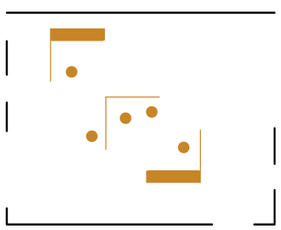
character

The space can be used in a variety of ways, being an extension for the workshop and the cluster. It can contain an exhibition of students' works, relax zone, an event area, etc.

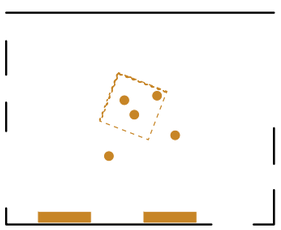




relax zone and exhibition

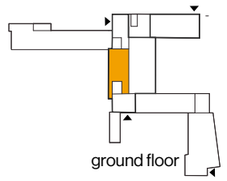


large exhibition space



focus on the relax zone

Individual areas



Library's mezzanine

connections

with the library

with the atrios

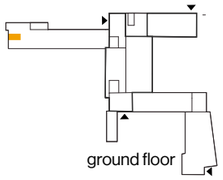
context

A part of the library situated in the central area on the ground floor, connected with the assembly hall

character

The mezzanine, accessible also with an elevator, is a cozy space for individual study and relax

Niche in the literature cluster



connections

with the circulation area

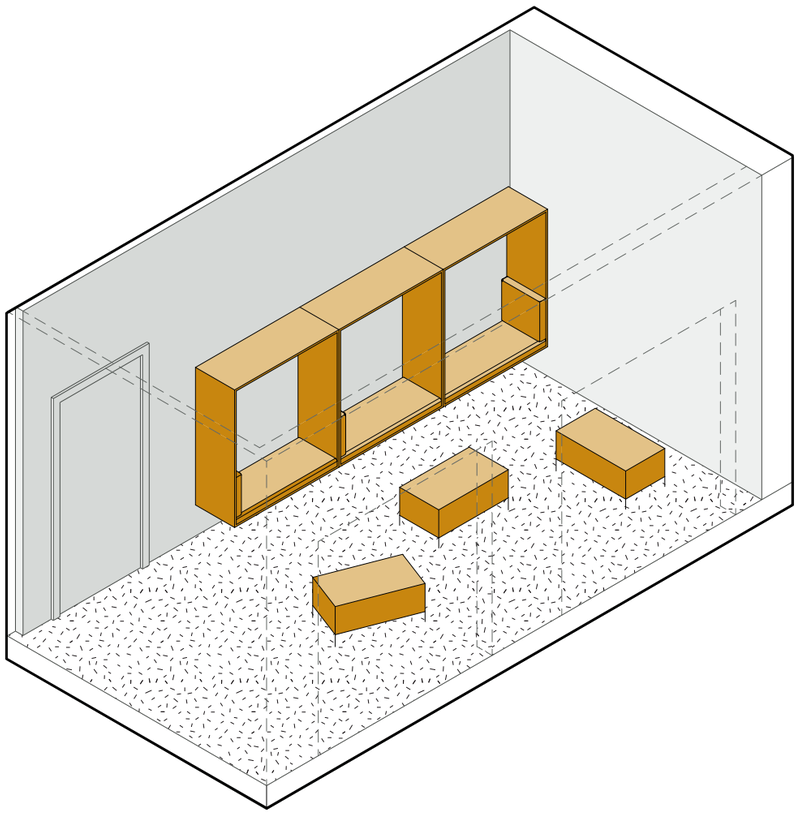
with the classroom

context

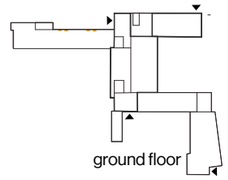
An niche in the ciruclation area, situated at the back of the literature cluster

character

The niche is a calm area, where students can rest, relax, read, etc.



Windowsills



connections

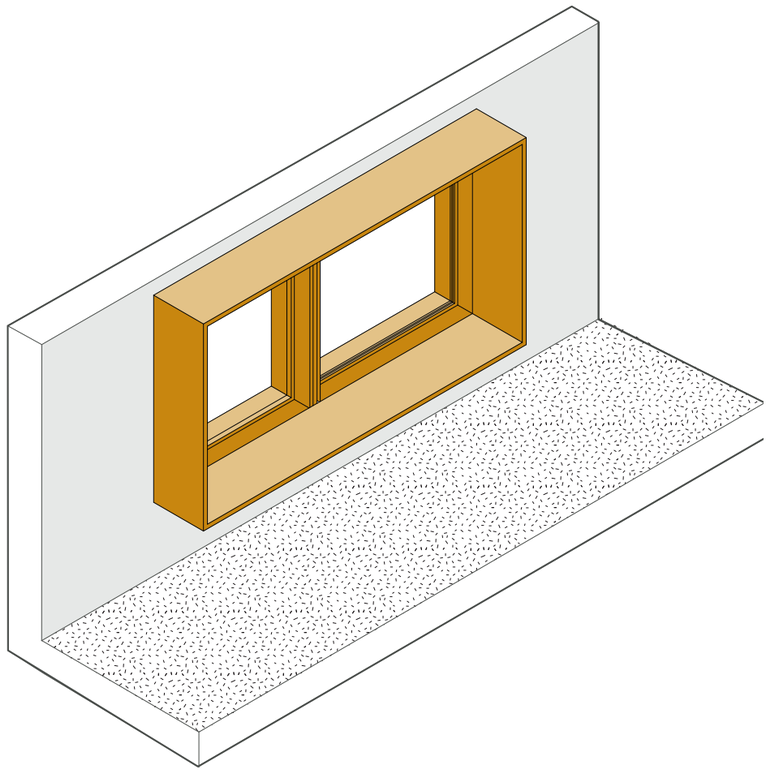
with the circulation areas

context

The niches are situated on corridors of every cluster, attached to the windows

character

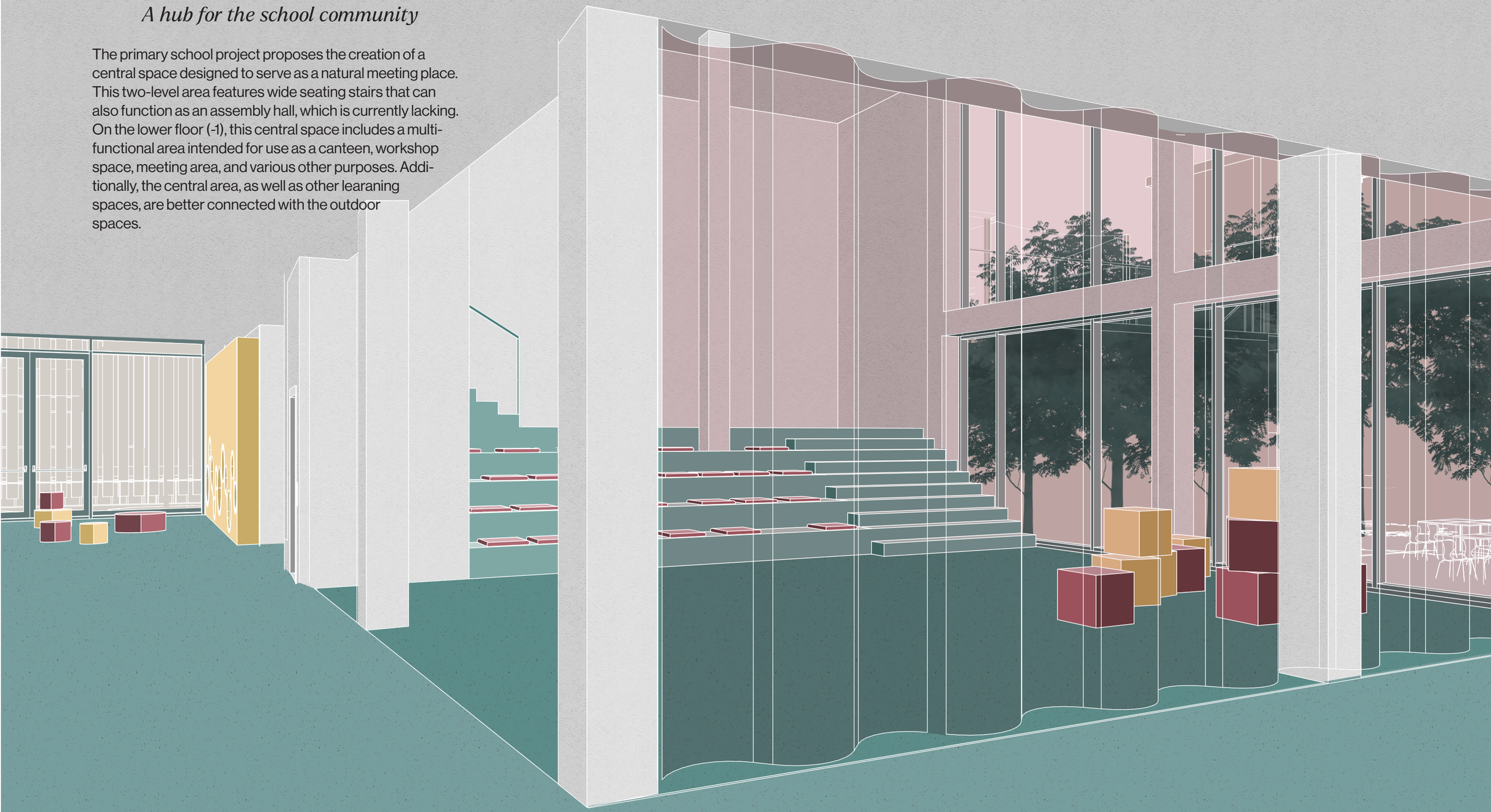
It is a space, where students can rest, relax, read, etc.



5.5. Design proposal for the primary school

A hub for the school community

The primary school project proposes the creation of a central space designed to serve as a natural meeting place. This two-level area features wide seating stairs that can also function as an assembly hall, which is currently lacking. On the lower floor (-1), this central space includes a multi-functional area intended for use as a canteen, workshop space, meeting area, and various other purposes. Additionally, the central area, as well as other learaning spaces, are better connected with the outdoor spaces.



Design strategies

The main goal of the transformation process is to create a dynamic learning environemnt, which can be easily modifies according to changing sues. The following strategies were used:

flexible, multifuctional layout to provide diverse learning settings

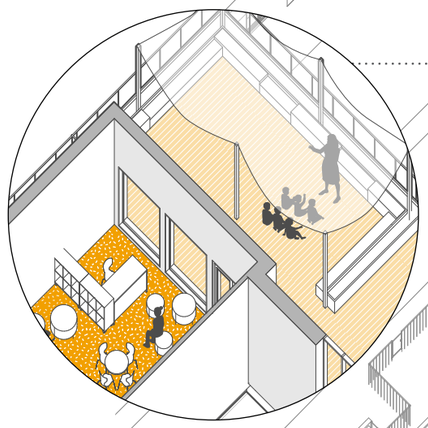
integrating outdoor spaces with other learning spaces

diversified spaces according to age of students and activity

interconnected spaces that can be used together (e.g. classrooms and informal areas)

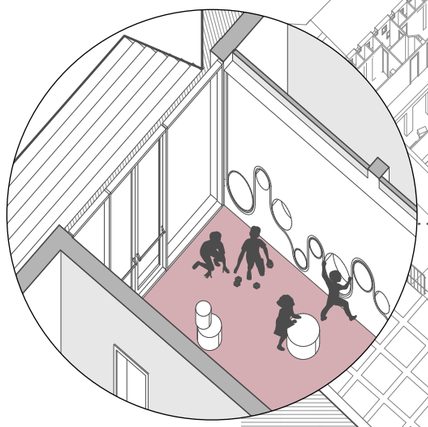
the new gathering space at the center of the school building

organization prioritizing movement creating spaces for physical activity inside and outside

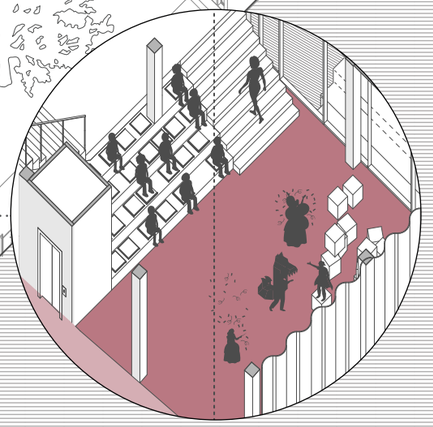


library

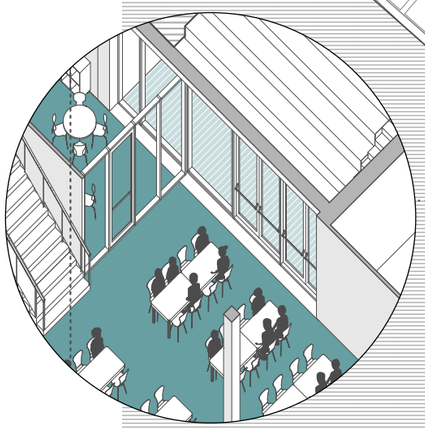
workshop rooms



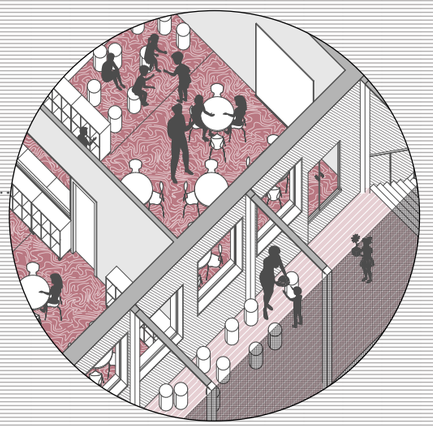
informal area connected to the outdoor area



central area

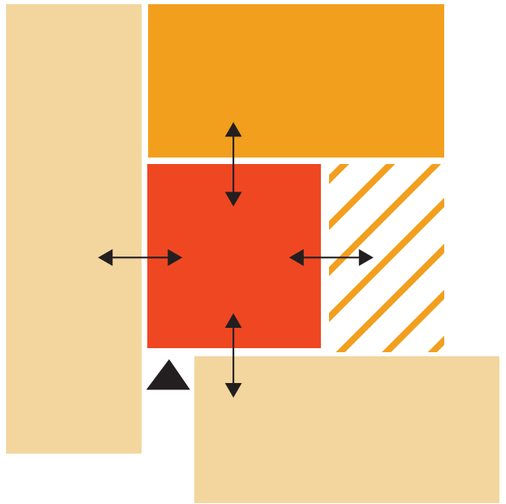


multifunctioanl workshop area



classrooms with flexible layout

Spatial distribution



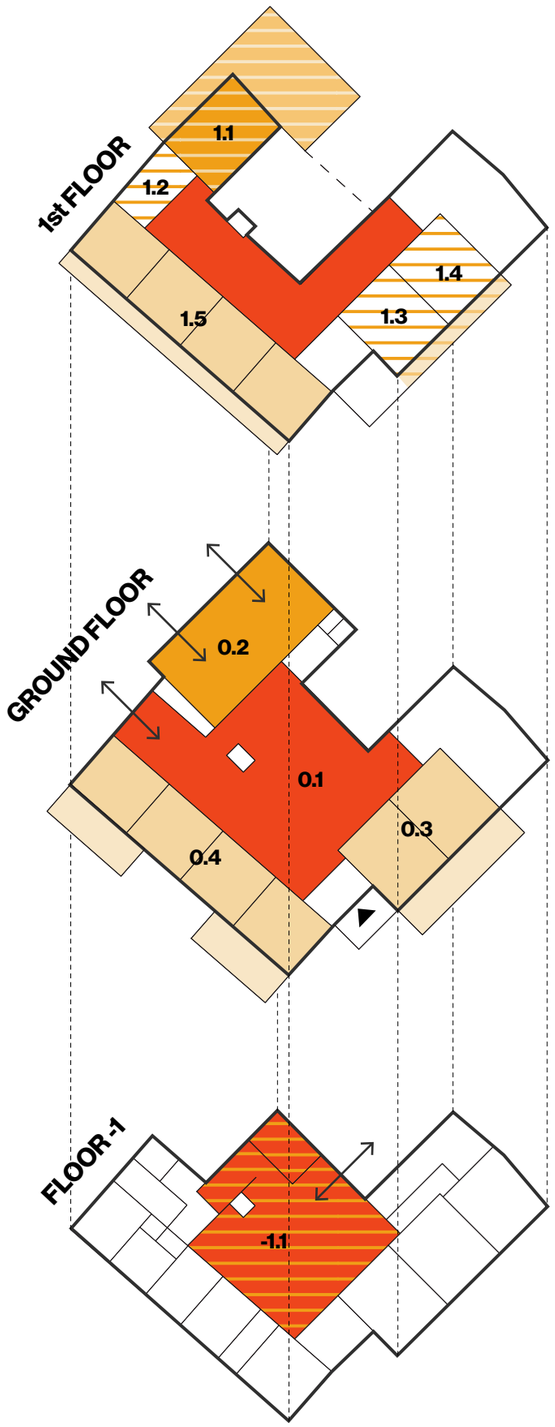
central area
gym

classrooms
workshops, laboratories,
additional learning spaces

The primary school is organized around a spacious multi-funcrional area, which can be used as an assembly space (in the ground floor), and as a flexible workshop space and a canteen (in the floor -1), which continues also outside. It is also an important meeting space for the students.

