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Buildings for Education

A Multidisciplinary Overview of The Design of School Buildings

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Preface

This book belongs to a series, which aims at emphasizing the impact of the multidisciplinary approach practiced by ABC Department scientists to face timely challenges in the industry of the built environment. Following the concept that innovation happens as different researches stimulate each other, skills and integrated disciplines are brought together within the department, generating a diversity of theoretical and applied studies.

Therefore, the books present a structured vision of the many possible approaches—within the field of architecture and civil engineering—to the development of researches dealing with the processes of planning, design, construction, management, and transformation of the built environment. Each book contains a selection of essays reporting researches and projects, developed during the last six years within the ABC Department (Architecture, Built Environment, and Construction Engineering) of Politecnico di Milano, concerning a cutting-edge field in the international scenario of the construction sector. The design of schools has been recognized as one of the hottest topics in architectural research, also for the criticalities detected in the current conditions of Italian school buildings.

The papers have been chosen on the basis of their capability to describe the outputs and the potentialities of researches and projects, giving a report on experiences well rooted in the reality and at the same time introducing innovative perspectives for the future.

With the aim of exploring the evolutionary scenario of school design as an architectural topic, the collected papers were selected according to a comprehensive and multidisciplinary overview. Researches on typology and spatial organization are enriched through the contribution of a historical and social perspective to enlarge the focus on the urban role of the school buildings. Moreover, innovative approaches and tools have been highlighted both in the design process and in the education techniques. The presented experiences include best practices of

consistent and coordinated contributions of the several disciplines involved in the design of school buildings, also implementing digital tools. Finally, the issues related to the challenges of the existing built stock triggered the development of more technical and specialized, albeit multidisciplinary, investigations and case studies' reports.

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Introduction

Background

The design of educational spaces dedicated to school is a rather recent topic in Italy, since until the end of the nineteenth century and the unification of the country,[1] children were educated exclusively in private or ecclesiastical environments; and only later, the school education was recognized for its significant role in the teaching and learning processes (Pennisi 2012). The evolution of the architectural school typology and of the primary school in particular, can be analyzed as a complex combination of political, cultural, social and urban planning issues and as a reflection of the historical situation. Through the analysis of the educational buildings erected in the different periods, it is possible in fact to detect the evolution of the legislative framework, aimed at defining hygienic and comfort requirements, and of the organization of spaces required by the different pedagogical approaches. The study of the architecture of existing schools reveals a sequence of construction systems, both traditional and innovative, from masonry walls to reinforced concrete frames and to prefabricated solutions, which were employed to better respond to changing needs (in particular, low construction and maintenance cost and construction time reduction). Finally, and with a strict connection with the above considerations, the role of the school building in the city is remarkable at the urban level also, for its ability to promote the development of entire neighborhoods of a city or for the ability to revitalize an existing portion of a city in relation to other public services and open spaces.

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[1]The compulsory education was introduced in Italy with the Casati Law, issued by the Minister of Public Education Gabrio Casati in 1860. This law entrusted the central government the obligation to enact laws in relation to school education and the management of public schools and gave private individuals the possibility of founding and managing institutions, but without the right to confer educational qualifications. In this period, elementary education became free, compulsory only for the first two out of four years (i.e., for pupils aged 6–7 years) but only present in cities with over 4000 inhabitants or in secondary education institutions (Laurenti and Dal Passo 2018).

The Current Situation

The results of a more than a centenary process of school buildings' construction are significant from a quantitative point of view. The whole stock of educational buildings of all levels and dimensions amounts to 42,408 units, hosting 7,816,408 students in 370,597 classes (Miur 2017), distributed all over the national territory (see Fig. 1). However, this is an extremely heterogeneous heritage,[2] because of the aging, the functional and often physical obsolescence, which ultimately does not respond to the current demands in terms of teaching and learning methodologies, but also because of the low comfort and safety performances and of fruition and accessibility problems (lack of compliance with "Universal Design" goals).

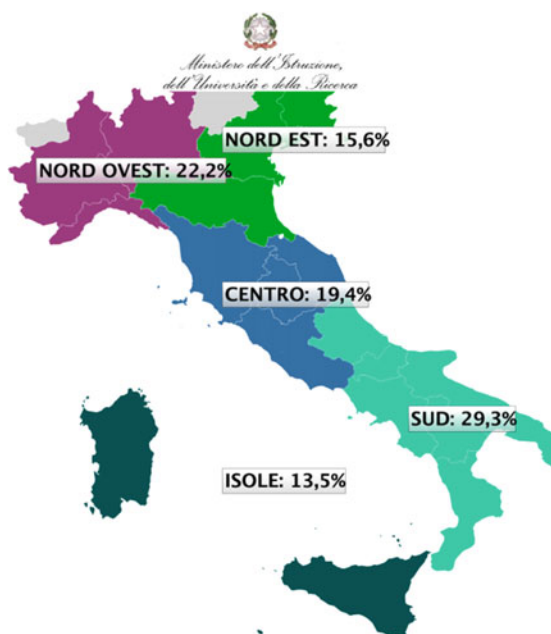**Fig. 1** Distribution of the educational buildings on the Italian territory (Source: MIUR—*Portale unico dei dati della scuola, Anagrafe scuola*)

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[2] Thirty-two percent of the schools was built after 1976, 27% between 1961 and 1975, 12% between 1946 and 1960, 8% between 1921 and 1945, 4% between 1900 and 1920, 3% in the nineteenth century, and 1% before 1800. There is no information for the remaining 13% (Miur 2017).

