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Rehabilitation of School Buildings in Portugal: an articulation between different pedagogic dimensions

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Abstract: The present article develops considering a strategy of intervention on Portuguese public school buildings. Intervening exclusively on preexisting (school) buildings, this methodology proposes the survival of school heritage, which was degraded and obsolete, renovating the structure, infrastructuring the spaces, and, mainly, modernizing the performance, especially with the introduction of an ideal of informal education. The convocation of the learning street concept constituted one of the significant inputs for the implementation of new learning and socialization spaces, affirming an identity intrinsically correlated with inclusion and cultural pluralism. The school institution, as a public entity, should provide the insertion and adaptation of new spaces, fostering accessible activities to the community.

Overcoming the intrinsic condition that correlates school and pedagogical curriculum, it intended to develop other pedagogical dimensions, affirmed in this context of the school architecture rehabilitation, from the pedagogy in the attitude of rehabilitation, the pedagogy of inclusivity, the pedagogy of participation and commitment between the various actors and agents of the community and, finally, the pedagogy from the rehabilitation of building on a systemic and structured program. In this sense, the school is refounded on the buildings of the past, reinventing itself for contemporaneity, based on social and pedagogical values.

Key words: School Architecture; Rehabilitate; Pedagogical expression; Multidisciplinary; Social.

1. Introduction

This article summons the recent *Programa de Modernização das Escolas destinadas ao Ensino Secundário* (PMEES) [1] [2], developed since 2007, by the Portuguese government, with implementation by *Parque Escolar E.P.E.* [1] and, in particular, the *ESCOLAS: Complexidade e Interpretação*[2] research project, which, considering a universe of 74 schools located in the north of Portugal, aims to analyze, understand and disseminate the pedagogical, multidisciplinary and multicultural aspects of that process.

[1] The *Parque Escolar E.P.E.* was created on February 21, 2007 (Decreto-Lei n.º 41/2007), as a company with administrative, financial and patrimonial autonomy, with the mission of developing and implementing the PMEES, and managing the school heritage for a period of 30 years.

[2] The *ESCOLAS: Complexidade e Interpretação* research project is under development at the *Faculty of Architecture of the University of Porto* (FAUP), being hosted at the *Center for Studies in Architecture and Urbanism* (CEAU), since January 2019. Coordination is ensured by researcher André Santos, integrating the team, a set of students from MIArq. The program can be consulted at https://sigarra.up.pt/faup/pt/NOTICIAS_GERAL.VER_NOTICIA?p_nr=51102.

As a whole, and regardless of the era or typology, Portuguese school buildings constitute a valuable heritage, cultural and social legacy that must be preserved, sustained, and modernized. Keeping as a background the architecture as a spatial structure that materializes the functional and symbolic conditions of the school institution, the methodology of this investigation is revealed in the expansion of the disciplinary field of architecture, summoning different knowledge to incorporate in the recognition of architectures the insights and sensitivities of other disciplinary areas. In this context, the pedagogical dimension assumes a natural and purposeful protagonism.

Within the scope of this approach, and while considering the theme of multidisciplinary, it was considered opportune to summon the dimension of pedagogical ideals in its various aspects, choosing and developing four of its senses.

i) right away, affirming the strategy and attitude which, centered on the exclusive intervention on pre-existing buildings, affirms an operative (and socially pedagogical) condition of the original constructions, that become carriers of heritage and cultural value, regardless of more or less singular architectural characteristics. In this way, the survival of these buildings is guaranteed, reinventing, and innovating for the future, based on a process of creation and consolidation of value that reinforces an identity sense. In fact, and as a policy for the management of buildings under the responsibility of the State, this Program is witnessing a complete inversion of the paradigm in the culture of construction, that is, easing the aspiration and the consequent practices of demolition to construct, in the same site, another building from scratch;

ii) In parallel, "… *when at the same school came, in increasingly greater numbers, individuals from different classes, ethnicities, creeds and family structures*…" [3], the institution shows more notoriously levels of inadequacy and obsolescence. In this sense, in modernization interventions, it has become essential to ensure conditions for effective democracy and universality capable of meeting, and respond positively to cultural and social diversity, encouraging interpersonal and spatial dialogue. The consideration of the opportunity to incorporate a diversity of spaces that transcend the traditional classroom, and assert them as inducers of less formal learning, inspired by the spatial and functional solution of the *learning street*[3], that was implemented in the schools of Maria Montessori[4] by the architect Herman Hertzberger[5], contributes decisively to a greater social integration and cultural pluralism, in the affirmation of an inclusive ideal. "*The classrooms (…) are conceived as autonomous units, small homes (…), since they are all located along the school hall, like a community street.*" [4];

iii) complementarily, it is important to foment the awareness of the school institution as a democratic and universal space in which intervene, in addition to the school community, a set of disciplinary areas and