The group learning spaces, gym, and flexible workshops and other activities, such as library and the music room, are connected to the central space.

Some of them can be regularly repurposed, according to the needs of the school community.



1.1 library with outdoor space
1.2 music room
1.3 workshop room
1.4 multifunctional room

0.1 central area
0.2 gym
0.3 classrooms for 1st grade
0.4 classrooms for 2nd and 3rd grade

-1.1 multifunctional area for workshops, canteen, etc.

Spaces other than classrooms

The learning spaces other than classrooms are designed in a playful and informal way, to meet the needs of the primary school children.They are distributed on each floor aaround the main space at the center. There can be distinguished the following types of spaces:

external spaces, providing outdoor spaces directly connected to the indoor areas. There are connected to classrooms, the library, and the teachers' room. TFor safety reasons, they are not directly accessible from the common area, tand he access to them can be monitored by the teachers.

workshops and laboratories with flexible layout that can be used in a variety of ways. Some spaces are intentionally left relatively empty to accommodate physical activities

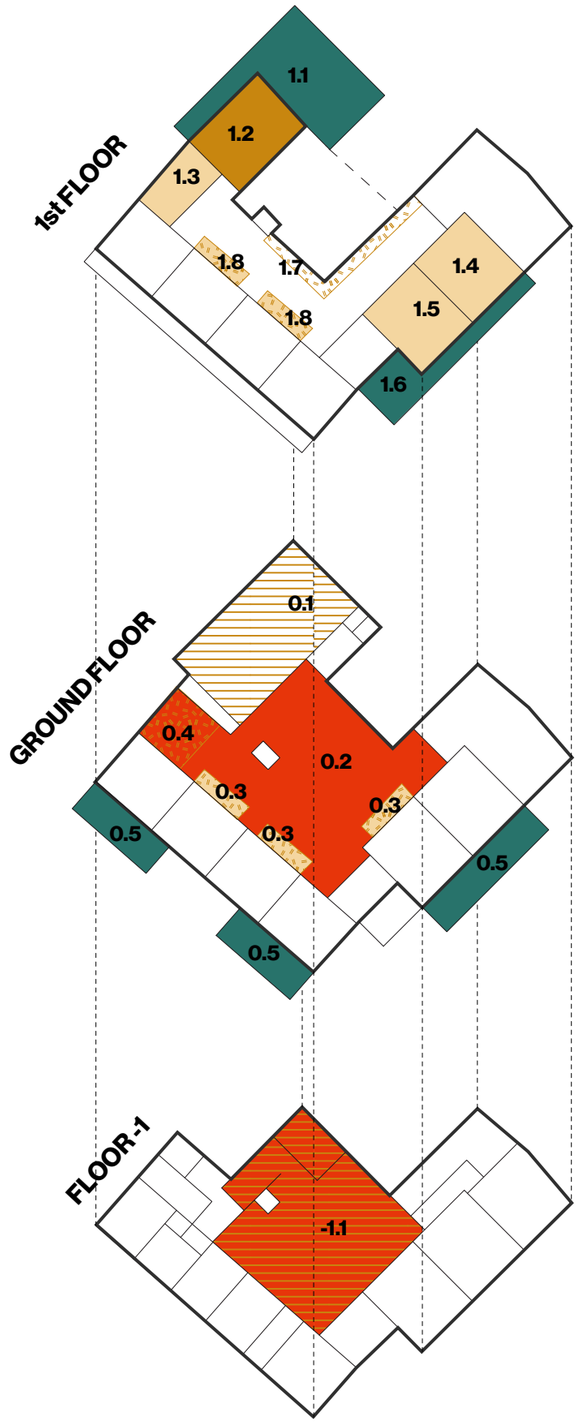
central space with wide sitting stairs and an open space that can be used as an informal meeting space on a daily basis and as a gathering space for the entire school community

multifunctional workshop space – large area on the level -1, which is intended to be used as a canteen and as a spatious workshop area

library – with an informal layout, where children can read, talk and play, connected with a large outdoor terrace

informal areas located in the circulation area, which can be used as an extension for classrooms, and can be a game and meeting space during the breaks

buffer zones spaces which can be used in a variety of creative ways, providing safe individual areas, and a space to leave external clothes



1.1 large terrace
1.2 library
1.3 music room
1.4 games room
1.5 multifunctional workshop
1.6 teachers' terrace
1.7 informal area
1.8 buffer zone

0.1 gym
0.2 central area
0.3 buffer zone
0.4 informal area
0.5 outdoor classroom extension

-1.1 multifunctional workshop

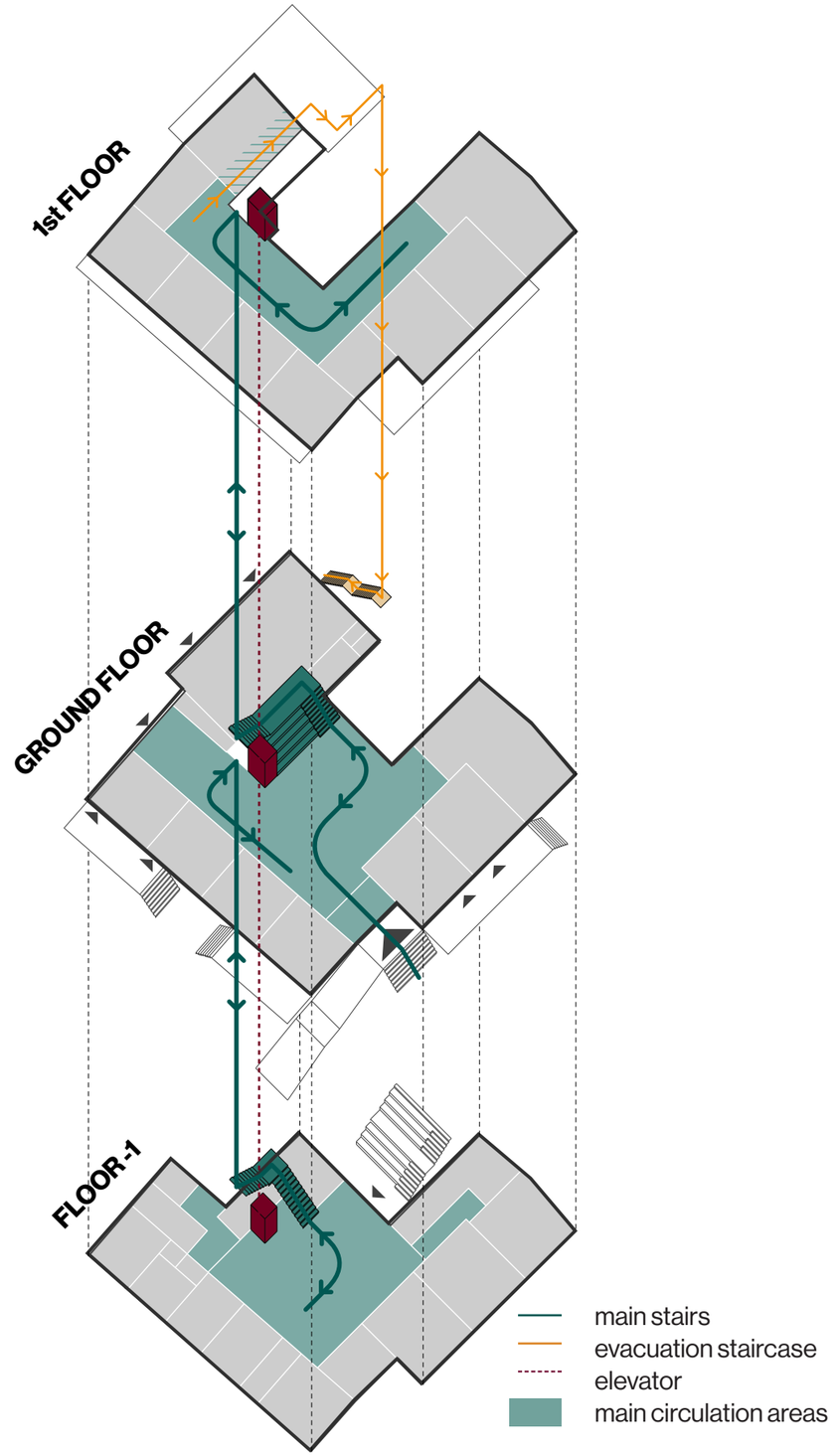
Circulation

The central space is the main link between floors. It connects visually ground floor and the first floor by a double-height part, and provides a direct connection with wide stairs, which are also important for the school life. This area provides also access to other spaces: classrooms, laboratories, etc.

The elevator, previously not present, was added to the central area. Thanks to this, the entire school is accessibe for the users with disabilities.

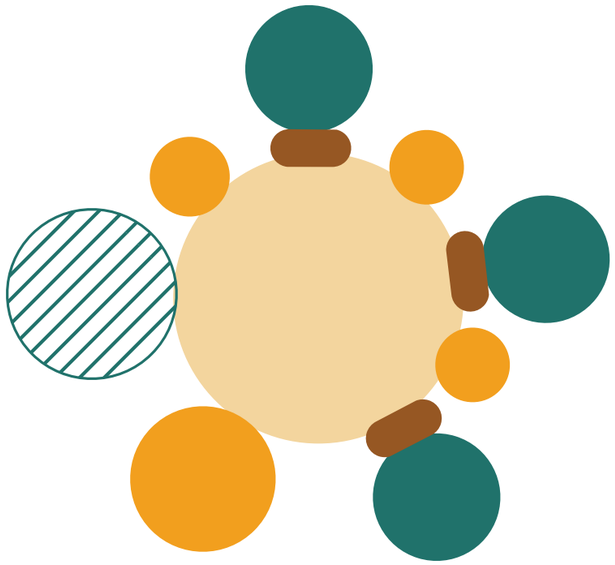
The evacuation stairs, previously located next to the entrance, were moved to the back of the building. In this way, the entrance area is more welcoming, and the balcony which was previously providing access to the evacuation stairs, can be used in other ways

The main entrance is accessible with stairs and with a ramp, available from the large pedestrian area. The connection to the outdoor area at the back of the school has been improved, andv several connections were added between the classrooms and outdoor spaces.



Learning spaces

Diagram: connections between spaces in cluster



The organization of learning spaces in the primary school is simple: All learning spaces are organized around a meeting place at the center of the school, which can be also used as an agora (an assembly hall). Small informal areas were also distributed within this space.

The group learning spaces were distributed according to age. Connections were created between pairs of classrooms. They are available from the main space through a “buffer zone”, which is an individual area, and a place to leave outdoor clothes.

group learning space

All the classroom have a flexible layout, and they are groupped in pairs, with a connection between the classrooms from each pair. The classrooms for the younger children are located in the ground floor, with a spatious outdoor space.

exploration lab

There is a lagre workshop on the floor -1, which can be used in a variety of ways. Additionally, there are two rooms which can accommodate laboratories, workshops, multifunctional spaces, etc. according to the needs of school community.

informal area

The largest informal area is the library. Its informal character aims to make learnig and reading an integral part of life, rather than a school chore. There are also smaller, playful informal areas distributed withn the circulation space.

agora

The gathering space is located at the center of the school, with wide sitting stairs that can serve as seats for the audience. Itis also a natural meeting place.

individual area

A structure next to the classrooms provides a buffer zone, and cozy space, where students can rest, or play.

Examples of learning spaces

The following pages show the examples of learning spaces according to their character. They have been classified using the 1+4 Learning Spaces model. Although most of the spaces can accommodate several functions together, the main functions were highlighted to show the diverse character of spaces. They have been analyzed according to the following categories:

connections

To show with which spaces thei interaact, and to what extens, and if the space can be used together with other spaces. The followeing scale was used:

weak connection
direct connection
strong direct connection and visual connection
spaces can be used together
spaces are merged together

context

The context was taken into cinsideration to decide the function of spaces

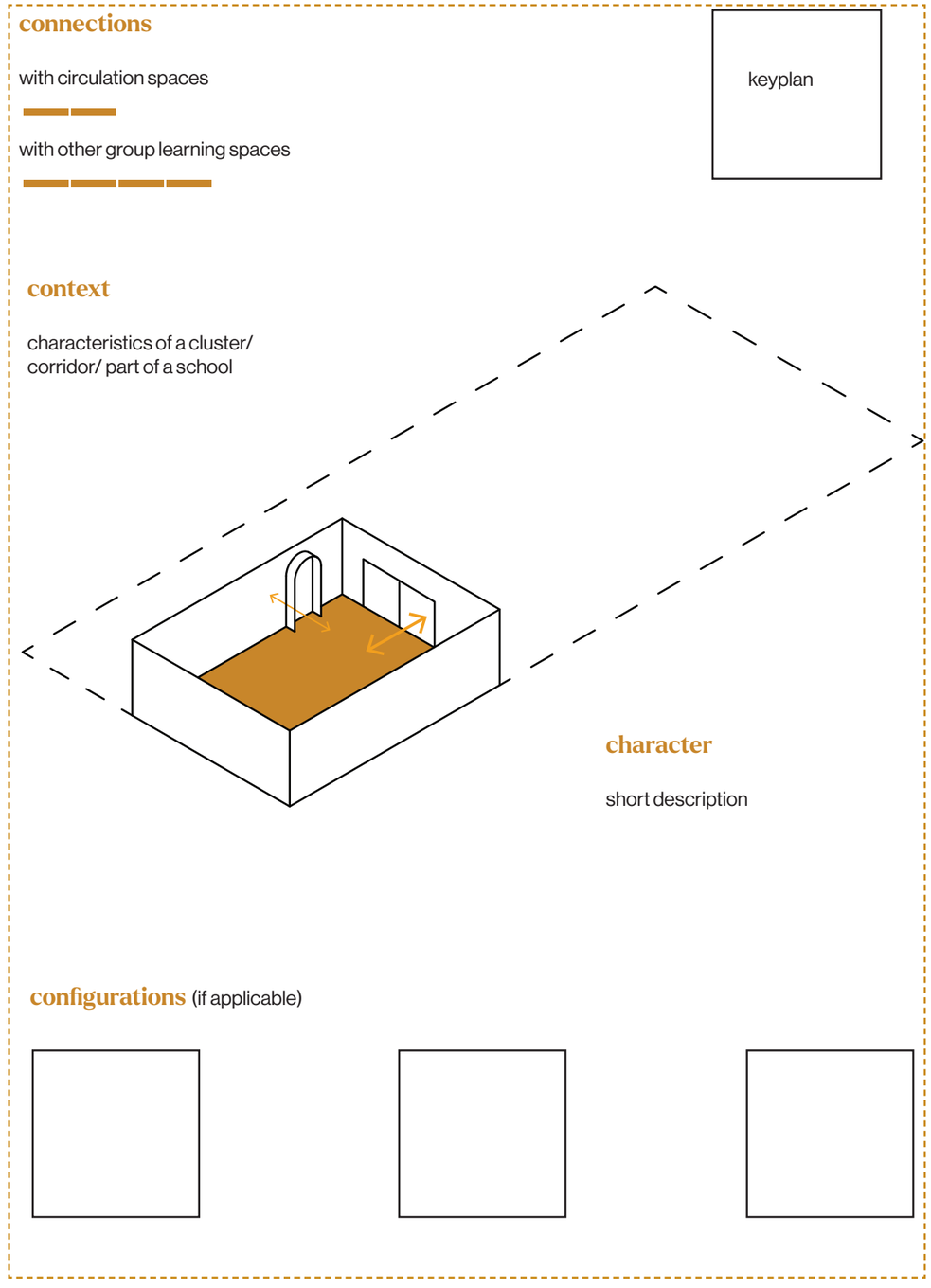
character

The character describes the characteristics of each space, as well as in what ways it can be used

connections

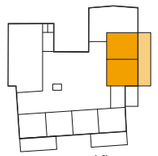
identicates exemplary uses of the spaces