In addition to the hydrogeological hazard that can affect some schools positioned in risk areas, one of the most urgent issues is related to the high seismic vulnerability characterizing most of the existing schools, which indeed were designed with respect to gravity loading only.

The identification of the seismic areas in Italy started at the beginning of the twentieth century, through the instrument of the royal decree, issued after the destructive earthquakes of Reggio Calabria and Messina on December 28, 1908. Since 1927, the areas hit by earthquakes have been divided into two categories, in relation to their degree of seismicity and their geological constitution. Therefore, the seismic map in Italy was nothing but the map of the territories affected by the strong earthquakes after 1908, while all the territories struck before that date (most of the seismic areas of Italy) were not classified as seismic and, consequently, there was no obligation to build in compliance with anti-seismic regulations. Only in 1974, through the law of February 2, 1974, n. 64, a new national seismic regulation was established which defined the reference framework for the seismic classification methods of the entire national territory, as well as for the drafting of technical standards. Immediately after the earthquake of October 31, 2002, that hit the territories on the border between Molise and Puglia, the Civil Protection adopted the ordinance of March 20, 2003, n. 3274, in order to provide an immediate response to the need to update the seismic classification and seismic regulations. According to the ordinance n. 3274, and unlike the provisions of the previous regulations, the entire national territory was classified as seismic and divided into four zones, characterized by different seismic hazard.

This brief history demonstrates that seismic regulations in Italy are quite recent. Indeed, according to the new registry launched by the Ministry of Education University and Research (Miur 2017), only 8% of the schools was designed in compliance with seismic regulations, 54% is in a vulnerable zone, and around 19,000 buildings are situated in high-risk seismic areas. The collapse of educational buildings in the 2009 and 2016 earthquakes in central Italy and the tragedy of San Giuliano di Puglia (2002), where 27 children died in the primary school building collapse, represent a clear symbol of the gravity of this problem.

A second major issue is related to the inadequate energy performance of the educational buildings, again due to the old construction date and to the evolution of the regulations on the energy performance of the buildings, the first being enacted only in 1976, but with very low requirements in comparison with the current situation. Although the European Energy Performance of Buildings Directive (EPBD) requires that "*the public sector in each Member State should lead the way in the field of energy performance of buildings*" and "*buildings occupied by public authorities and buildings frequently visited by the public should set an example,*" almost 85% of the school buildings in Italy belongs to the bottom classes of the energy performance ranking. Only 5% (Legambiente 2018) of the stock can be classified among the first three classes, a percentage corresponding to the constructions completed after the 2001, when the first regulations requiring a high standard of energy efficiency were enacted. Hence, if the lack of sufficient structural safety can appear as a real threat, the inadequate energy performance is certainly a

waste of resources and a lost chance as well. Energy retrofit programs in fact can become lighthouse projects not only because schools are public buildings visited by pupils, their parents, and the staff, but also because the direct understanding of the behavior of the building envelope and technical systems can help children learn how to support energy savings as responsible users and transfer the knowledge to their families. A further issue to add to the serious situation of the national heritage, related to both structural safety and energy poor performance, is the significant gap between northern and southern regions; an imbalance which characterizes also the funding for ordinary repairs, let aside renovation interventions.

Furthermore, health and indoor comfort requirements should be addressed, especially when considering that almost 10% (Legambiente 2018) of the existing complexes should be cleaned from asbestos.

Finally, the shift toward a knowledge society where information and knowledge are expanding in quantity and accessibility is introducing major changes in teaching and learning models. The information revolution has changed the way we interact with people and things. We live in a society where information is spread out in a large-scale dimension, and new technologies become new tools to change the relationship between time and space. Learning happens everywhere. The new generation of net-native pupils, with an increasingly different set of expectations about space and time, will require constant access to learning materials and resources to share within and beyond the school. Inter-disciplinary learning and collaborative peer-to-peer learning will become increasingly common. New educational models and approaches will be required to help multiple generations, belonging to diversified cultures and in different fields. This will require a general rethinking of the school layouts to overcome the actual strict zoning of the functions and to respond with a higher flexibility to the rapidly changing demand.

The barriers toward the starting of a concrete policy for the renovation or the replacement of the existing stock are varied. It is not just a problem of economic resources but also of a complex set of different issues related to both the diversity of the heritage and the heterogeneous set of institutions responsible for the construction/renovation process. The schools in fact are managed by municipalities as well as by provinces and also directly by the central state. The interventions, considering the major presence of public buildings, are very often subjected to the national public works legislation, requiring a significant effort in planning and organization. One of the challenges is thus how to support municipalities or institutions, especially the smallest ones, in the process from the design activity, to the tendering, to the site inspections and co-ordination during execution, until the final acceptance testing.