[3] In the context of the PMEES, the concept of *learning street* is assumed as a spatial structure that aims to promote the agglutination of the dispersion of the various school buildings, and to articulate a set of functions of a collective and social character (library, auditorium, multipurpose room, cafeteria, shop), as well as providing spatial conditions for diverse activities, where informal learning takes on the main guiding line.

[4] Maria Montessori (1870-1952) was an Italian doctor and educator trained at *Sapienza Università di Roma* (1896). She developed experiences and proposals for pedagogical philosophies based on a human development model through interactions with the environment, to explore the innate capacity that children have for cognitive development. Based on its ideals, Montessori's pedagogical method was widely disseminated during the 20th century, with materialization in learning spaces that benefit children's accessibility, autonomy, and freedom.

[5] Herman Hetzberger (1932) is an architect who graduated from *Delft University of Technology*, in the Netherlands (1958). His works include the Montessori school, Delft (1966-70), the Central workshops building Beheer, Apeldoorn (1972), and the Chassé Theater, Brada (1995).

knowledge that summons the politics, the pedagogy, the culture, the society, the business sector, among others, and it becomes essential and decisive to invite to participate in the debate on the transformation and evolution of the school space. For the first time in the history of the management of public buildings in Portugal, PMEES has established itself as a participatory process, congregating multiple contributions, which, in addition to interdisciplinary enrichment, has also allowed the promotion of levels of complicity and responsibility of each of the actors intervening and interested in the school space. This condition proved to be essential to ensure both a sense of belonging and a commitment;

iv) finally, the innovative quality of the Program, as a strategy for the rehabilitation of school heritage, ensures the functional and social conditions of buildings, renews the attractiveness of architecture, incorporates technological requirements that aim to increase environmental quality, sustainability and safety, asserting itself as a reference pedagogical input for the structured rehabilitation of public buildings, regardless of their programmatic or territorial condition, which is stated as a model that can be replicated in the management of other public management programs for the building. [5].

In this context, it is argued that the intervention to which secondary schools were subjected, constitutes an exemplary case of rehabilitation of school architecture, but also of the cultural condition whose diversity and plurality is expressed in the affirmation of identity values. The declaration of individuality to which architecture responds, whether concerning each of the educational projects, with the different communities, or the specificities of the urban models that contextualize it, assertively defends diversity and plurality. The expression of multiculturalism asserts itself as a demand for a *new type of school* to which its openness to the community contributes, fomenting cultural, civic, and social activities, with the plural and universal condition being declaredly enhanced for contributing "*… decisively to reduce school inequality, raising the quality standards of buildings (...), regardless of their location and the characteristics of the space in which they operate.* " [6]. In addition, the (re)construction of school architectures suitable for the future, and the multiculturalism that the school institution undertakes, focus on the preponderance of those pedagogical values that architecture conducts and incorporates.

And the conviction that architecture matters places the ambition to refocus its essence, or reason, on the human and social dimension. The school space is, by nature, the one that acquires the greatest importance in the human and social development of each individual, representing the most persistent experience of living with other individuals and, complementarily, with spaces. It is also from this context that the increase in the pedagogical condition of architecture is recognized and defended.

2. School buildings, a heritage legacy

2.1 Architecture and pedagogical expression

"There are those who say that the architect who designs a school building takes on the responsibilities of a pedagogue, such that the good or bad functioning of a teaching house depends on the architectural layout of its facilities." [7]

Fig. 1 ***Conde de Ferreira school,*** **Lagos, inaugured in august 23rd, 1868.**

In Portugal, the *Conde de Ferreira primary schools*, with a project from 1866 [8], were the first buildings built in *series* and from scratch [6], exclusively for the school function (Fig. 1), marking the beginning of a long process in which architects, and especially architecture, played an important role in the teaching-learning process [7], standing *"... how the spatial properties of school buildings can incorporate the contemporary educational curriculum and can function as a social, cultural, and informational interface, that is, how space can be effectively used as a pedagogical tool."* [9]. The house of knowledge, and where knowledge is transmitted was, throughout the history of the school building, assuming an image, more precisely an identity that, connoting it with the values of the public education institution, promoted a sense of respectability, dignity and social recognition, expanding the pedagogical value of architecture, since *"... physical space is a fundamental part of children's learning since it can be considered a third educator, as it offers a series of possibilities by inviting and instigating children to explore it."* [10].