Exemplary space



Group learning spaces

Classrooms for ages 6-8



connections

with the circulation area

with the outdoor space

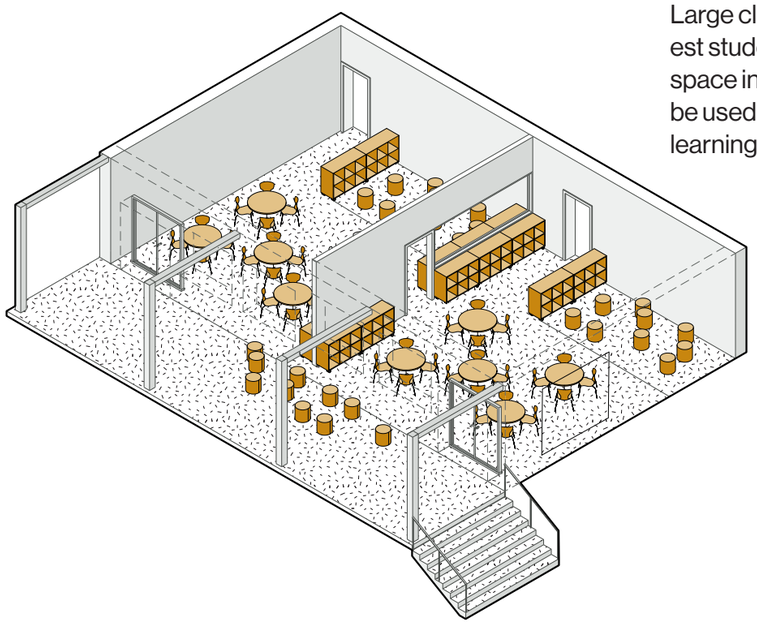
between the classrooms

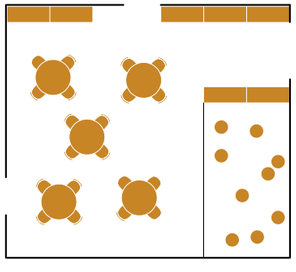
context

Located on the ground floor, directly connected to the central area

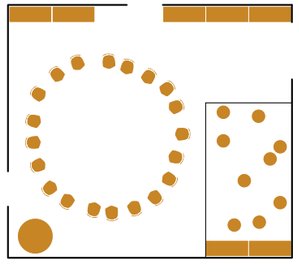
character

Large classrooms for the youngest students, providing redundant space inside and outside, which can be used to accommodate diverse learning spaces

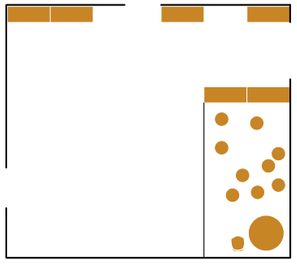




activities in small groups



group discussion



physical activities

Classroom for ages 9-11

connections

with the circulation area

with the outdoor space

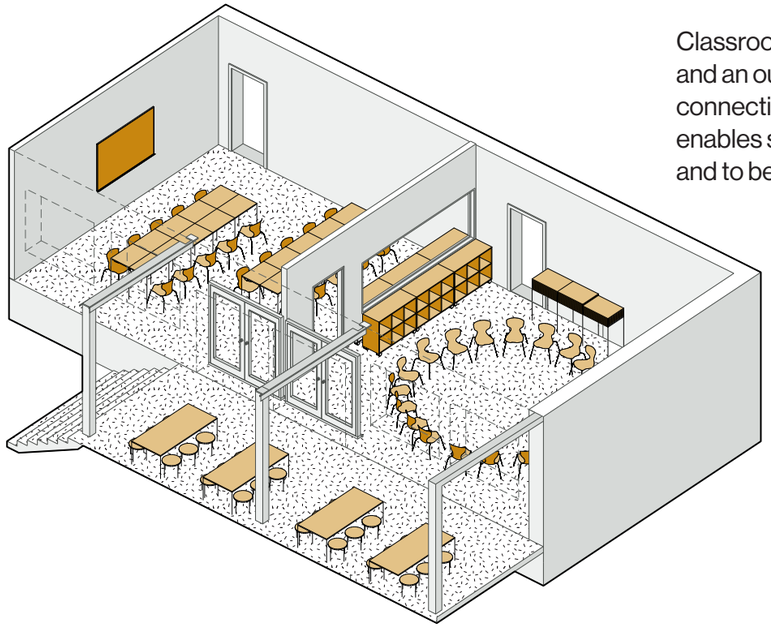
between the classrooms

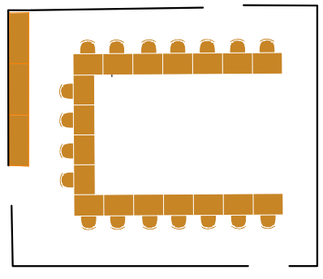
context

Located on the ground floor, directly connected to the central area

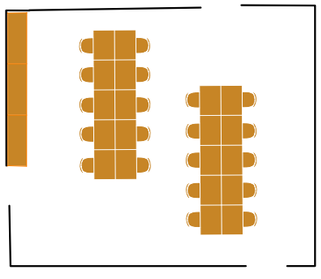
character

Classrooms with a flexible layout and an outdoor extension. Direct connection between classrooms enables students to integrate better and to benefit from shared activities

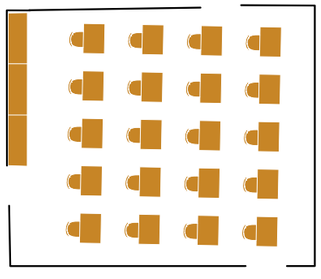




presentation

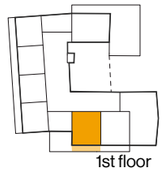


group activities



individual work

Exploration labs



Workshop room

connections

with the circulation area

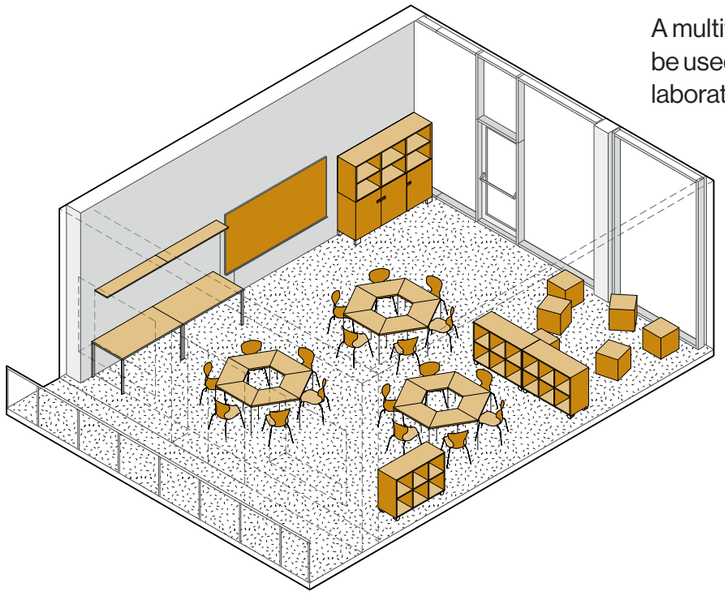
with the outdoor space

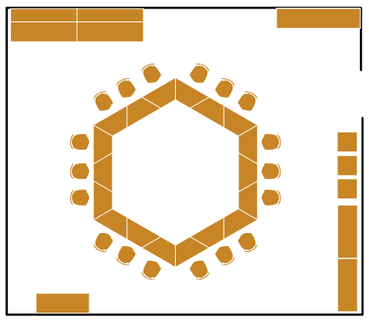
context

Located on the first floor floor, next to the workshop room

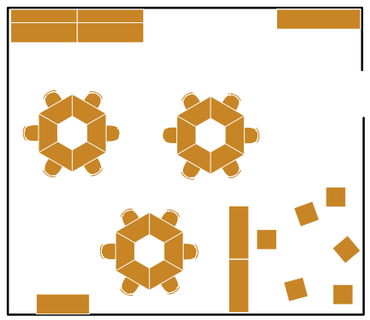
character

A multifunctional space, which can be used as a biology and science laboratory, a workshop space, etc.





group activities



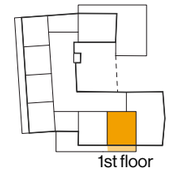
various activities

Games room

connections

with the circulation area

with the outdoor space

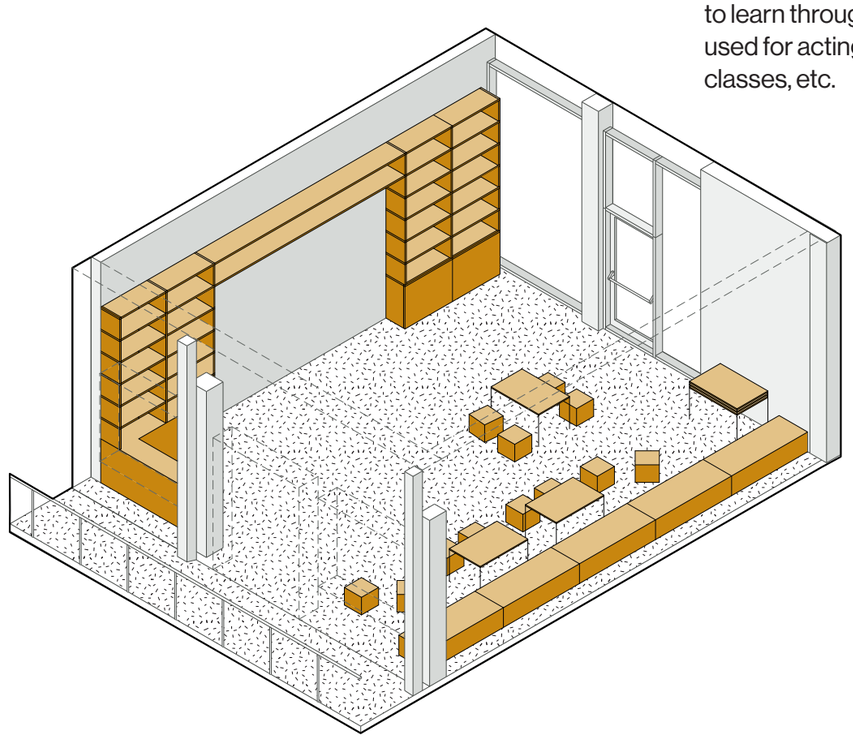


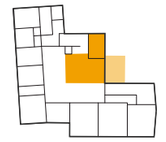
context

Located on the first floor floor, next to the workshop room

character

An empty room, with stackable furniture, which aims to provide a space to learn through play. Can be also used for acting workshops, dance classes, etc.



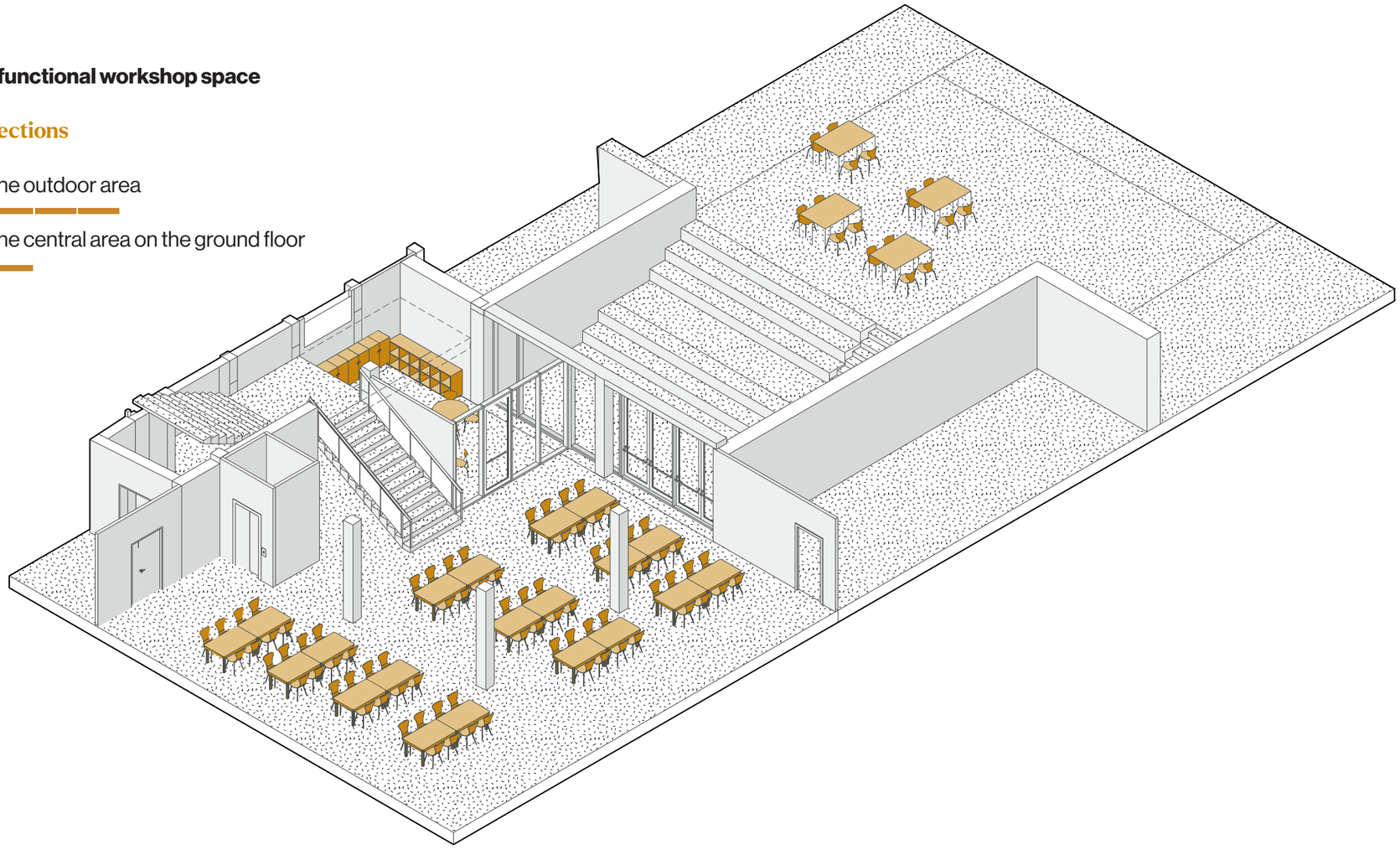


Multifunctional workshop space

connections

with the outdoor area

with the central area on the ground floor

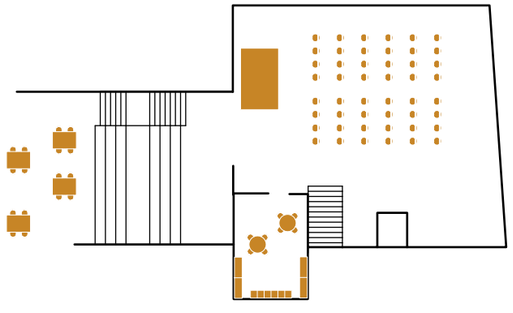


context

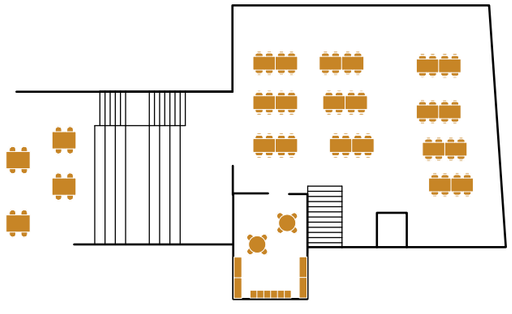
The space is situated in the central part of the building, on the floor -1. It is connected to the outdoor area

character

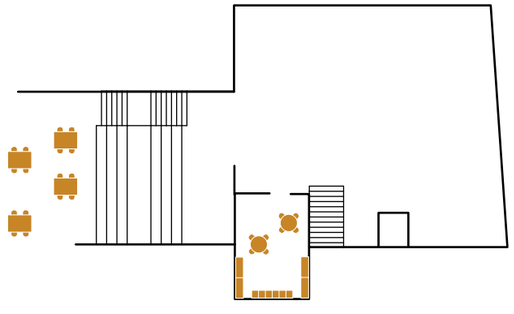
The large space is an important part of the school life. On daily basis, it is a canteen. It can be also used in a variety of other ways: for workshops, meetings, presentations, open doors, etc.