The decision for the construction or the retrofit of the school building should consider the relationship with the urban context and the possible potentials that the public building and its annexes can add to the community, for example, in terms of quality of the public spaces, additional resilience in case of emergency[3] and of lifelong learning[4] or integration with other public facilities. A new construction or a requalification can also trigger the regeneration of the surrounding neighborhoods.

The Challenge of Renovation and New Buildings Design

From 2014, in Italy a vast program[5] of construction of new schools and requalification of existing educational buildings that affect, in different ways, every level of education, from primary schools to universities, have been public financed. Different architectural design competitions were also proposed, beyond the attribution of the design task, to collect innovative proposals able to explore new solutions and approaches for the renovation of the educational facilities. Many examples and competition applications are collected in this book.

This program concerned the transformation of educational and pedagogical approaches, aimed at improving the effectiveness of learning models, as well as the requalification of the existing buildings from an energy-saving and structural safety point of view, the latter with particular regard to seismic vulnerability of the existing buildings.

These themes have long been a field of great interest, experimentation, and research, aimed at developing projects, models, and intervention strategies where different disciplines and skills are involved. The possibility of giving old places a new identity, to update buildings according to the new educational and teaching models, to develop projects that take into account the actual needs of energy savings and structural safety is deeply investigated in the following chapters.

On a broader scale, all these needs offer the possibility of redesigning complex existing buildings and developing projects that play an important role also at the urban level, by becoming reference places, opportunities for redevelopment of degraded parts of a city, new cultural, and civic centers.

This book describes the results of some of the research and consulting works, carried out at the Department of Architecture, Built Environment and Construction engineering (Politecnico di Milano), related to the design of new schools and to the

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[3] A structural safe school building in seismic areas can be used, for example, as a possible emergency center or temporary accommodation in case of necessity.

[4] The often-unused spaces of a school building during the evening or weekends can host courses for adults or other continuous learning programs or different activities for the whole community.

[5] Of the ten billion euros invested, five have been spent by municipalities, provinces, and metropolitan cities to construct 300 new buildings and start 12,000 renovation projects. ItaliaSicura, the Council of Ministers authority created to lead and manage the renovation programme, was closed in July 2018 (https://www.corriere.it/scuola/primaria/18_luglio_05/edilizia-scolastica-ambiente-governo-chiude-italiasicura-adef7264-8017-11e8-841c-47290107a48c.shtml).

requalification of existing ones. The description of these activities has been organized into three sections, where particular emphasis is given to the effective collaboration with institutions at various levels and the synergetic combination of the different disciplines involved, needed to respond to their requests through applied and basic theoretical research works.

The chapters, organized into the three different sections, investigate central themes about the buildings for education, focusing, in particular, on the definition of multidisciplinary approaches for the design of new schools and for the upgrading of existing ones. Among the main topics highlighted, the first section focuses on the relationship between the city and the school as a civic building with a public role for the community also to possibly host different functions. Accordingly, some recent concept designs are featured, carried out within national and international competitions, and analytical and historical studies on the theme of schools and on their typology, as well as on the role of these buildings at the urban level, are reported. In the second section, innovative solutions for both the design and the construction process are analyzed, and in some applications, particular relevance is given to the building information modeling (BIM) strategy as an optimal tool to achieve a synergetic combination of the different disciplines involved. Finally, the third section focuses on the built heritage, particularly: (i) on the tools, technologies, and approaches required to upgrade the existing buildings, in order to comply with the new regulations (in terms of seismic resistance and energy performance); (ii) on the possible transformation of unused constructions into buildings for education, and (iii) on the management of the existing stock. Theoretical as well as applied research paths are reported to illustrate the topic both from the methodological point of view and through real case studies.

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Contents

About the Editors

Stefano Della Torre Graduated in Civil Engineering and in Architecture, he is a full professor in restoration at the Politecnico di Milano. He is the director of the ABC Department - Architecture, Built environment and Construction engineering. He is the author of more than 250 publications. He serves as an advisor for CARIPLO Foundation (Cultural districts) Province of Como and Lombardy Region (policies of programmed conservation of historical-architectural heritage). He is the president of Building SMART Italia - national chapter of association Building SMART international.

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Laura Daglio, Ph.D. is a registered architect and an associate professor of Architectural Technology at the Politecnico di Milano (Department of Architecture, the Built Environment and Construction Engineering) where she works on research issues concerning building and construction design with a special interest in social housing, environmental design and sustainability in architecture for new construction as well as renovation. She is involved in research programs funded by Ministries and Public Bodies at different levels and in international projects. She is the author of books, essays, articles in reviews and of academic papers included in international conference proceedings, on topics related to sustainability in architecture and environmental comfort at different scales. She has been in charge

of various projects for public and private buildings' new construction and refurbishment and achieved mentions and awards in design competitions.