In alignment with the contemporary thinking of some authors, we can defend that architecture, the different architectures of the school space, correspond and identify the different pedagogical models, drawing together two timelines in which architecture and pedagogy intertwine in an evolution of identity and complicity. That is, in some way, architecture takes on the face of the different pedagogical models, implemented throughout the history of education: *"The school space must be (...), a clear expression (...) of the achievements of pedagogy."* [12]. "*We look at the buildings, the walls, the furniture. We sensed the life that passed through these spaces, the people who inhabited them, everything that was accomplished here and everything that remained to be accomplished. We analyzed the layout of rooms and desks, checked teaching practices, learned different pedagogies.*" [13].

In the context of the Portuguese educational tradition, the classroom assumes the basic condition for teaching. From spatial organization, concerning the rigid disposition of the students and the teacher, to the furniture, in particular to the desks and the platform that elevates the teacher, affirming his control position, the static model of exposure carries an austere environment, whose symbolism was, for a long time, reinforced by elements such as the flag and the cross, inherited by a tradition fed for a long period by the conservative and oppressive ideas that marked the Portuguese political and educational reality.

Fig. 2 The traditional classroom organizes their occupation and dynamics in a relatively unidirectional and rigid manner, invoking the concept of staticness,

Even though the classroom has been leading a certain resilience to change, maintaining its spatial and functional stability, more recently, developments on pedagogical models invited architecture to investigate and propose solutions that would allow to overcome that hegemony of the classroom., defending that *"... the learning spaces must be reconfigured to support changes in the social context of education and respond to different teaching and learning practices, as well as*

[6] 91 schools of this type were built throughout the national territory.

[7] It should also be noted that, in Portugal, the first legal diploma related to the school space, also dates from 1866, concerning the rules of construction of school for elementary education, including the characterization of its furniture. [11].

to a more decentralized learning process, which is no longer exclusively restricted to the space and time of the classroom." [14], making evident the indispensability of guaranteeing an effective spatial diversity. In this sense, and with a view to a suitable school for the future, it is assumed that *"... to meet the needs of different learning models and individualized learning, schools must provide a wide variety of spaces*." [15].

The moment of the paradigm shift, in which, in these circumstances, there is an opportunity to update and modernize teaching spaces, to accompany an evolution that is wanted at all levels of society, in sustaining the country in infrastructural and comfort standards, but also concerning the international contemporary ideology and practices, is marked to a large extent by the discussion about the classroom space, in contradiction of this limiting stability of the teaching-learning processes. In this regard, it is considered that *"... it will be in this domain, in the design of the classroom, that new technologies may have greater impact. However, this design can only be interesting when the use of communication and information systems is associated with a reinvention of practice and teaching methods*" [16]. Still regarding this issue, adaptation to new pedagogical ideals - also driven, in a process that is, as we have seen, of reciprocity, through architectural argumentation - is argued that *"... school buildings must be designed in the perspective of diversification and versatility of solutions: each school must have its own character and all must have the capacity to monitor (...) the evolution of pedagogical practices and curricula and fluctuations in demand."* [17].

If in the domain of interior spatial composition, the relationship between the teaching model and the materialization of the classroom space (Fig. 2) becomes absolutely notorious, also the conformation and the image conveyed from the outside, allows to accentuate that sense of commitment between architecture and pedagogy.

"Architecture shapes, renews, determines, and modifies pedagogy. Space is not a context, it is a key player: organizing a space means organizing a metaphor of knowledge, an image of how we know and learn" [18].

In the process of rehabilitation and modernization of school facilities, the concern for preserving the identity of each school was safeguarded. If this programmatic ambition takes center stage in the projects of schools of high patrimonial value, in which the connection to the urban space and the cultural and social connection that each school establishes with society has been recovered, this role assumes an even greater value in the schools where the social protagonism was minimal, due to the weak connection to the urban fabric and the low architectural, constructive and expressive quality. Here, architecture has taken on the responsibility of creating, almost entirely, an image capable of projecting the identity of the school institution and of refocusing it on the urban fabric, for an effective integration in societies, defending the *"... image of the school as a place for affirming personality and social integration* " [19].