performance



canteen / workshop



physical activities

Agora

Central area

connections

with the circulation area

with the outdoor space

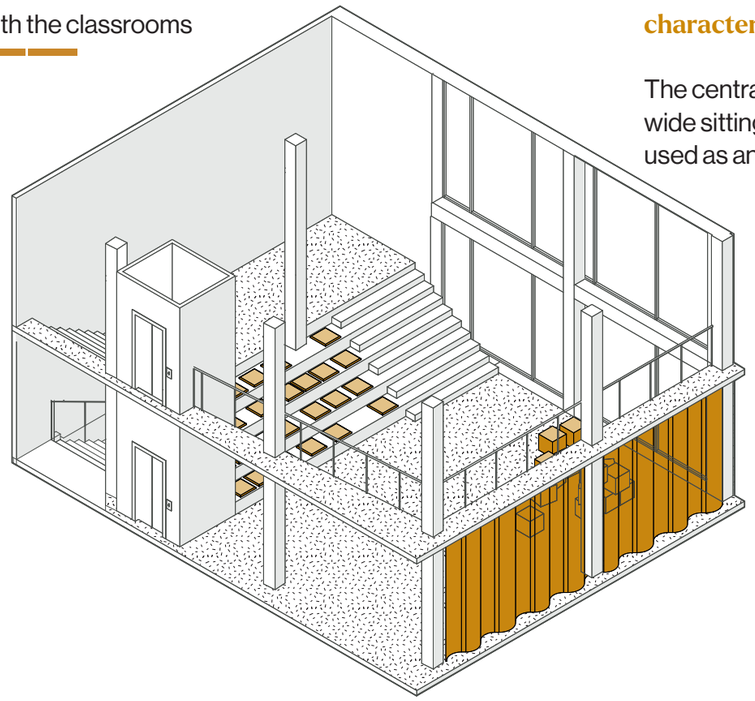
with the classrooms

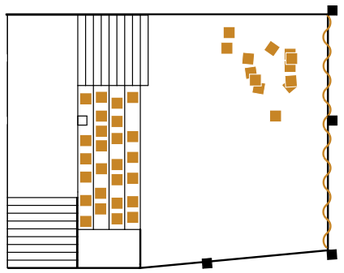
context

Located at the center of the school building

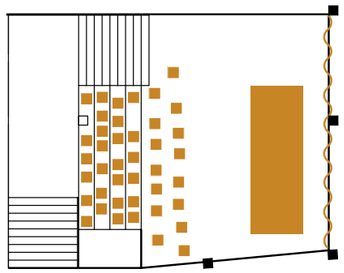
character

The central meeting space, with wide sitting stairs, which can be also used as an assembly hall





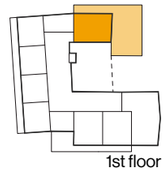
meeting space



school gathering

Informal areas

Library



connections

with the circulation area

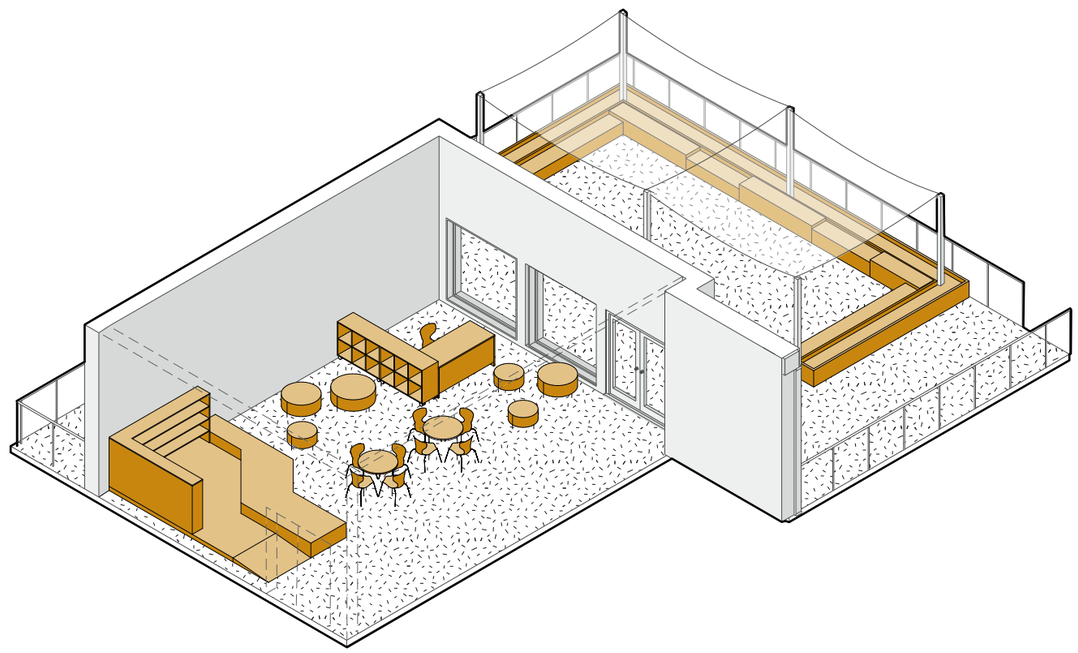
with the outdoor space

context

Located on the first floor, above the gym. It provides access to the spatious terrace

character

An informal space, where students can meet, play, and read. It is also a space where teachers can organize varoius activities. The large terrace provides a multifunctional shaded area.



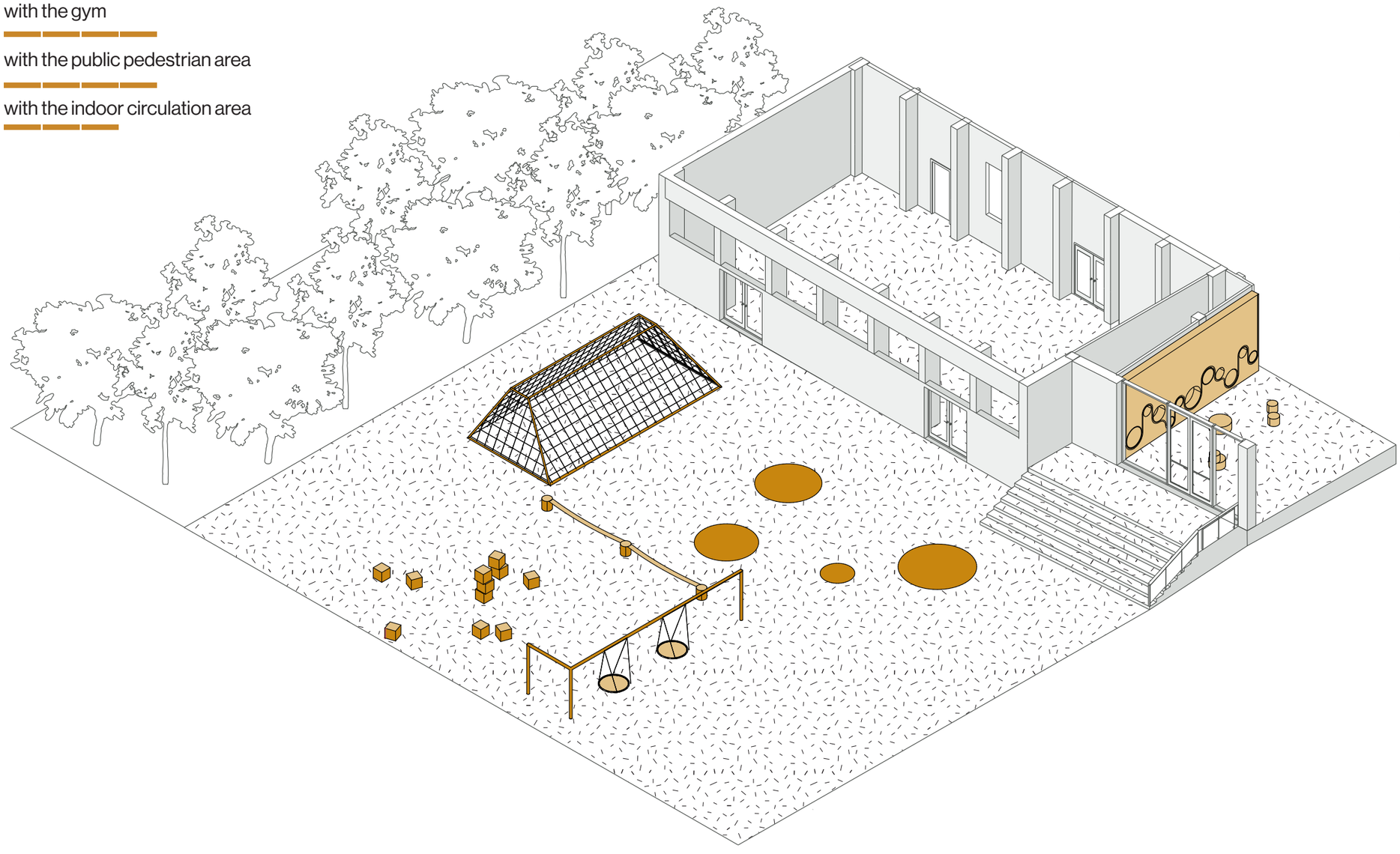
Playground

connections

with the gym

with the public pedestrian area

with the indoor circulation area



context

An outdoor space located at the back of the building, directly connected with the pedestrian area, and with the gym, and circulation area

character

It is divided into three pverlapping zones: an empty space disignated for games and events, a playground, and a calm orchard

Corridor 0 connected to outside

connections

with the circulation area

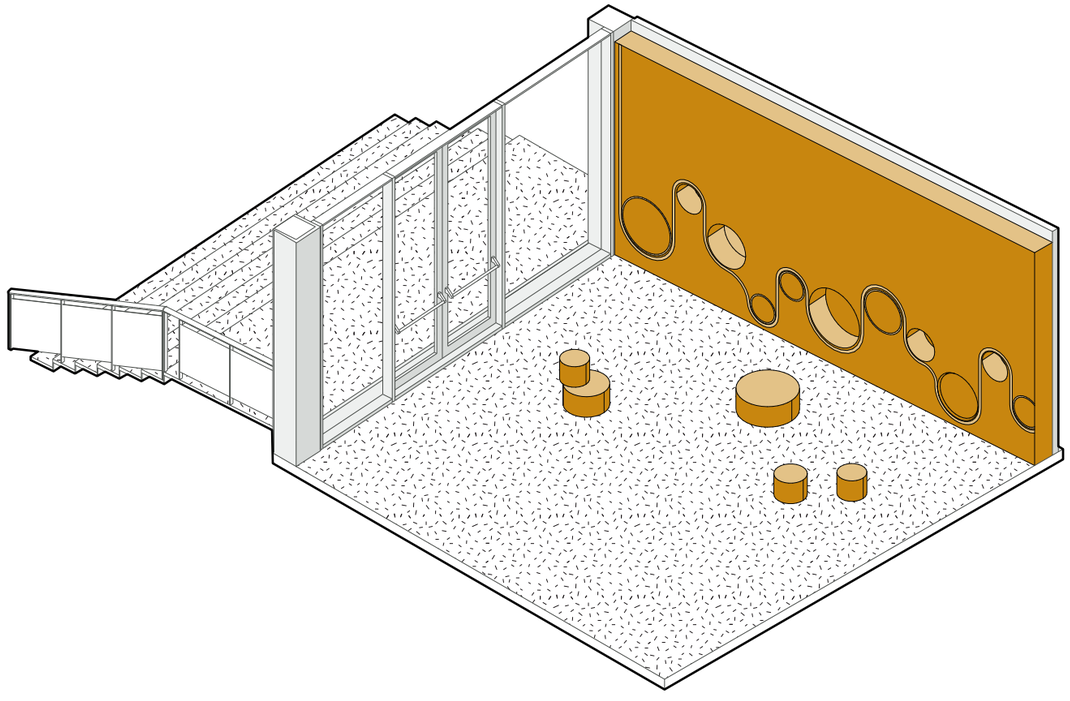
with the outdoor space

context

Located on the ground floor, at the back of the school, connected with the outdoor area

character

The large part of a corridor is an informal space, where students can meet and play during breaks. It can be also used as an additional didactical space



Individual areas

Buffer zones

connections

with the circulation area

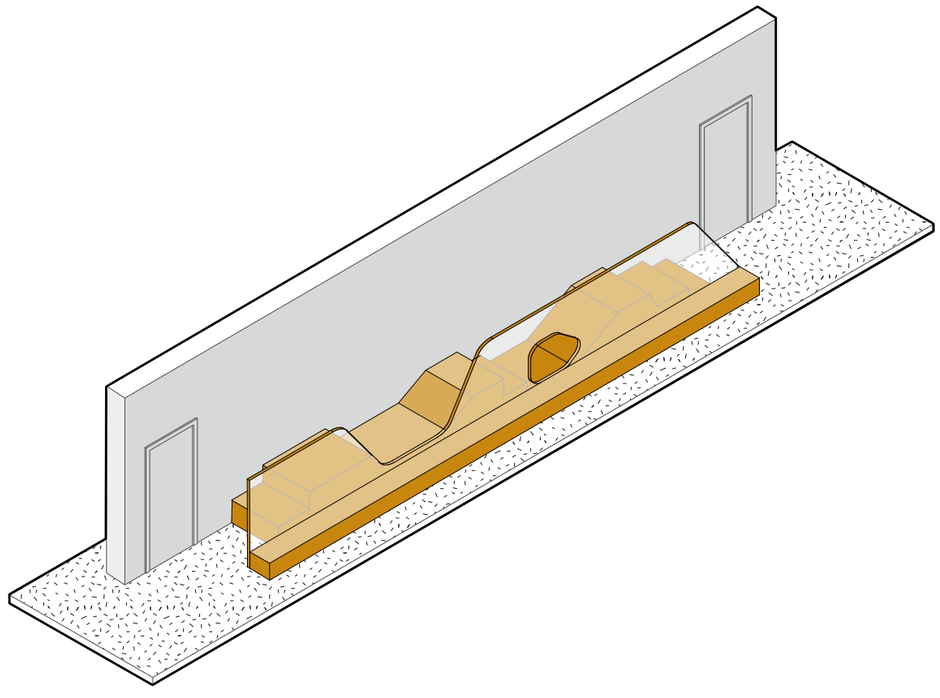
with the classrooms

context

Located at the front of each classroom, connecting them with the common area

character

The space provides a buffer zone, and cozy space, where students can rest, or play. It is also a space where students can leave their outdoor clothes.



Ch. 6

Implementation design strategies for the Ugo Foscolo schools

Introduction

As described in Chapter 2, resources from funding for school renovations are often used ineffectively due to a lack of cohesive planning. To address this issue, creating a holistic vision for school building is essential, which would help to make the most of limited resources from funding. It is important to note that school buildings are dynamic environments that need to evolve to meet the needs of their users. Therefore, the transformation plan must be adapted to changes in school organization, teaching staff, and student population.

To ensure that spaces remain adequate for their users, they need regular updates and ongoing re-evaluation elaborated together with the school community. An effective tool for this process is post-occupancy evaluation. It evaluates how the spaces operate and identifies what areas that require improvement. This regular feedback helps to align spaces with the needs of their users.