Raffaella Neri Graduated in Architecture in 1986, she is a full professor at the Politecnico di Milano. In 1993 she gained her Ph.D. in Architectural Composition from IUAV, Venice, with a dissertation entitled, "Essay on construction. Research into the role of construction and architectural design in relation to type and decoration". In 1994–1995 she worked on organizing the exhibition entitled, "The Center elsewhere" (coordinated by A. Monestiroli), La Triennale di Milano. Since 2003 she has been a member of the teaching staff body for the Ph.D. in Architectural Composition at IUAV, Venice. Her research activities include the theory of architecture, urban design and the role of construction in design. In recent years she has studied compositional principles for residential developments and the issue of redevelopment of brownfield sites and former military zones. She participates in design contests, winning the Luigi Cosenza National Architecture Award in 1996.

Field of Education and "*Corpus Socialis*"

Riccardo Canella and Micaela Bordin

Abstract The Italian school system is still affected by the "Berlinguer Reform"—it never entered into force but it became the basis of every subsequent reform that was implemented—for which the legislator intended to compensate for the imbalances of the Italian school, in the relationship with mass-studies, with the transposition of European directives that have substantially changed the schools of every order and degree and introduced a "3 + 2" structure in the university educational system, stiffening the entire school cycle and causing further fragmentation. The essay presents a pilot project of a reversible wooden pavilion as the primary nucleus of (the) experimental teaching, for the recovery of degraded and typologically insufficient public schools in Milan, but also for the reuse of the "mother houses", the farmhouses in Lombardy and also for the restoration of the "*forum*" in the Italian places damaged by the earthquake.

Keywords Architectural composition (architectural design) · Architectural theory · Italian architecture · Typology · School complex project · Prefabrication

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1 Public Compulsory School in Municipal Complexes for a New Culture-Civilization: Project for the "Carro di Tespi" Pavilion[1]

"*Test suckers and roots to build a new ethnicity*".[2] If we consider how it is possible that the origin (*the poleogenesis*) of Italian cities (whether large, medium or small) is to be attributed fundamentally to "facts of structure" (in the meaning given by Ferdinand de Saussure)—as the historian Henri Pirenne seems to suggest, paraphrasing the well-known thesis about the paleogenetic dualism of the medieval city (fortified *nucleus* and mercantile town) that became functional to the proto-capitalistic structure (Henri Pirenne 1927)—we could therefore argue that the interaction between the resources and the endowments of the city-center and resources and endowments of the peripheral area and of the metropolitan concentric structure becomes necessary to the understanding of the *phenomena* of transformation into an inalienable coherent destiny.

If after all it is considered possible that the most careful and in-depth analyzed urbanistic critique now tends to favor this hypothesis, it is also true that, in the not so disorderly growth of the same Italian cities, hazarding a generalization, there are entirely original characters that distinguish, in adherence or in transgression, the destiny of some of the most representative and emblematic among them.

It would seem that these characters may depend precisely on the "suckers" and on the "roots", that is the propensity of the humanized environment and of the work culture that takes place in the relationship with the "*longue durée*" (like *Annales*), underlining once again the relative autonomy of architecture and of composition (Guido Canella 1969), but also suggesting the way to complete its "knowledge". An architecture of the city that is capable, precisely, of bringing that "knowledge", when it is considered "behavioral" architecture, which we believe must be the basic philosophy and ultimate goal filtered into the project and into the construction.

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[1]The Carro di Tespi (or Pavilion) were mobile theaters built with covered wooden structures used by the comedians of the popular Italian nomad theater for their street theater, starting from the late Nineteenth century. They were mounted "on the town square" and remained set up for 40/50 days during which the companies of the "guitti" wanderers recited a different script night after night, exhausting completely their repertoire. They owe their name to the mythical figure of the theatrical actor Tespi d'Icaria, described by Horace in the *Ars poetica* and were anchored to the idea of a mass theater with a strong emotional impact and capable of conveying theatrical culture to forgotten sections of the population. The fascist regime used this experience to build an outdoor traveling theater in 1929.

[2]For a constructive intervention strategy by parts in the polycentric city: "*Saggiare polloni e radici fino a costruircene nuova etnia*". Title of the famous essay by Lucio Stellario d'Angiolini published in "Hinterland" n. 4, *For a metropolitan museum*, monographic number dedicated to the museum, July–August 1978, pp. 50–54.

And it would not seem on the other hand, still generalizing, to contradict this hypothesis with the appropriate differentiation between capital cities, military cities, trade fair cities, ration cities, etc. These non-ordinary, genuine characteristics of Italian cities, superimposed on the "structural facts" that have conditioned their development, would seem to be the expression of a whole culture, even if specific point to point. What then could be a *minimum* common denominator that can confirm the belonging of these cities to that level of merit that is attributed to the "boroughs of Italy" and that can condition the project of the "modern"?

It could be, for instance, a geographical factor, which is declined at first in the great Italian cities[3] divided, for example, by climatic bands (north, south, but also coast, countryside, mountain); or for medium and small cities it could be the effect of irradiating the characters of the same major cities of reference on the territory and the other way around. Characters that combine and recombine with different degrees of intensity and elaboration to create a "skein" whose in-depth and punctual deciphering is decisive for understanding the true nature of every Italian city.