It is from these considerations that we assume the statement that *"... architecture is pedagogical. Architecture for education becomes art only when architecture itself teaches; when the elements of the design highlight concepts in all disciplines, forming an environmental curriculum; when the school facility meets the greatest aspirations of the architectural profession; and when a school is endowed with beauty and imagination*." [20].

In this sense, for an effective renewal of both the educational program the teaching-learning methods, as well as the programs that define transformation through rehabilitation and expansion through construction of the Portuguese school universe, it is of utmost importance to take into account that *"... space also educates… "*[21].

In summary, it becomes clear that the education space incorporates two dimensions, and two distinct

scientific areas (space and education), which do not allow each other to live without being based on a dialectic of strong commitment and mutual understanding, collaborating for the affirmation of a common objective, defending that "… *architecture is born from a form of pedagogical thinking and pedagogy takes into account the vital experience of the architectural space.*" [22].

2.2 School architecture and the normalization paradigm

"The normalization systems and the processes leading to standardization procedures are so present in the functional group destined for teaching that it allows the construction of a narrative reading of the evolution of the school building. Indeed, the history of the evolution of the school building in Portugal is closely related to that of standardization ideals and normalization processes. Whether in terms of defining programmatic objectives or defining aspects of spatial characteristics, either in terms of procedures and methods or in terms of the constructive materialization of buildings." [23].

In this sense, the factors and characteristics that result from a strategy of normalization and the application of standardization ideals are decisive for the construction of a coherent and identity image and, in particular, for the intensification of that correlation between architecture and pedagogy. In fact, the history of the school building in Portugal is inseparable from the ideals of normalization, standardization, and typification. As will be seen, most of the buildings constructed since 1866 and until the end of the 1980s, mostly correspond to examples resulting from standard programs, standard projects, pilot schools, or standard schools, emphasizing the normalizing principles that guide the construction of the national school space.

Reasons of an emergent nature, recurrently associated with greater financial conditioning, made the school function a consequence of that attitude. It should be remembered that throughout history, the construction of buildings for public education has been determined by a succession of moments, some of them called *Plan* [8], developing without an apparent sequence nor in perfect continuity. Indeed, political conduct was imposing a diversity of episodic and discontinuous moments that, taken as a whole, determined the current legacy of school buildings.

"Due to the ignorance of the conditions that must be attached to the buildings destined to primary education schools, it is rare the one, (...) in which some of the most important principles of the school architecture have not been missed. In several countries, plants have been erected to serve as a model for constructions of this kind, but everywhere there is a harmful tendency to restrict drawings in the work process, and, for this reason, the rules of art are almost always sacrificed to considerations of an economy that is sometimes petty and always misunderstood. (...) What would be convenient if the matter was already laid down in regulations, is a need whose remedy cannot be postponed any longer" [11].

After several decades of this first statement, the condition has not changed substantially, verifying that "… in the context of the conceptual definition, from the use of a standard project for the construction of *Conde de Ferreira primary schools* to Adães Bermudes schools, the *Plano dos Centenários* and finally to the *P3 Project*, there are several examples that fill the history of school buildings for the first levels of education. " [23], a condition that would extend to lyceums, and later technical school buildings, culminating in the maximized expression of buildings of a pavilion nature, with the standard project of 3x3 schools.

[8] The various plans have succeeded each other over time, such as the *Plano dos Centenários*; *the Programa de construções, ampliação e melhoramentos de edifícios liceais* (Plan of 38); the *Plano de construção de escolas técnicas para o ensino industrial, comercial e agrícola* (Plan of 47) and the *Plano de construção de novos liceus* (Plan of 58).

2.3 School architecture and building typification

Given the nature of the intervention of *Parque Escolar*, that focus only on preexisting buildings, it became important to analyze the entire universe of intervention to assimilate and understand the typological and constructive diversity, to be able to shape the Program so that it could respond to structural, spatial and functional needs of all schools.

"In their urbanistic relationship with the city, these lyceums are clearly born within a new urbanistic logic, which locates the equipment in areas of controlled expansion of the city, functioning as elements capable of generating urbanity." [24].

After a long period in which teaching was not conveyed to a specific space, the liberalization that the French revolution brought transformed this reality, making teaching autonomous by creating spaces suitable for pedagogical practice. The lyceum in Portugal was created in 1836[9], a period after which schools were created in all district capitals, installed in preexisting buildings, left empty after the expulsion of religious orders from the country [10].

In a fast process in which the school building gained importance and impact in the urban fabric of cities and representativeness, *"... at the beginning of the 20th century, the identification of the school building as an autonomous public equipment is completely established."* [25].