The methodology shown in Graphic X was elaborated based on the model for post-occupancy evaluation for school buildings published in 2013 by Piroozfar, Rosenkind, Winstanley, and Pegg; and the "systems design" elaborated by Bela H. Banathy and C. Lynn Jenks (described in Chapter 2). This ongoing process is divided into five steps:

feedback – providing insights from the user of the space about their needs, plans, and the issues that should be addressed

information processing – combining, ordering, and evaluating the feedback

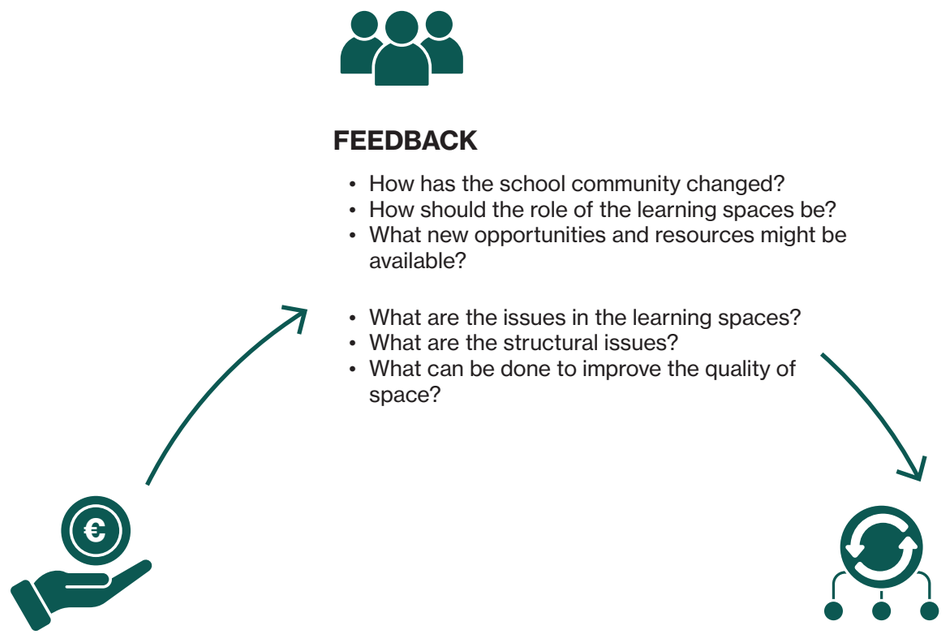
documentation – setting boundaries, establishing guidelines, and conducting feasibility assessments

toolkit development – creating and regularly updating a general project that would give a structure for the entire learning environment. It needs to consider priorities – decided by the community, key interventions (interventions that influence other parts of the building), and include a schedule that determines which changes should be implemented first and how they interrelate with other parts of the school building.

managing resources from funding programmes – distributing the resources from funding programmes to specific parts of learning environments, according to the elaborated toolkit

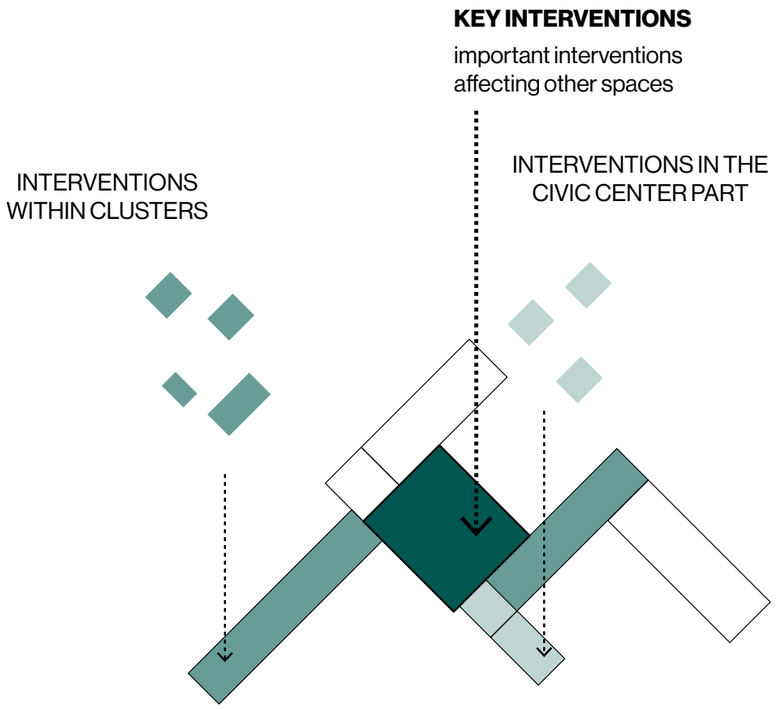
This chapter provides the toolkit which was elaborated based on the project proposed in Chapter 5. The toolkit is intended to help plan future interventions, based on the changing needs of the users of the learning environments. The toolkit includes key interventions that have to be executed in a specific order, and spatial strategies focusing on the repeatable parts that will likely change the most frequently. Using this methodology, the learning spaces can benefit from a dynamic, adaptable plan that addresses both immediate needs and long-term goals, and remain aligned with the needs of their users and innovative teaching methods.

Graphic X. Procedural model for post-occupancy processes
elaborated by the author (Adeyeye, Piroozfar, Rosenkind, Winstanley, and Pegg, 2013)



6.1. Middle School

Strategies for the central area and learning spaces

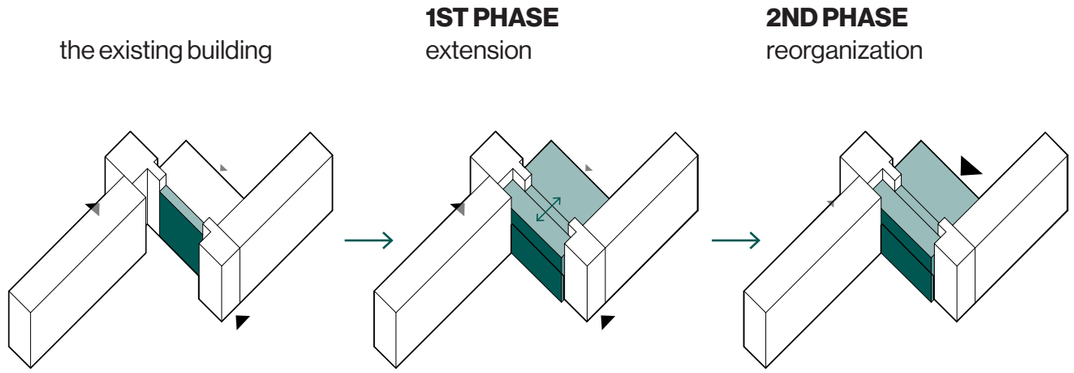


As the transformation process of the school buildings is carried out with numerous small interventions, the renovation strategy for the school aims to provide a general picture of the school, rather than a specific design, which will be stricktly followed.

There has been developped a strategy for the key interventions, which has to be followed in the right order, as they set the framework for the rest of the interventions.

Additionally, the strategies for the main spaces have been elaborated, which aims to facilitate regular modifications, admitting than the educational spaces are in a constant process of re-shaping

Key interventions



initial condition

- poor connection between the two wings
- no outdoor entrance area
- no entrance area to the mltifunctional hall
- inefficient use of outdoor space

main interventions:

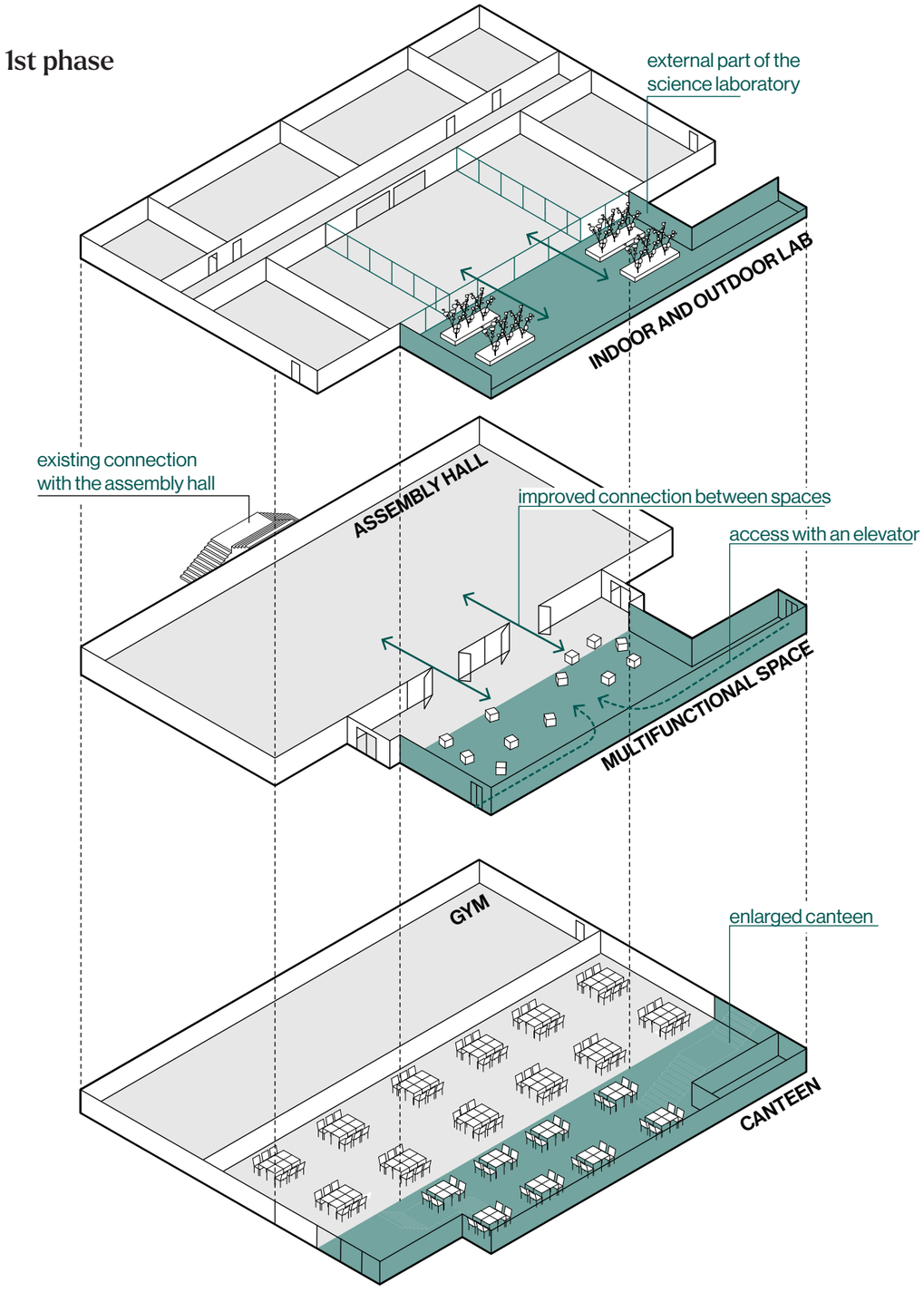
- Adding volume to the central area, which can serve as the central meeting space
- Improving connection between the added volume and the multifunctional hall

main interventions:

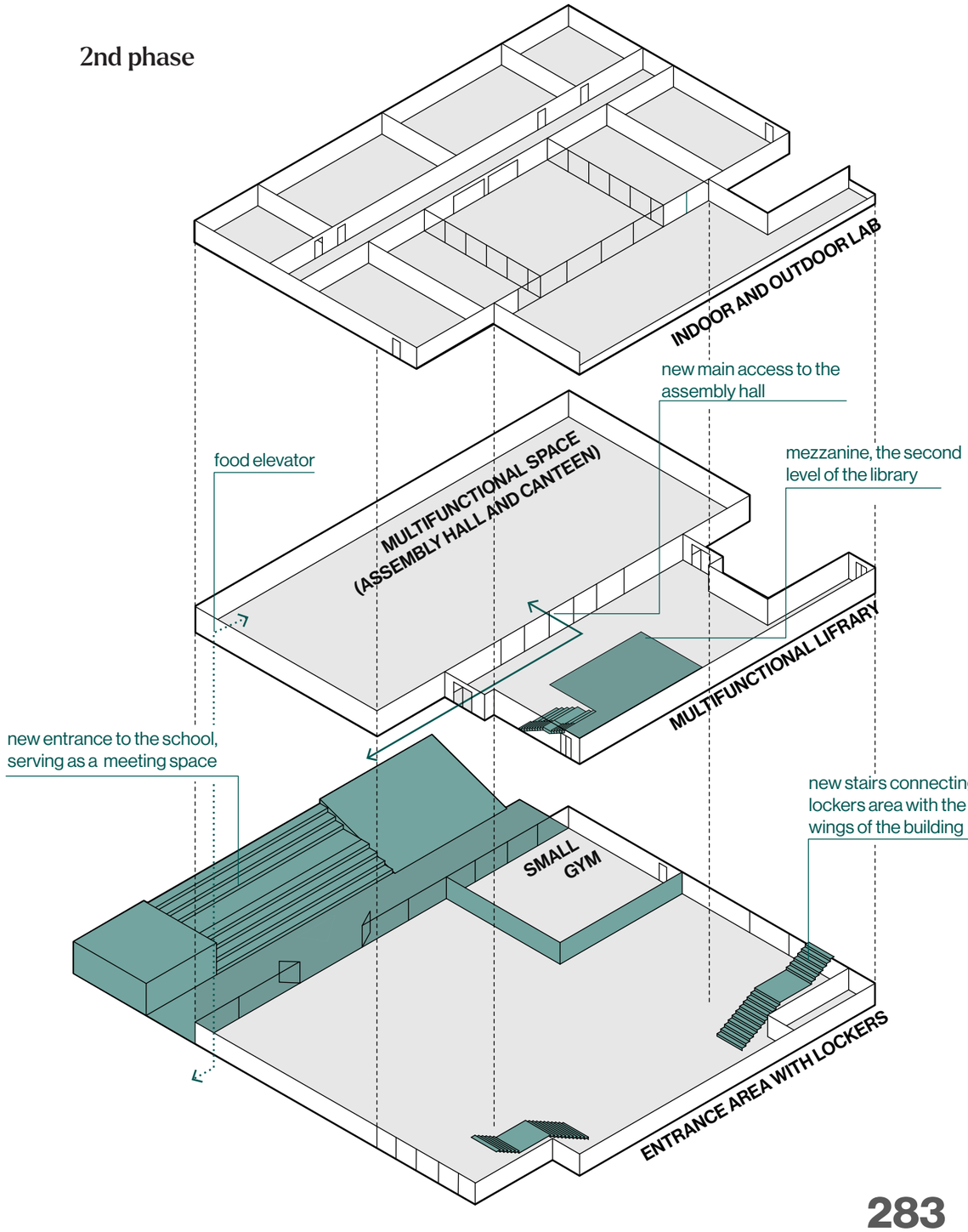
- Moving the entrance to the central area on the floor -1, which makes it possible to organize clusters according to subjects
- Moving the canteen to the multifunctional hall on the ground floor
- Creating the library in the added volume
- Moving the entrance to the multifunctional hall to via Piazzi

Key Interventions

1st phase



2nd phase



Interventions within clusters

Each cluster consists of 5 to 7 modules of the same dimensions (680x780 cm). Therefore, it is possible to set a general strategy for the renovation and transformation of the spaces withinn the clusters in order to plan the future modifications, that can be adjusted according to the fundings and changing needs. The following pages are a catalogue of the modules, according to their dimensions. The space can be filled with these modules freely, respecting the following elements that has to be considered:

at least one informal space connected with the corridor, accessible during breaks, which can be also used as additional flexible learning spaces

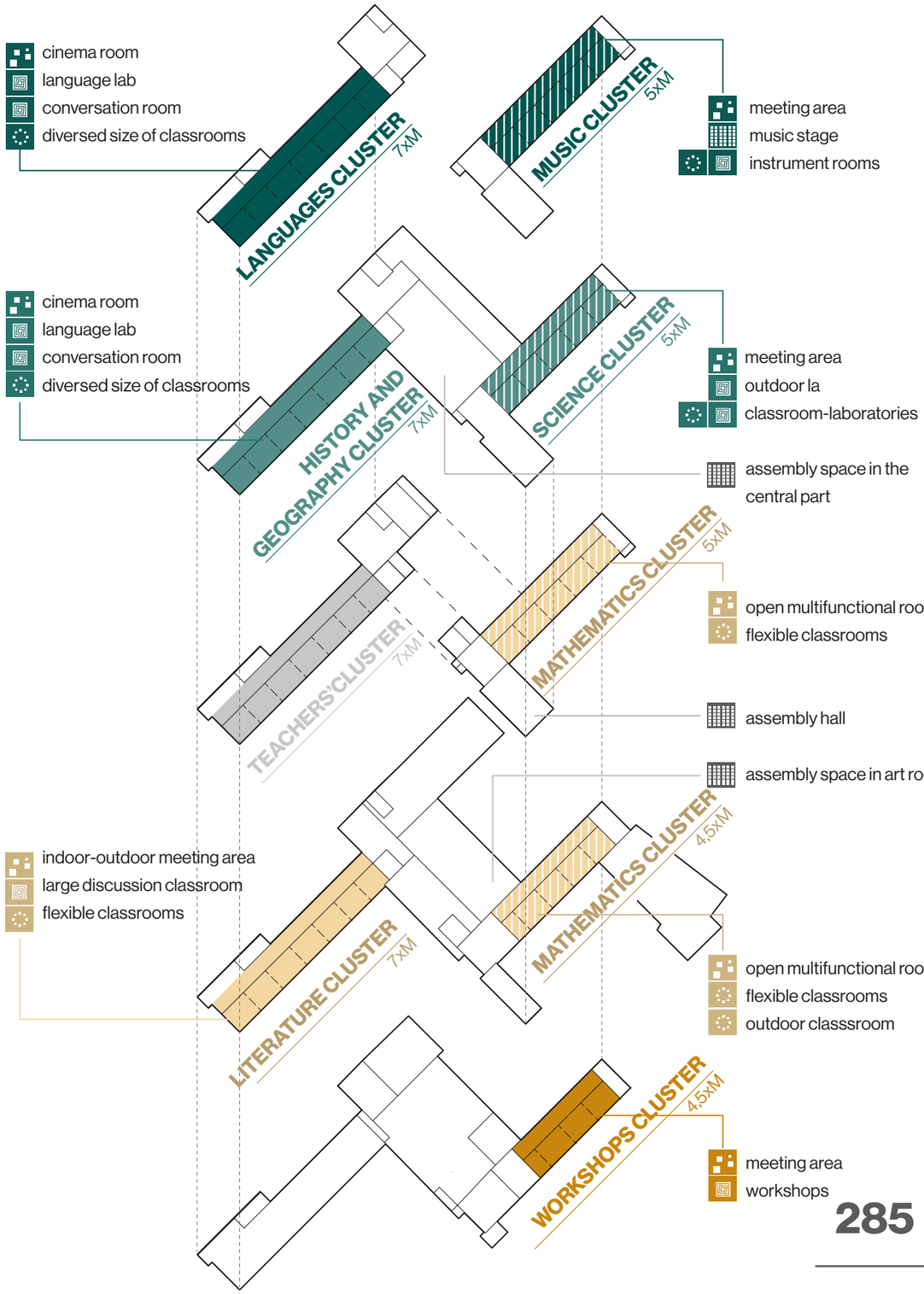
spacious gathering and event space (appriximate size of 2 classrooms) situated within the cluster or at the same floor

special areas, according to the characteristics of each cluster (e.g. laboratories, cinema room, small individual classrooms, etc.