However, it seems to be the so-called second and third order poles, precisely the "boroughs", that contain in their genetic heritage—typological and figurative but also urbanistic-morphological—that clarity and transparency of "behavioral" intentions that it seemed to have been reached with the medieval construction of the primary space (the town square) of the compact city in a system however "polycentric", that of the "boroughs of Italy".[4]

We could therefore be led to suppose that the structuring factor for excellence is represented by the *agorà*, understood as an assembly[5] and by its permanent surrogate, the public school, considering the epistemological question and the academic political-cultural distinction.

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[3]Among the "big" names, the cases of Venice, Rome and Florence are memorable, but also those of Milan, Turin, Genoa, Naples, Palermo and of the others, which have become such since the realization of central quarters surrounding the square of the government, of the ritual and of the exchange, generally in the Middle Ages, up to the construction of the so-called "historical periphery" (this is the term-concept with which Guido Canella used to define the first suburb of Milan, the productive one, which seems to have been able to express its own original "character" since its formation), at times capable of relating to the countryside in a fruitful relationship of reciprocal regeneration, prevailing a physiocratic conception *ante litteram*, but at times also a reservoir of that workforce capable of sustaining and reviving the fortunes of the city itself, this, on the other hand, belonging more specifically to the modern era.

[4]Pisa, Siena, Lucca, Verona, etc.—considering its consolidated historical centers with only the adjacencies of the "historical periphery", omitting the opportunistic and troubled expansion of the second half of the twentieth century—, but also for example Syracuse, naturally considering only the island of Ortigia with the adjacency of the neighborhood and the port on the inland sea.

[5]Ultimately by the "school of Athens", understanding as a representation of the seven liberal arts: grammar, arithmetic, music, geometry, astronomy, rhetoric, dialectic.

For a didactic offer that is coherent in a renewed global course of studies that are truly "of the *futuribles*"[6]—in the context of the Italian public school of every order and degree—a role that seems to us to be decisive should be covered by the instruction given by the universities, as well as by the research that is carried out within them in the name of them. But we are obliged to acknowledge that the didactic offer presented to university students doesn't follow a coherent academic organizational program, even if we consider a new faculty and the implicit epistemological and methodological assumptions.

Therefore, a possible new direction for a degree course today should inevitably be placed in coherence with a general reference assumption (perhaps incorporated as *stigmata* of the same faculty), with the sense of belonging to a critical thought.

Nevertheless, belonging to that partisanship that is consistent with the assumption, we are trying to introduce into the debate to circumscribe and define a "problematic and operational"[7] approach to knowledge, aimed at forming critical intellectuals and not just specialists or professionals with a trade.[8]

The coordinated professors within this new direction, beyond possible differences for cultural positions, would necessarily be united by the same "holistic" conception of reality, by virtue of which the approach to knowledge can be global, dialectical and historical, in total antithesis with that of ontological and methodological individualism, or "Robinsonian".[9]

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[6]"Città dei futuribili", an architectural column curated by Guido Canella, which appeared from 1968 to 1970 on "Il Confronto", a magazine on politics and culture, in which appear the first critical writings by Guido Canella and his friends M. Achilli, G. Polesello, A. Rossi, F. Tentori and others.

[7]This term-concept defines the modalities of teaching developed by the research group "Architecture and City" coordinated by Guido Canella and Lucio Stellario D'Angiolini in the Faculty of Architecture of the Polytechnic of Milan from the Sixties of the last century.

[8]The experience of "field research" therefore seems to be the only cognitive approach that, on the one hand, allows an authentic contact with reality and an accelerated scientific education—creating among students interest in an unprejudiced study of the chosen problems and the need to corroborate it through direct relationships with the operators involved—and, on the other hand, allows a partialization of theories without necessarily renouncing organic conceptual relationships. The cultural project would be proposed as an "activity project"—in view of a critically assumed structure framework, in function of a policy of interventions capable of affecting the nature of the development of cultural and productive forces, their organization throughout the territory and the expectation generated by society, in the search of a new culture-civilization—and not as a mere expression of a good "scholarly" attitude and an involvement in the standards of the discipline. And never less as a tool of neoliberalism that is dominant today, functional to the needs of the market, guaranteeing an operational flexibility that the timely satisfaction of particular interests would demand from time to time.

[9]Here understood as "individualism" in the sense given by Marx in the following essay: Karl Marx, *Formen, die der kapitalistischen Produktion vorhergehen* (1858), Dietz Verlag, Berlin, 1952.

Learning in this way could express itself in maximum awareness as a dialectic expression of a historically determined civilization. By virtue of an adequate ability to interpret the needs of society, it would be able to stand out on the identity of the European (and of the world) city and on those of the historical and problematic essence of its disciplinary heritage, escaping from a notion of cultural project which today is increasingly equated with the pursuit of the vogue too often claimed in the global market of postmodernist culture.

If we become aware of the underlying gnoseological and epistemological discriminating factor, perhaps the spaces intended for education should be reformulated in reverse order: from the configuration of a university to the possible configuration of a school complex that includes high school, passing through middle school, to end with primary school and kindergarten, where the configuration of a middle school would have a dominant role, as Giuseppe Samonà had already underlined back in the 1960s: "*It is likely that in the future there will be large localizations of educational establishments of middle schools that will be much more significant than (the) universities, because in them the intelligences will mature and a very lively social life will be formed.*"

So it could be said that, by filiation, the school, considered as a functional and figural device, should present that same typological "icasticity" and that predisposition towards the central role of the "behaviors" of the space of life, if not universal, of the center—church-palace-square—of the "boroughs of Italy". Those same behaviors that are necessary for the learner to build their own critical intelligence corroborated by the juxtaposition of preparatory spaces delegated to their formation.