In this context, the first buildings built from scratch for the practice of teaching activities only appeared in the early twentieth century. These buildings are found in areas of great importance in the city map, usually occupying the entire block, as is the case of *D. Manuel II lyceum*, where today stands the *Rodrigues de Freitas secondary school*, in Porto (Fig. 3).

Fig. 3 ***D. Manuel II lyceum*** **(*Rodrigues de Freitas secondary school*), Porto.**

These buildings are indebted to the French *lycée* model, with compositions inherited by the conventual models, structured around patios, with high hygienic concerns, endowing the spaces with ventilation and sun exposure mechanisms to enhance comfort. Additionally, and so that the building assumed its central role in the social life of the city, the façade imposes itself in a composition marked by rationality and monumentality [23].

The history of the Portuguese school comes to know a new important milestone in 1938[11], when after a period of some political and ideological uncertainty, and therefore, of greater creative freedom, the *Estado Novo* [12] regime promoted a new plan for the construction of lyceums, whose "... *projects start to be developed by the city's technical staff, abandoning direct delivery and the tendering system, which guarantees, on the one hand, great technical competence in the management of the program and construction and, on the other hand, a controlled formal unity*" [26].

[9] The creation of secondary education in Portugal was determined by a Decree of November 17th, 1836 (*Decreto da Instrução Secundária*).

[10] Male religious orders were extinguished in Portugal in 1834, after the end of the Civil War (1832-1834), which dictated the strengthening of liberalism.

[11] The Plan of 38 was created by the *Decreto-Lei nº. 28: 604/38* of April 21st, 1938.

[12] Estado Novo was an authoritarian political regime under which Portugal lived from 1933 until the revolution of April 25th, 1974.

In this period, that "*... essentially reflects two moments of the educational policy of the Estado Novo"* [27], architecture is controlled by the regime's doctrine, investing in a "rationalized image where the principle of symmetry commands the distribution of the functional program", and contradicting the trends of international modernism. The construction system, despite using reinforced concrete in the construction of the slabs, refuses it in the expressiveness of the building, resuming the construction of stone masonry walls, "*... which determines a rigid composition, physical strength, and consequently an austere image*", such as the *Carolina Michaëlis lyceum*, in Porto (Fig. 4) [23].

Fig. 4 ***Carolina Michaëlis lyceum*****, Porto.**

In 1947[13] the technical education was reformed, with the launch of a program for the construction of technical schools, subdivided into industrial and commercial, agricultural, and decorative arts schools. Considering the programmatic specificity of these three types of school, the typologies are quite diverse. This Plan sought to find a strategy for classifying school structures that would allow for cost reduction. The buildings' expression is marked by a sense of rationality and is supported by a mixed construction system, with stone masonry walls and concrete slabs, as illustrated by the *Filipa de Vilhena secondary school*, in Porto (Fig. 5) [23].

[13] The *Plan of 47* was enacted by the *Lei n.º 2:025/47 of June 19th, 1947.*

Fig. 5 ***Filipa de Vilhena secondary school*****, Porto.**

The *Plan of 58*[14] emerges in a context of urban growth in new, disorganized, and still-to-be infrastructured, peripheral areas. Schools were built in hinge areas to contribute to the cohesion of the city distribution. The school, maintaining the principles of composition previously practiced, is based on an organization that uses the contiguity of several built moments that do not assume full autonomy. The buildings constructed under this plan abandon the language previously conveyed by the lyceums of the Plan of 38, oscillating now between evocative approaches to the language of modern architecture, as in *Padre António Vieira lyceum*, in Lisboa, by the architect Ruy Jervis d'Athouguia (Fig. 6), and greater compositional sobriety [23].

Fig. 6 ***Padre António Vieira lyceum*****, Lisboa, architect Ruy Jervis d'Athouguia**

[14] Developed in two periods since 1958, the second phase, starting in 1964, marked the beginning of the participation of OCDE in the development of programs for the construction of in Portugal.

From the 1960s onwards, given the emergency construction of school buildings for secondary education, the design of proposals based on standardization strategies was intensified. Since then, several normalization studies have been developed for the construction of schools composed of several autonomous buildings of a pavilion nature.

Fig. 7 ***Industrial and commercial school of Montijo*****, Montijo.**

The first resulting project of this studies, *Projecto Mercúrio* [15], would start a series of developments that lead to the progressive division of the various programmatic functions into different modular buildings. An example of these structures is the *industrial and commercial school of Montijo* (Fig. 7) [23].