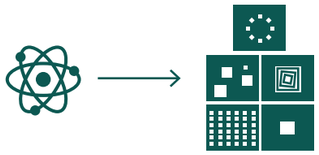
main group learning spaces, well connected with other areas (laboratories, informal areas, etc.) and with other learning spaces (if needed). Each classroom is assigned to a subject

individual areas provided in each cluster

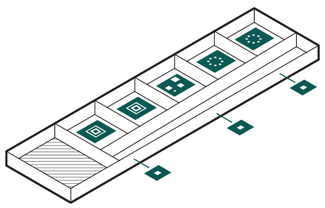
Clusters of the middle school and suggested placement of learning spaces



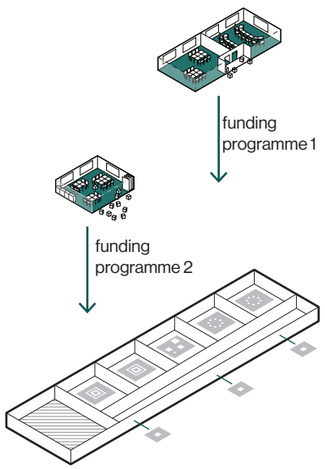
Transformation process of the clusters



STEP 1
Define learning spaces specific for the cluster, according to its subject and their quantity, considering also spaces surrounding the cluster (e.g. additional labratories in the civic center part, assembly rooms, atrios, etc.).



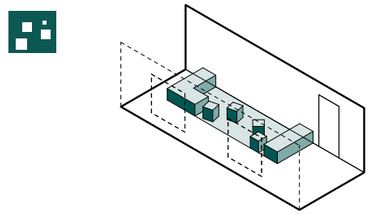
STEP 2
Distribute the spaces to the available modules, before specifying their final form, creating a general plan for each cluster. This step aims to facilitate further decisions how to use the scattered fundings. The general plan can be changed in the future, if needed.



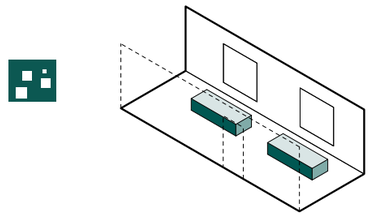
STEP 3
Choose the final form of each space according to the available fundings. To avoid creating detached spaces, connections between spaces must be taken into consideration. The catalogue of spaces can facilitate the process, providing a collection of spaces according to their size and function. They have beed divided into 1, 1.5 and 2-module spaces, and ideas for the corridor.

The spaces change constantly, because of the changing uses, number of students and their specific needs, therefore they are in a constant process of re-shaping.

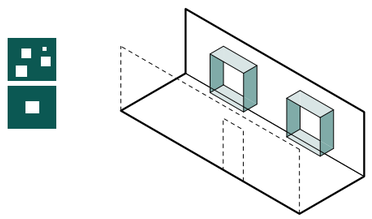
Corridor



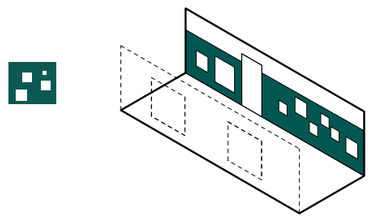
Island
A meeting spaces scattered along a wide corridor, which can be used during the lessons or for individual study



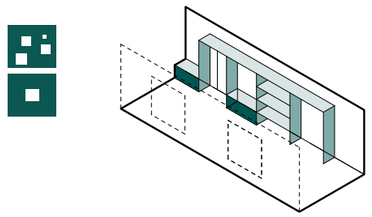
Benches
Seats distributed along the corridor



Windowsills
A sitting area around the windows, providing a sense of privacy

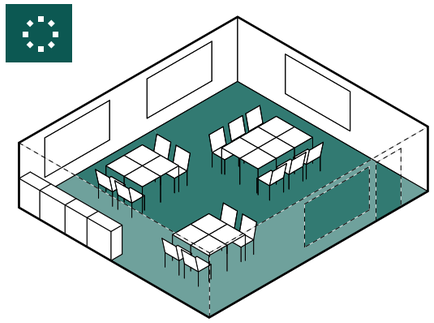


Exhibition
The walls used as a gallery of students' works, which can be customized and managed by them

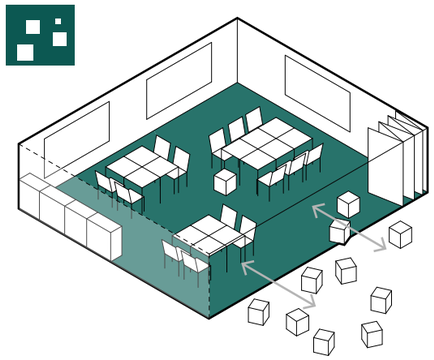


Buffer zone
Objects places next to the classrooms entrances providing sitting spaces, storage room, etc.

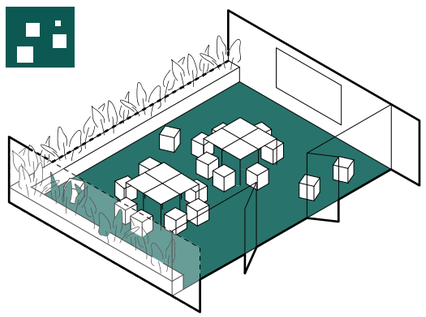
1 MODULE



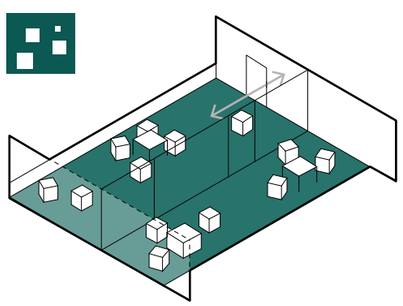
Flexible classroom
A basic classroom module with a flexible layout that allows varoius types of activities. The module should be adjusted to a subject, e.g. by providing specific didactic tools, furniture, etc.



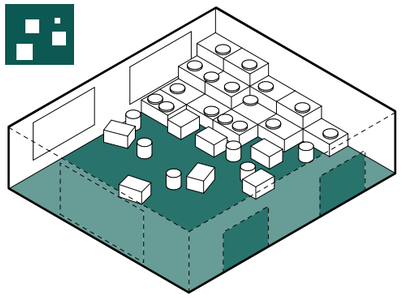
Open classroom
The open classroom is an informal space during the breaks. Additionally, it provides additional learning space, which can be used during the lessons, or as an extension of another learning space.



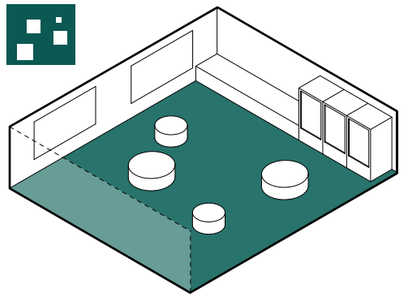
Outdoor classroom
The outdoor classroomNam que natet iminus estius. Tempossitia volorer ferupis sa doluptasiti il ma sit quam, ut molupta spellup



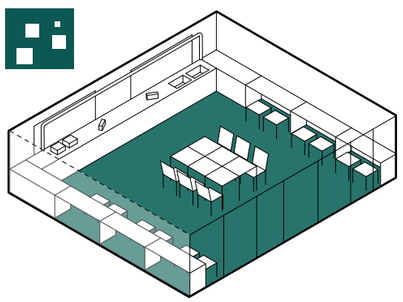
Indoor-outdoor space
An external area connected with the niche of the corridor. It provides an informal area, which can be also connected directly with the classrooms and serve as their extension



Cinema room
The space accessible during the breaks, with a flexible layout, which is equipped with a projector and can be used as a cinema room

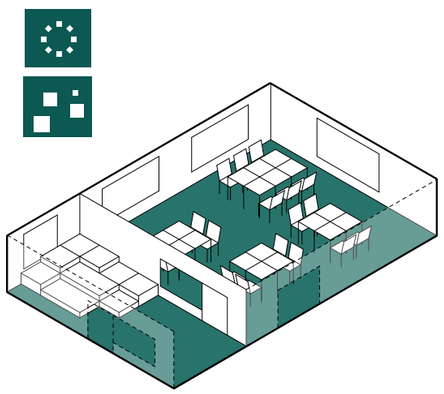


Snacks area
A space with comfortable seats and vending machines

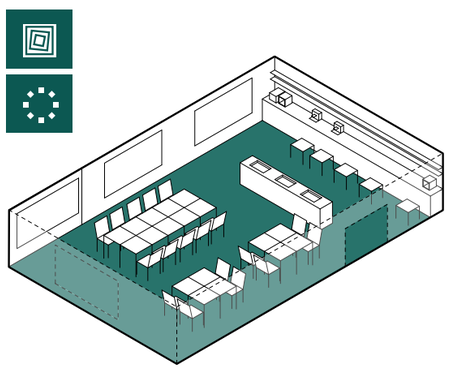


Laboratory
A small laboratory visually connected with the informal area, which can be also directly connected with other learning spaces

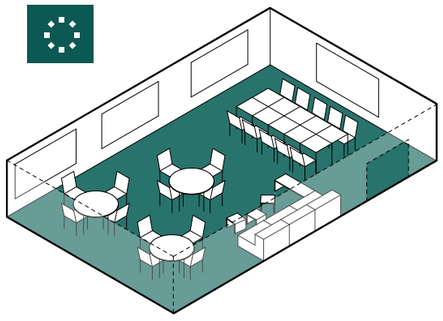
1,5 MODULES



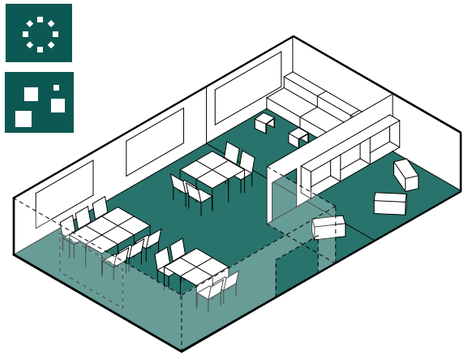
Classroom + niche
The informal area directly connected with a classroom can be used as additional learning area, complementing toe group learning activities



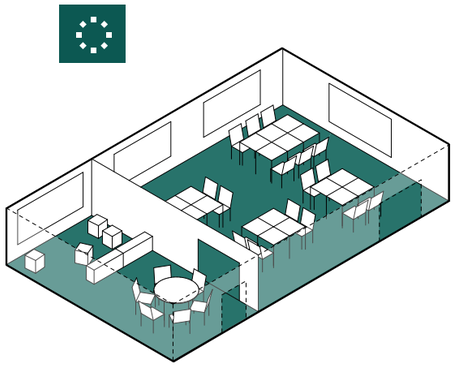
Classroom-laboratory
A group learning space with a laboratory zone



Large classroom
A bigger size of a classroom opens possibilities to introduce additional areas within a classroom, such as informal part, open space, etc.

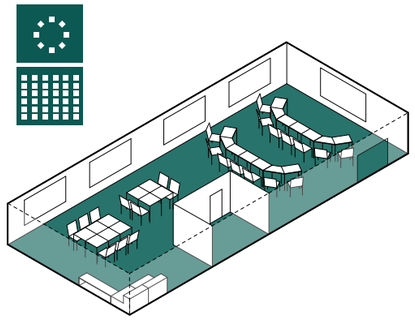


L-shape classroom
The L-shape classroom offer an additional, moderately separated and private zone. Additionally, a niche in the corridor is a meeting point during breaks

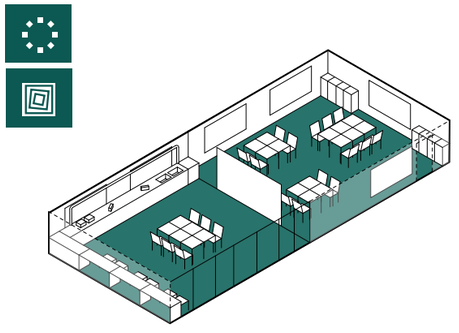


One and a half classroom
The space can be used together, offering diversed learning settings, or separately, as two different size classrooms

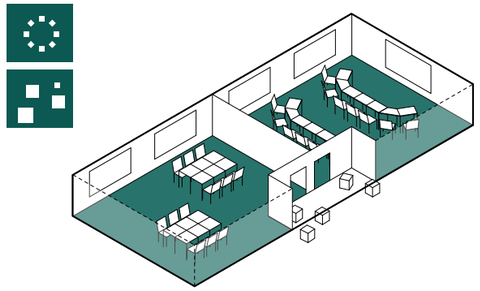
2 MODULES



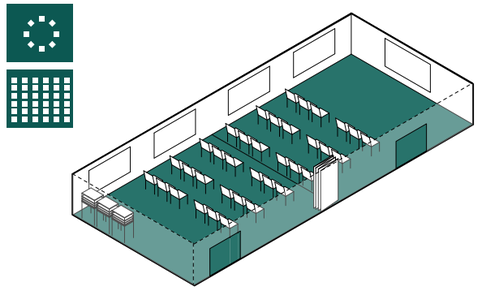
U-shape classroom
The large space, divided by a storage space in the middle offers diverse, slightly divided learning zones. It can be used as a gathering space



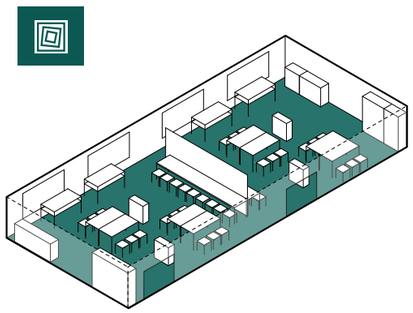
Big classroom - laboratory
The space is divided into a laboratry and a classroom zone. It allows to learn in a natural and efficient way - through experiment and practice



Two classrooms and niche
A set of two L-shape classrooms with a niche connected to a corridor



Assembly room
A large classroom can be used as a group learning area, as well as as a gathering space, a free space for physical activities and workshops, etc.