The research for a new way of child and of adolescent education based on "doing", able to put the student at the center as an actor and not just as a user of their development, a new "Montessorian spring"[10] (Fig. 1) seems to be a viable way within a *scenario* that appears to be completely fluid. To achieve these goals today the school should radically transform and renew itself, with an "ontological-social"[11] attitude, into a "school-laboratory" made up of different *ateliers*, special rooms aggregated around a space that we could define as a "library" or as a town square "forum *scentiam*-forum of knowledge", where children can carry out appropriate activities and become aware of the cognitive problems to be deepened through the aid of books

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[10]According to Maria Montessori—and according to Friedrich Fröbel, Rosa and Carolina Agazzi, but also according to Giuseppina Pizzigoni, Rudolf Steiner and others—school education should have overcome the division between theory and practice and favor a critical learning method based on direct and concrete experience.

[11]See the essays on the subject by Georg Lukács and Costanzo Preve.

Fig. 1 Phototypesetting for the presentation of the project references. E. Beaudouin, M. Lods, *École en plein air*, Suresnes, Paris 1932–35; «Hinterland» directed by G. Canella, n. 17, 1981 and n. 3, 1978, dedicated to the subject of education; G. Folli, *Open air school in the Trotter*, Milan, 1918–1927; R. Steiner, *First Goetheanum*, Dornach, 1908–25; «Casabella-Continuità» directed by E. N. Rogers, n. 249, 1961 and n. 245, 1960, dedicated to the subject of school; T. Crosby, *Shakespeare's Globe Theatre*, London 1997; G. Canella, P. Bonaretti, *Technical Institute Giambattista Bodoni*, Parma 1985; G. Canella, *Service Center Piazza Monte d'Ago Quarter*, Passo di Varano, Ancona 1984; A. Belloni, *Primary School Rinnovata Pizzigoni*, Milan 1924–27

and, above all, learn the art of permanent assembly as a form of culture-civilization.[12]

The project[13] involves the prefabrication of a medium-sized structure, a "special" classroom to be placed in the courtyards of public schools of every order and degree that requests it, typologically preordained for those special operating activities that the teaching requires, when it wants to have the features and characteristics of a "problematic and operating" approach.

We are naturally favoring the atavistic distinction that there is between the work of industrial design—dominated by practicality as a form of knowledge induced by the dominant traction of ergonomics applied to the "object of use"—and the work of architecture—pervaded by practicability as a form of knowledge induced by the dominant traction of the typology applied to the public building for the city. It has been difficult for us to find away to identify "knowledge" in the structuring "composition" process that has characterized this research on prefabrication as an architectural product of a work that otherwise could be attributable to the design of the "object of use". Thus it is uprooted from any "allocation context", while still abstracting from the practice of reconstruction, imitation or anastylosis and evoking instead, in the construction of this prefabricated humanized environment, a tendential "approach by figures".

The theme is therefore the search for the possible conformation of a reversible pavilion that can be inserted in the courtyards of the degraded and typologically insufficient public school complexes, but also for the reuse of the "mother houses", typical of the irrigated countryside farmhouses, and also for the restoration of town squares in places damaged by the earthquakes, as the primary nucleus of experimental teaching.

The project requires the constructive completion of a school complex in the outskirts of Milan,[14] located at the intersection of two waterways, the Naviglio Grande canal and the Lambro river, characteristics that make it a microcosm, but unfortunately "wounded boroughs" hit by degradation and neglect, and characterized by instances of superfetation that have over time altered and mutilated their practicability (Fig. 2).

We therefore chose a planning strategy that envisaged the re-triggering of the endemic territorial polycentrism which, as always, also involved the small Italian cities, the so-called "boroughs", and thus, by extension, the foundation cities, the additions of parts of cities, the quarters and "formally completed parts of cities".[15]

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[12]The content of teaching has always been the study of human activities placed critically within a new mode of development—alternative to that of globalization or of generalized, polarized and financialized oligopolies, as Samir Amin calls them (in a recent essay later formalized in 2012 in the text *The Crisis*)—in the hypothesis of a coexistence of the capitalist system and the socialist system, trying to overcome the seasons of capitalism that have alternated as follows: competitive capitalism, oligopolies and monopolies, organization of the transnational network.

[13]Developed in collaboration with the M2B Medie Montessori Association and conceived by its co-founder Andrea Perugini.

[14]The Ilaria Alpi State Comprehensive Institute in Via San Colombano.