The development of the various standardized studies would be resumed by the standardized study of lyceums[16]. This project would be implemented in the 1970s answering to the needs posed by the increase in years of compulsory education, determined in 1964[17] and stimulated in 1979[18].

The project reaffirms the opportunity for the persistence of the pavilion typology, with a strategy for defragmentation of the school, opting for a composition of independent pavilions related to an outdoor circulation system in a covered gallery, such as it happens in the *national lyceum of Olivais* (current *D. Dinis secondary school*), in Lisboa, by the architect Maria do Carmo Matos (Fig. 8) [23].

Fig. 8 ***National lyceum of Olivais*** **(*D. Dinis secondary school*), Lisboa, architect Maria do Carmo Matos.**

In 1974, due to the need to optimize the means and costs, as well as to provide a massive response to the need to build new schools, the *Programa de Escolas de Pré-Fabricação Mista e Pesada [Mixed and Heavy Prefabrication Schools Program]* emerged, supported by a solution of three types of buildings implanted orthogonally in relation with each other and connected by covered outdoor paths: the main building, which concentrates administrative and social functions, the sports pavilion, and the pavilions destined for classes.

Due to its' particularity, the image of these buildings is specially marked by the construction system, without any major connection with the urban environment, or even with the lot of implantation, as exemplified by *Dr. João Araújo Correia secondary school*, in Peso da Régua (Fig. 9) [23].

[15] Coordinated by the architect Augusto Brandão, the *Projecto Mercúrio [Project Mercury]*, inspired by the space plan set in motion by the United States of America, was launched in 1960.
[16] Coordinated by the architect Maria do Carmo Matos, the *Programa de Escolas de Base Liceal* was launched in 1969.
[17] *Decreto-Lei n.º 45.810/64* of July 9th, 1964, which extends the period of compulsory schooling from 4 to 6 school years.
[18] *Decreto-Lei n.º 539/79* of December 31st, 1979.

Fig. 9 ***Dr. João Araújo Correia secondary school,*** **Peso da Régua.**

In an increasingly intense process of expansion of the national school network, in 1980 the *3x3 Program* [19], appears, which follows the same principles of standardization of pavilion buildings, where the condition of social anonymity is even greater, with buildings apart from the public space, in a situation of independence concerning the urban environment, definitively nullifying the condition that the public school equipment has as an artifact with protagonism and responsibility in shaping the urban space. An example of this Program is the *Inês de Castro secondary school*, in Vila Nova de Gaia (Fig. 10) [23].

Fig. 10 ***Inês de Castro secondary school,*** **Vila Nova de Gaia.**

[19] The *Programa Especial de Execução de Escolas Preparatórias e Secundárias [Special Program for the Execution of Preparatory and Secondary Schools,* or Projet *3x3*, was created by Decreto-Lei n.º 76/80 of April 15th, 1980.

3. Programa de Modernização das Escolas destinadas ao Ensino Secundário (PMEES)

The Programa de Modernização das Escolas destinadas ao Ensino Secundário was implemented in Portugal, following the awareness of the high physical, functional and environmental degradation of existing school buildings. Its adaptation to the new pedagogical and constructive requirements (where the conditions of comfort and safety took on particular importance), made intervention inevitable from a systemic and concerted strategy among the most varied themes, agents, and interests.

3.1 Framework and context

The Programa pursues the perspective of responding to the objectives and guidelines implied by the educational policy of the beginning of the 21st century, aiming at the search for a new identity for the school institution. Considering that the ambition of the new educational and architectural reforms aims to transform schools into *"… attractive, multifunctional, safe, accessible, and inclusive spaces that allow a wide use for people with disabilities and special educational needs, as well as the community in general, in scope of post-employment training activities, cultural and social, or sporting events.* " [28].

In this context, the PMEES aims to act in an integrated manner at three levels: requalification of physical infrastructures; the opening of the school to the community; and the maintenance and management of the buildings after the requalification [1]. At the same time, three guidelines are defined that correspond to the national educational policy objectives, which each school building would have to achieve with the intervention: ensure conditions for schools to operate in a single shift regime; reinforce physical and resource conditions, enabling equitable access to education; finally, the integration and emphasis of vocational education and the certification of competences, ensuring the technical conditions for this.