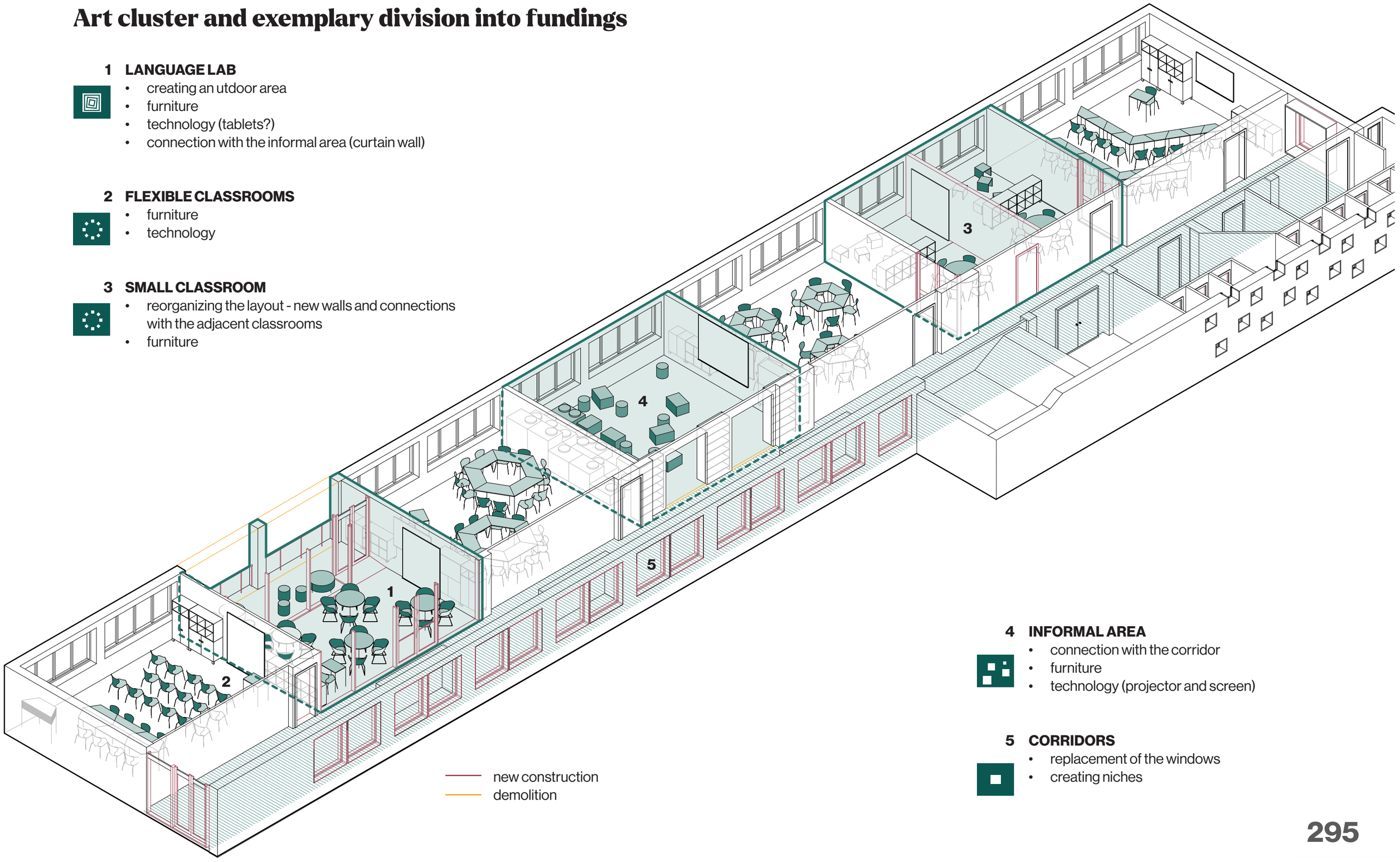
Two-zone workshop
The subtle division marks out two distinct zones, maintaining their connection and enabling the use of both spaces during one lesson

Art cluster and exemplary division into fundings

1 LANGUAGE LAB
- creating an utdoor area
- furniture
- technology (tablets?)
- connection with the informal area (curtain wall)

2 FLEXIBLE CLASSROOMS
- furniture
- technology

3 SMALL CLASSROOM
- reorganizing the layout - new walls and connections with the adjacent classrooms
- furniture



4 INFORMAL AREA
- connection with the corridor
- furniture
- technology (projector and screen)

5 CORRIDORS
- replacement of the windows
- creating niches

Interventions in the civic center part

The civic centr part is both for the school an the local community. It is a meeting point between these two communities, therefore a variety of important spaces is situaten in this part, such as spacious workshops and laboratories. The civic center part can be used independenly, without access to other parts of the school building.

During the transformation process, it is essential to keep this part accessible to the local community and to maintain the connections with the other learning spaces.

The civic center consists of the following types of spaces:

Atrios, connected together by stairs and elevator. They are a meeting and exibition space, as they connect all the spaces

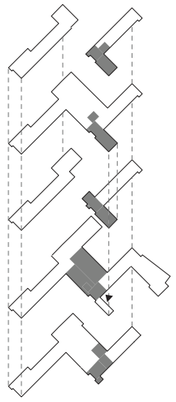
Workshop areas, providing lagre space for workshops and laboratories. They are based on a module 16x9.7 m. They can be transformed and repurposed according to the needs of the school and the local community

Library and assembly hall, the largest gathering space, which can be used for meetings, discussions and events

Sport facilities, with changing rooms, multifunctional space and gymnastics hall

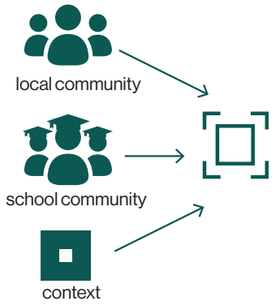
Virtual Reality room, which opens a variety of learning opportunities unavailable without this technology

The part of a school available as a civic center with suggested facilities



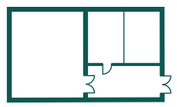
key plan

Transformation process of the civic center part



STEP 1
Define the functions of the spaces, involving the school and the local community in the process. Other spaces surrounding the civic center part should be taken into consideration, to ensure the holistic approach to the design

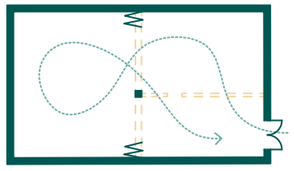
STEP 2
Prioritize the spaces to order the transformation process in time, and plan the transformation to ensure that the other spaces are operational



STEP 3
Choose the final form of each space, considering their purpose

Configurations of the repeatable workshop areas

The layout of the workshop areas – the main part of the civic center, is primarily determined by a function of its space. They can can be reprogrammed if the use of the space chages. There can be distingushed the following layouts of the areas:



example of use:
arts and crafts workshop | dance studio | gathering room | cinema room

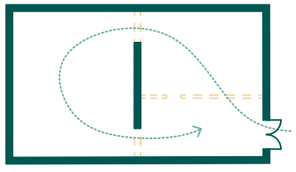
Open space

initial intervention

functionality

single — multiple

possible noise problem
may require additional divisions (e.g. movable walls)



example of use:
art workshop | large laboratory | DIY workshop

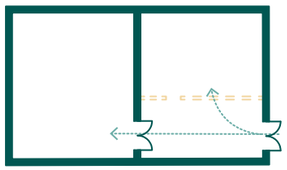
Open space

initial intervention

functionality

single — multiple

possible noise problem



example of use:
laboratory | workshop | library

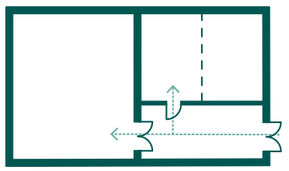
Open space

initial intervention

functionality

single — multiple

passing through a classroom



example of use:
laboratory | music room | recording room | 1 to 1 meeting space

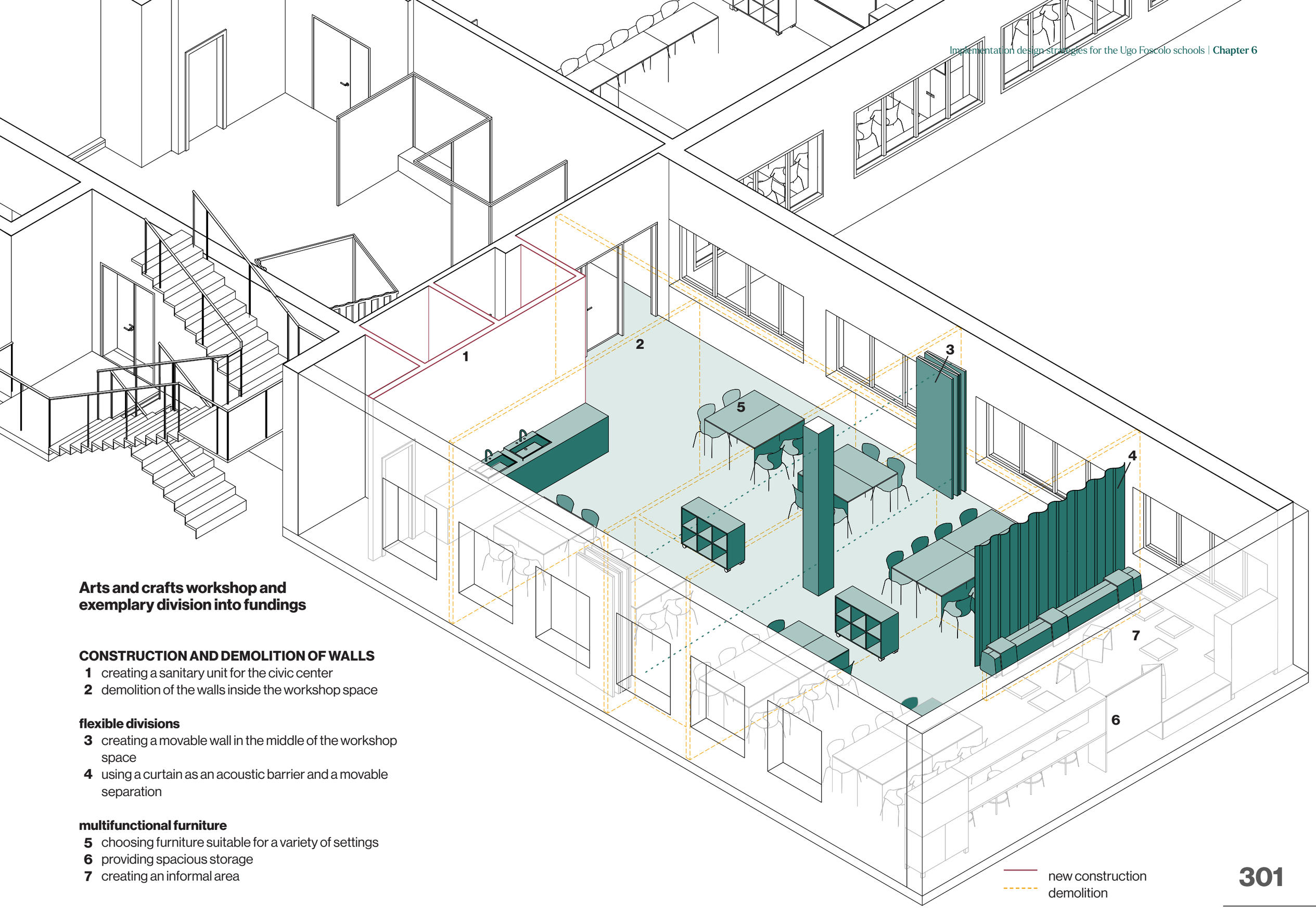
Open space

initial intervention

functionality

single — multiple

large citculation space



Arts and crafts workshop and exemplary division into fundings

CONSTRUCTION AND DEMOLITION OF WALLS

1 creating a sanitary unit for the civic center
2 demolition of the walls inside the workshop space

flexible divisions

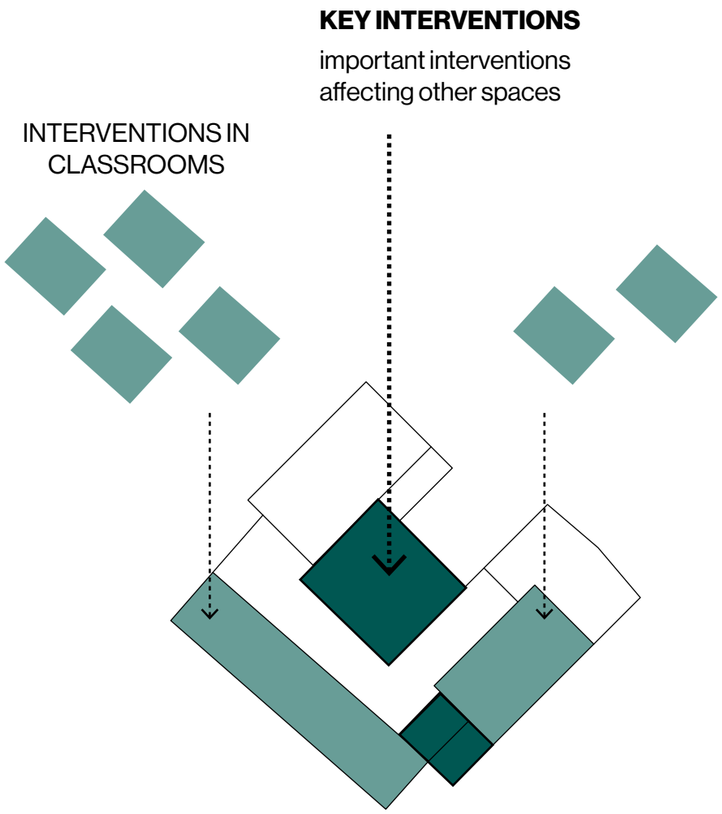
3 creating a movable wall in the middle of the workshop space
4 using a curtain as an acoustic barrier and a movable separation

multifunctional furniture

5 choosing furniture suitable for a variety of settings
6 providing spacious storage
7 creating an informal area

6.2. Primary School

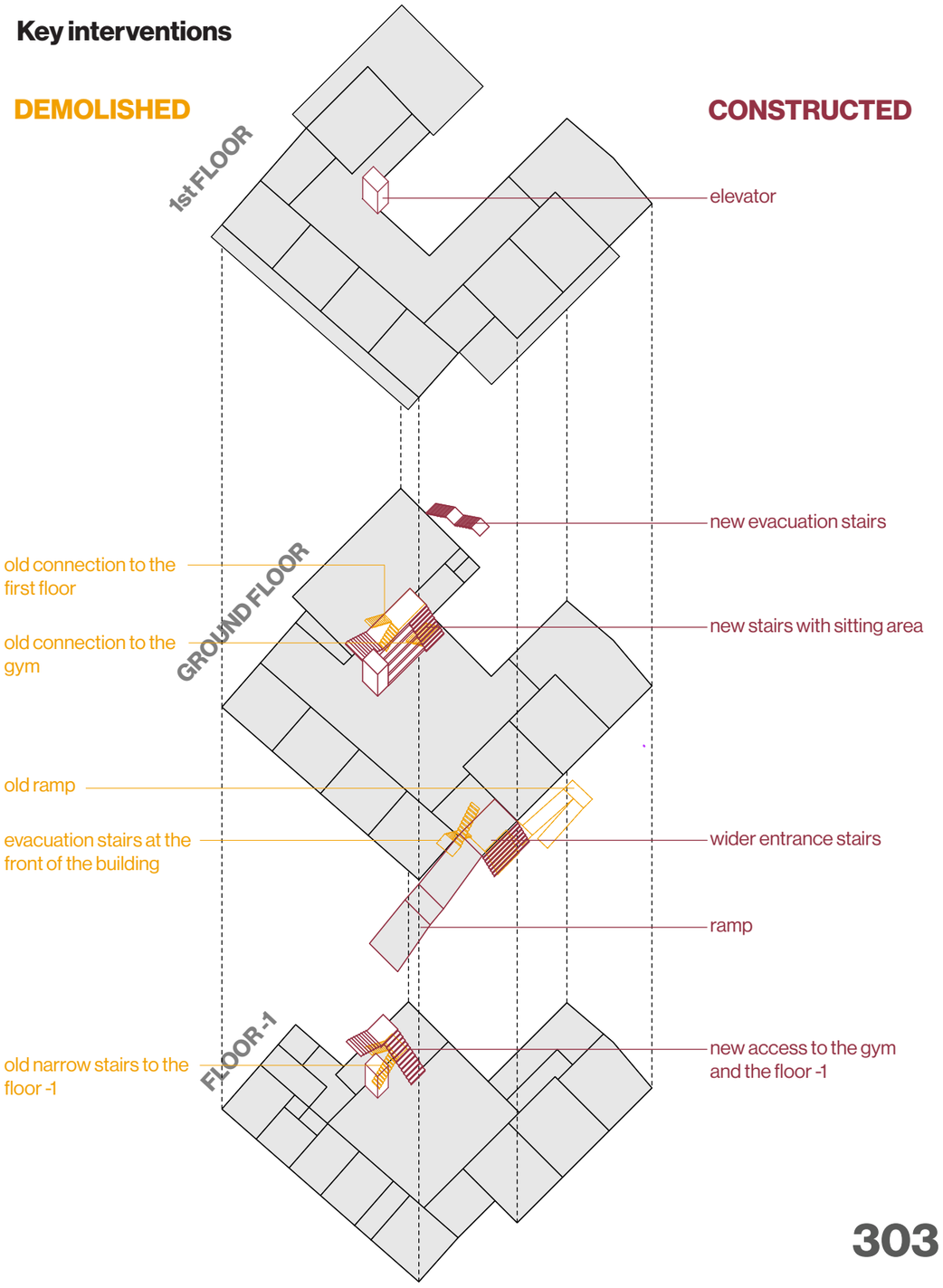
Strategies for the central area and learning spaces



As the transformation process of the school buildings is carried out with numerous small interventions, the renovation strategy for the school aims to provide a general picture of the school, rather than a specific design, which will be stricktly followed.

There has been developped a strategy for the key interventions, which has to be followed in the right order, as they set the framework for the rest of the interventions.