[15]Carlo Aymonino used to denounce the relationship that his architecture establishes with the city.
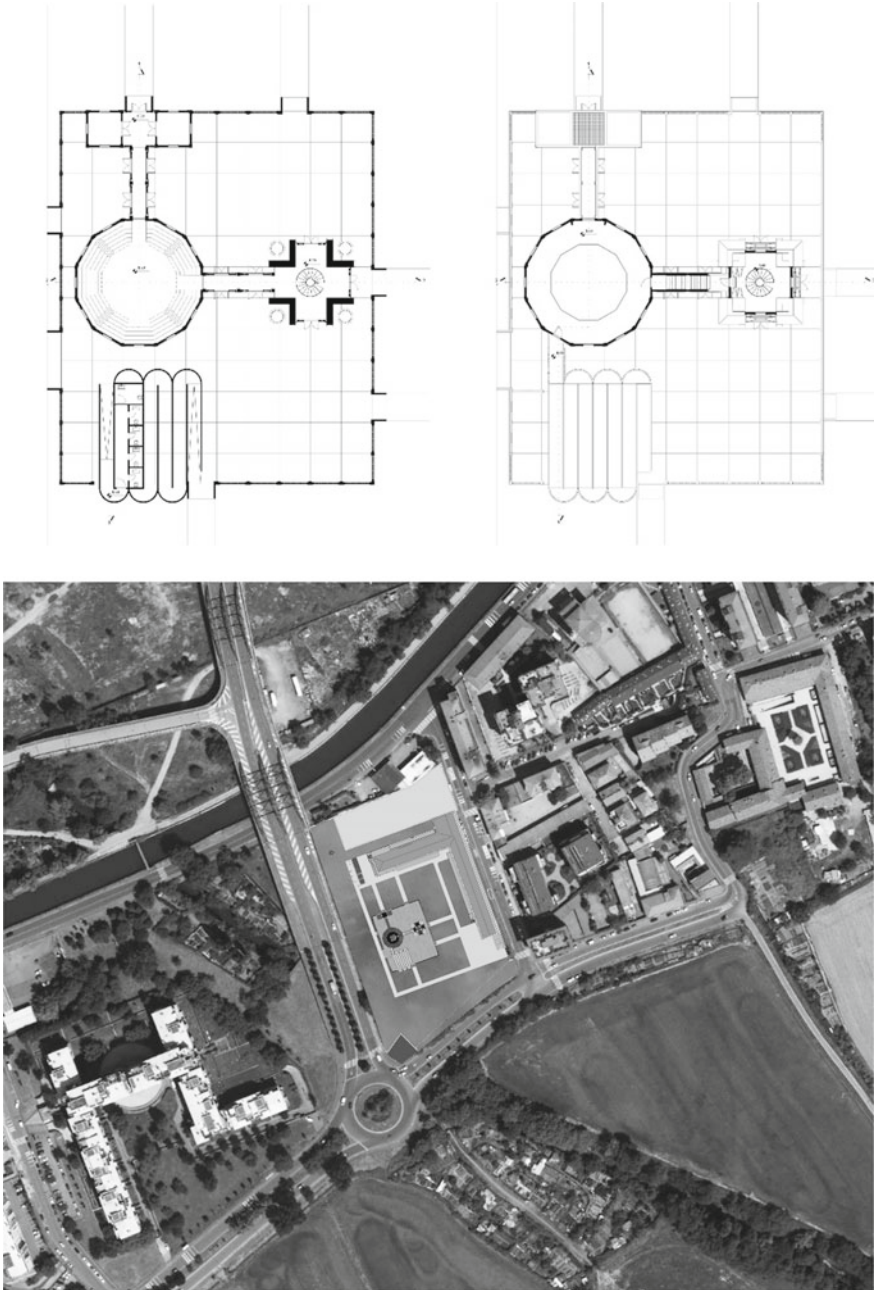
Fig. 2 **The pavilion "Carro di Tespi"**. Ground floor plan, First floor plan, Masterplan

The pavilion, "Carro di Tespi", is envisaged as prefabricated with laminated wooden structures and floors, and vertical infill walls in sandwich panels complete with building services and insulations, such as x-lam system. The panels are uniform, modular, square of three meters side, self-supporting and interchangeable, with three finishing solutions, so as to allow the construction of different sequences of "reversible" aggregation spaces, so to speak "in palimpsest". For the reconstruction hypothesis, therefore, the research has provided for the maintenance of the original building, a work that would seem part of that eclecticism "of manner" of Milan ("Novecento" style without frills and tinsel) which, in the complicity of some architects dedicated to the construction of the city of the 1930s, it prefers a relationship with the context, not directly from a geographical point of view, nor from an exclusively historical point of view and not even from a purely linguistic point of view, but from a more general point of view of "evocation" (Figs. 3 and 4).[16] The concept of "evocation" that these architects of the "Novecento" style seem to be transplanting for a criterion of assimilability that can be defined "of distance in absence" and "of temporal detachment" with respect to the chosen models, and it seems sublimated in their poetics. This concept can also be, for example, an alternative to other decisive experiences that have involved similar "boroughs" of northern Italy, which are prerogative of enlightened entrepreneurs (like Adriano Olivetti in Ivrea) who were able to operate in those same years through the wise planning and construction of the already industrial suburbs.