Due to the awareness of the need to rehabilitate the Portuguese school universe, in deterioration of the construction of totally new buildings, a process of conservation and modernization of pre-existences was implemented, with the objective of reversing the degradation process that was emphasized in the last few years with the lack of maintenance of Portuguese school architecture, developing a *"... management model for the requalification process that would bring together conditions for an effective rehabilitation*." (Fig. 11) [28].

Fig. 11 The degraded state of pre-existing buildings.

At the same time, a sustainable management model is developed and implemented, correlating with the construction of durable solutions in physical, environmental, and functional terms, reducing the cost and maintenance in the medium and long term.

Considering the focus on maximizing the rehabilitation process, by virtue of respecting the patrimonial value, as well as the identity of each school, this prevails as a methodology that was intended to be implemented, without interrupting the good functioning of the teaching activities.

The disqualification present in pre-existing buildings was not only understood by the infrastructural or constructive conditions, but also by the inevitable degradation of the educational space, translating into a spatial-functional reorganization, as a strategy to revitalize the relationship between physical spaces and new pedagogical practices.

3.2 Participatory model

Methodologically, the Program foresees a convergence between the interests of the educational system and the specific needs of each school. In this sense, a participatory process is designed between the various actors involved, promoting and emphasizing the relationship, especially between the school community, the design team and the *Parque Escolar*.

To ensure a participatory process and the involvement of the educational community, procedures, and phases were created in the projects that ensure this communication.

The involvement of management in the process is materialized by the *Plano Estratégico* [20], whose objective is to present the reality of each school and its needs, being characterized as the first phase of the intervention process. In this context, the remaining phases of the project sought to respect the needs and characteristics of each school's educational project.

3.3 Conceptual model

PMEES bets on a school model that is intended to be adapted to the educational project of each school.

The *Conceptual Model* (Fig. 12) is based on three principles: the articulation of different functional groups (formal and informal spaces); the guarantee of conditions for its integrated operation; and the possibility of opening some spaces for the use of the extra-school community.

The relationship between these is enhanced by the concept of learning street, introduced by the architect Herman Hertzberger at the *Montessori School*, in Delft, Holland, in the 1960s, based on the ideals of the architect Maria Montessori. "... the various functional sectors of the school are articulated through a

[20] The *Plano Estratégico [Strategic Plan]* is a document written by the school boards, where they express their objectives, drawing a diagnosis of the situation prior to the intervention, characterizing the functional organization model and finally presenting their strategic guidelines and their spatial needs.

three-dimensional path that constitutes a succession of interior and exterior spaces of diversified valence, related to different situations of formal and informal learning." [28].

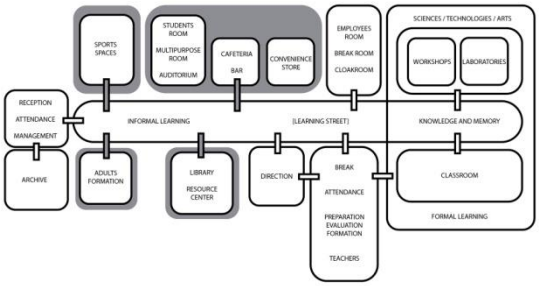

Fig. 12 *Conceptual Model* scheme developed by Parque Escolar.

This structure corroborates the relationship between the different spaces that make up the school, from formal and informal spaces, indoor and outdoor, along a path with different environments associated with the spaces that it aggregates.

In addition to the *Conceptual Model*, *Functional Hierarchization Levels* were defined, affirming an ideal of greater versatility and spatial flexibility, capable of inducing diversified activities to be implemented in the design of new school equipment (Fig. 13).

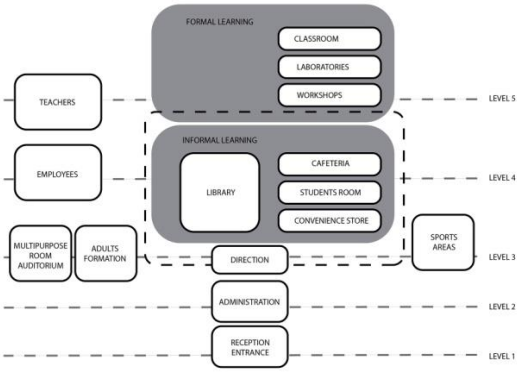

Fig. 13 *Functional Hierarchization Levels* scheme, developed by Parque Escolar

The ambition to expand the didactic space beyond the school community, encouraging a greater socio-cultural, economic dialogue and, above all, with the social context and the urban environment where each school equipment is inserted, stands out in the functional hierarchy, highlighting the social spaces and informal learning spaces as the protagonists of this relationship. We sought to foster and encourage a new culture of knowledge, interaction, sharing of ideas, and experiences.