Additionally, the strategies for the main spaces have been elaborated, which aims to facilitate regular modifications, admitting than the educational spaces are in a constant process of re-shaping

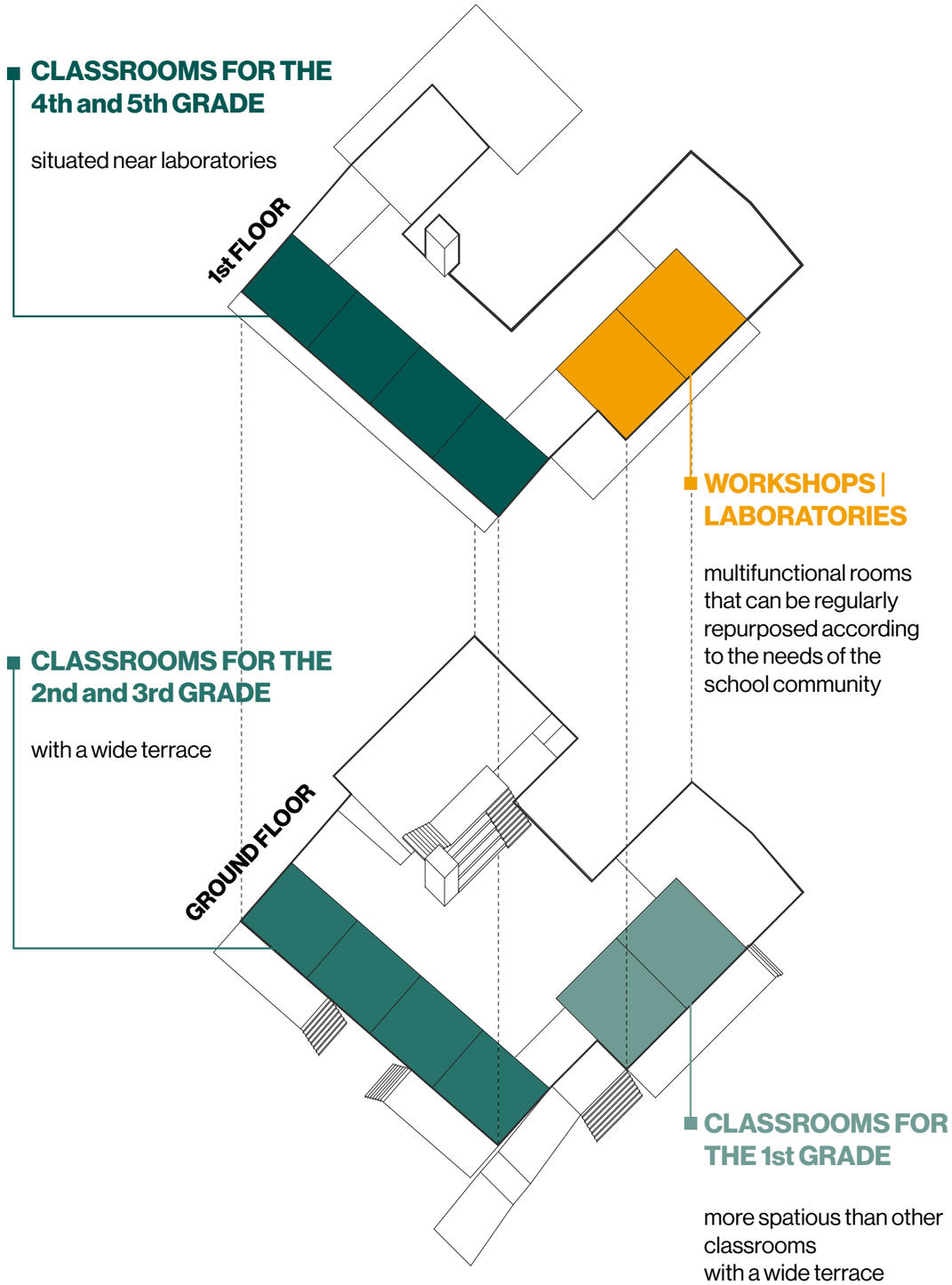


Interventions for the classrooms

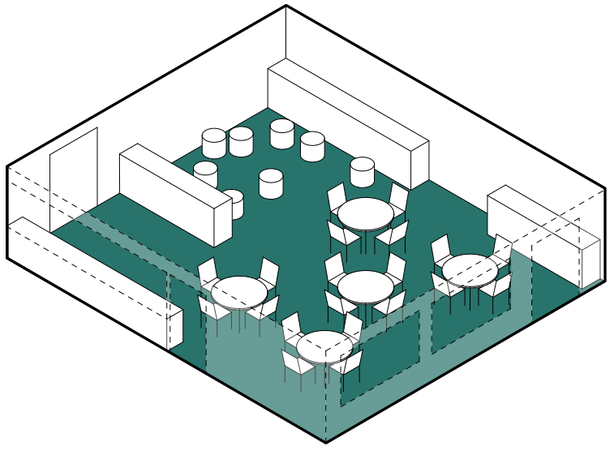
The classrooms and workshop and laboratory rooms are spaces that will potentially change the most in the future with the changing needs and size of school community. Therefore, a library for spatial ideas was created, to help to adjust these spaces to their users' requirements.

In the proposed design, classrooms for the youngest children were situated on the ground floor, with a spatious outdoor area. The largest classrooms are dedicated to the first grade, as they can contain additional space for physical activities. On the first floor, there are classrooms for grades 4-5, and workshop/laboratory rooms.

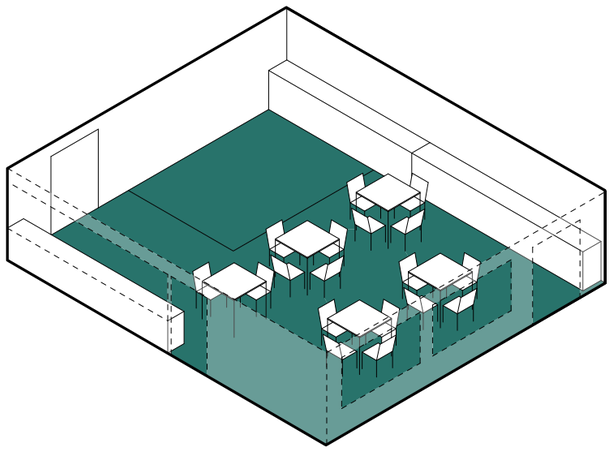
The folloowing pages contain ideas for these spaces, aiming to help deciding on the function and type of activity that will be placed in these areas.



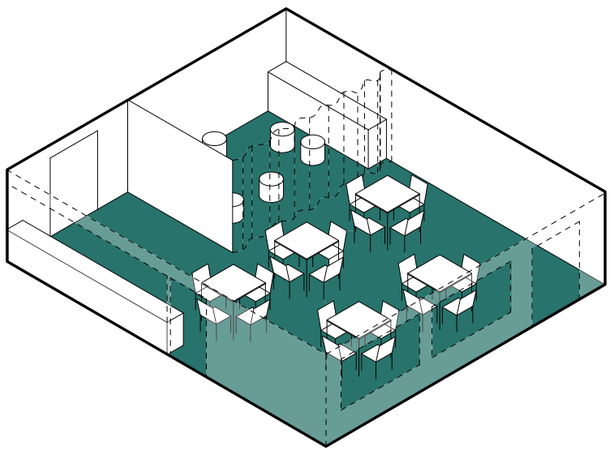
CLASSROOM FOR 1st GRADE



Classroom with a creative zone
classroom with a space which can be used for discussions, building and storing simple constructions, etc.

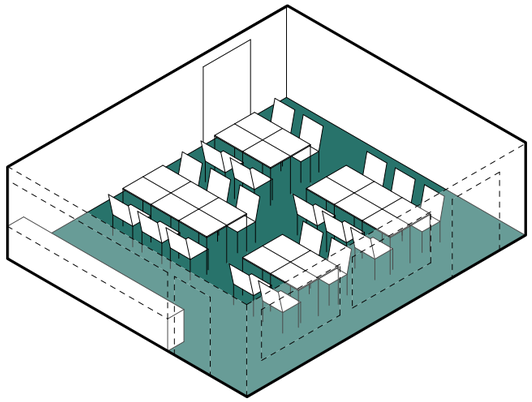


Classroom with games zone
classroom with a lagre empty space dedicated for physical activities and games

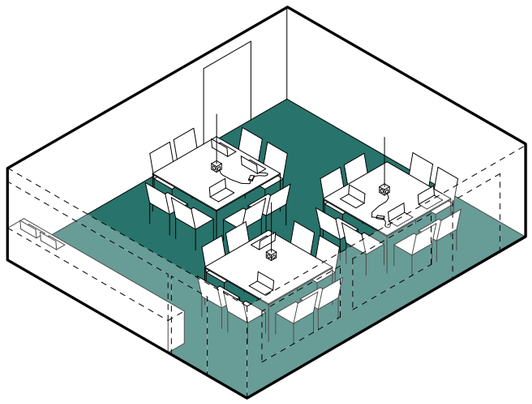


Classroom with a calm zone
classroom with an area, where children can relax and calm down. It can be also used as an integral part of the main learning space, if needed

CLASSROOMS FOR GRADES 2-5

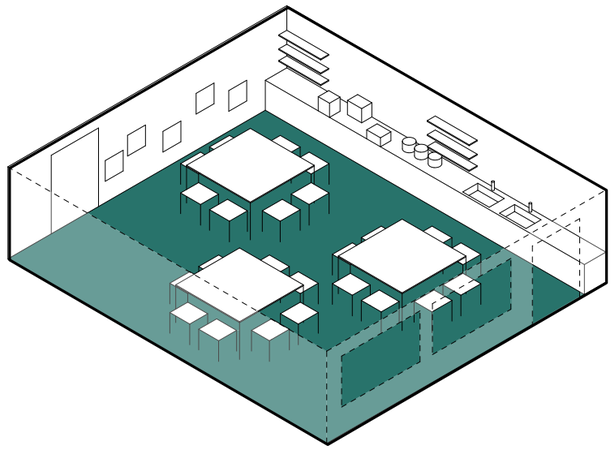


Flexible classroom
A basic classroom module with a flexible layout that allows varoius types of activities, which ensures that space can be personalized by students

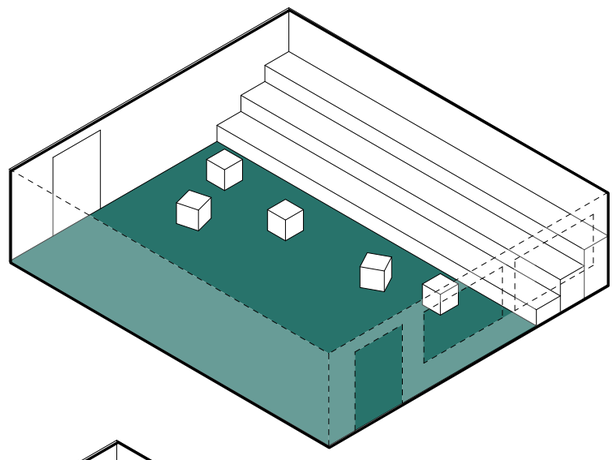


Technology classroom
A classroom that prioritises the use of technology, while still remaining flexible and multifucntional

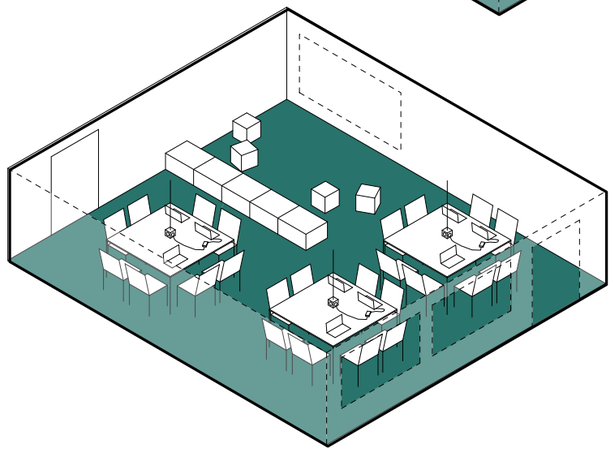
SPECIAL ROOMS, WORKSHOPS, LABORATORIES



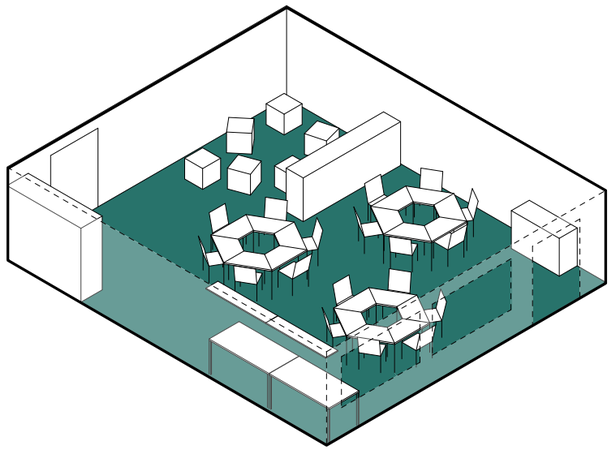
Arts and crafts workshop
A spatious, well equipped room for creative works, with an an area to display students' works



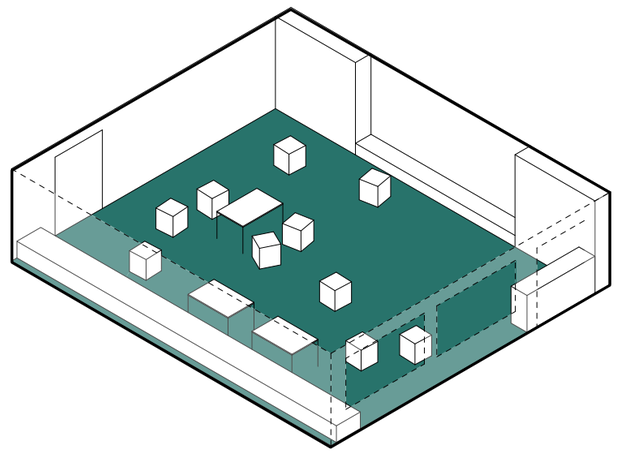
Cinema room
Room witnh sitting stairs and light, easily movable seats, designated to watch movies, presentations, etc.



Technology workshop
A workshop where students can learn how to use technology in a creative way. For example, can serve as a robitic room, where students learn the basics of coding.



Workshoop room
A multifunctional space, which can be used as a biology and science laboratory, a workshop space, etc.



Games room
An empty room, with stackable furniture, which aims to provide a space to learn through play. Can be also used for acting workshops, dance classes, etc.

Conclusions

The thesis has revealed a strong need for the holistic transformation of school buildings in Italy to create innovative learning environments suitable for diverse learning approaches. It aimed to answer the question of whether it is feasible to achieve with the use of fragmented fundings.
A review of the history of Italian educational infrastructure has highlighted that the buildings were shaped by various factors and revealed how various strategies were needed at different times to address diverse challenges. It became evident that currently, the main challenge lies in the fact that resources do not bring qualitative changes as they lack a cohesive strategy. These “patchwork” transformations are not able to transform the learning environments into innovative learning spaces.

An analysis of the funding programmes and the management process has revealed that there is a strong necessity for a comprehensive strategy and a clear plan for transformations and renovations, which would facilitate decision-making and utilizing the resources from the funding programmes more effectively. Additionally, it became evident that dialogue between school staff, municipalities, and local communities in creating this transformation plan is a key element in the process.

Exploring school models such as the DADA model and the 1+4 Learning Spaces Model has highlighted the importance of creating more dynamic and effective learning environments. It also provided guidelines on how to achieve this. It was highlighted that there is a need to find practical ways to implement these models in existing schools on a case-by-case basis.

The case studies of the transformed school buildings in Europe have provided practical insight into implementing innovative learning models in existing school buildings. The analysis revealed that the transformation process can be adjusted to the needs of each school community. For example, the process can be extended and consist of smaller-scale interventions if the school needs to remain operational during the time of construction. It also revealed the importance of collaboration with the local community and of their inclusion in the school spaces.

The project for two buildings in Turin, developed in collaboration with the school staff, has provided practical solutions for implementing these innovative strategies into the existing spaces in Turin. The project aims to remove unnecessary divisions that were gradually added to the spaces since their construction, and to create a flexible and diverse learning environment. It is intended to serve as a framework for planning the future fundings and as a comprehensive vision of the entire space.

The practical ideas for implementing the designed spaces provided a practical framework for the long process of transformation. It highlighted key interventions and strategies for repeatable elements, for example, classroom models. It also discusses how the project can be used and updated in the future, emphasizing the necessity of involving the local community in the design and decision-making process.

The thesis aimed to address the transformation of existing educational spaces using available fundings. This issue deserves broader research because the existing spaces are often inadequate for innovative learning strategies. To improve this, it is necessary to develop a strategy that takes into consideration the constraints of existing infrastructure and funding programmes, as well as the changes caused by demographic decline.

In conclusion, the thesis argues that innovative learning environments rely not only on novel ideas but also on cohesive, practical strategies that make their realization possible. Achieving this requires the involvement of municipalities, school communities, and local citizens. Despite the complex nature of the issue and the long process of changing the existing situation, it is worth implementing, implementing these strategies is crucial because it allows transform existing learning environments from fragmented, “patchwork” spaces into a holistic, homogeneous, and innovative learning environment.

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