This practice of "evocation", in the case of the school on Via San Colombano, seems to be an appropriate path to conform to, in the act of composing "by figures", not so differently, on the other hand, from what Leonardo da Vinci undertook proposing for Milan—city for which the most original proposals were made over time, even though they have almost always been betrayed—the project of placement of his "giant" equestrian sculpture, which should have been allocated either in the Sforza internal courtyard (the *Rocchetta*) of the *Castello Sforzesco* or in the transplantation of the "Square of Central Italian tradition" newly formed in front of the Castle itself.

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[16]This attitude is more appropriately reminiscent of Central Italy, where it would seem that these same architects received assignments from various institutions, even "total" (Army, Ministry of Education but also the Vatican, for the construction of prisons, schools, asylums, hospitals, churches, orphanages), not only for the attraction exercised by the "*Urbe*", the capital, but perhaps more as compensation to those common "rebels" and "secessionists" of the belt of Rome, because of the mutilated regional membership (the "secession" from the Lazio Region). These same architects would seem to operate through a series of institutional "grafts", according to a practice of "evocation" of the ancient place of the decentralized government out of town, which brought "municipality" into the "*ager centuriato*", countryside.
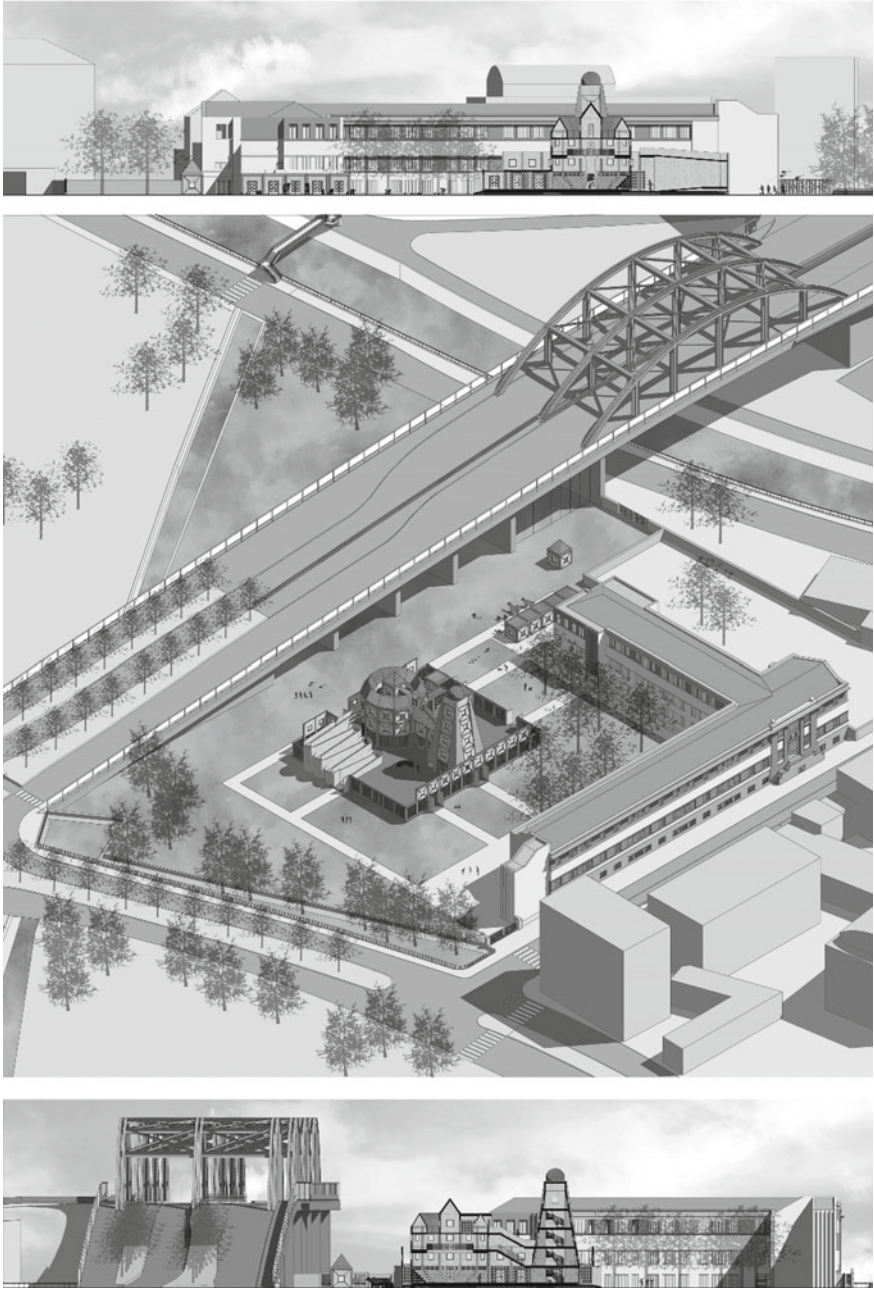
Fig. 3 The pavilion "Carro di Tespi". Longitudinal section, General view, Cross section

Fig. 4 The pavilion "Carro di Tespi". Front elevation east, Photographic insertion of the project in the Ilaria Alpi school, Front elevation north–west. (For all the images, rights are reserved for authors.)

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