3.4 Recentering in the urban context

In this context, the approximation of the school to the school community was ensured by the opening of school spaces to society, however the recentering of the building in the urban context was assumed as one of the strategies of the Program, in revitalizing the image of the school before the city (Fig . 14).

Fig. 14 The structural character of school buildings in the urban context as a motivator and transformer of society.

Considering the relationship that the school building establishes with the urban context, it became essential that the interventions assume the aim of reversing the successive degradation of this relationship, evident in the buildings prior to the intervention.

This approach, aimed at the redignification of the school as a public entity at the service of the instruction of society, and consequently of its buildings, as symbols of this condition and value. The positioning of buildings in the fabric of the city, being one of the most relevant issues in the reaffirmation of the school institution, has become a requirement for contemporary intervention to revitalize its structuring position and influence the evolution and transformation of the city.

Therefore, it is important to emphasize and recognize that the attitude of rehabilitation of pre-existing buildings favors this condition, insofar as it restores the social and cultural responsibility of the school building in urban consolidation.

3.5 Intervention on existing buildings and identity

The Program is based on a strategy for the rehabilitation of pre-existing buildings, even advising that around 80% of the buildings be used in each of the schools. Motivated mainly by an operational reason, the maintenance of the place, that is, to intervene on the same school lot, allowed to shorten the process, since it would be inconsequential and inoperative to build in a different lot. For administrative and financial reasons, but also (and above all), because schools are in a consolidated urban fabric, the possibility of finding available spaces in a size consistent with the required for school premises was compromised. Thereby, a transformation process is ensured, in which the pre-existing buildings take center stage in the process of their adaptation.

The ambition of preserving the identity of each school is an intrinsic condition of the Program, aiming to articulate the maintenance of the building's characteristic elements in the compatibility and incorporation of the current requirements. Therefore, it is possible to understand the preponderant role that pre-existing schools assume, since, regardless of their intrinsic patrimonial value, both architectural and constructive, a greater and broader sense of understanding heritage is called for, embracing social and cultural values of relationship with the communities in which each of the schools operates.

3.6 Legislation and infrastructure

The development of the *Program* is, due to its temporal proximity with the entry of new regulatory provisions, the key moment for experimenting and introducing new constructive paradigms.

Its multifunctionality, safety, durability, and accessibility were some of the most important factors to be followed and taken as the basis for this intervention, seeking to transform school spaces according to new paradigms.

The Program proposes and ensures the incorporation of the various infrastructural systems and equipment within school spaces, considering that these will provide the necessary comfort for the smooth functioning of curricular activities. In the inevitability of meeting the contemporary infrastructure requirements, the Program consisted of a process of experimentation and introduction of the new constructive canon. This condition promoted in the architectural process and, especially, in the relationship with the pre-existences a complex scale of debate between the various agents, affirming this moment as innovative, singular, and paradigmatic.

4. Articulation between different pedagogical dimensions

4.1 Rehabilitation strategy i)

The PMEES intervenes only and exclusively on existing buildings, more precisely, on that had already a school function. In this sense, and since there is no change in the functional program, the transformation process is apparently less intrusive, because of the adequacy that the spatial modeling of the classroom allows. In fact, school buildings, beyond the various complementary functions, are essentially constituted by a rhythmic succession of spaces, normally along

circulation axes (or around central courtyards), constituting the compositional essence of the school space.

The more singular question, and that we must highlight here, becomes a consequence of that characteristic of the Program that determines the exclusivity of the rehabilitation attitude. It should be recalled that from a cultural and social point of view, the rehabilitation operations of the patrimony built in Portugal (and in some way, in the sphere of western culture) were, until, then, (almost only) directed to two types of pre-existing contexts.

Fig. 15 View of the main façade of *Carolina Michaelis secondary school*, built in 1951, under the Plano of 38.

On the one hand, buildings with significant architectural value and consensually recognized by society or community where it is inserted (Fig. 15), and on the other hand, building aggregates, normally residential, implemented in consolidated zones of cities or historic centers (Fig. 16).

Fig. 16 View of the residential buildings on the Porto riverside that have been subject to rehabilitation.

In this way, the sensitivity and the culture of defense of built patrimony values have always been relatively circumscribed in a restricted universe, in some way unprotecting all other buildings, with less constructive or formal quality, of greater anonymity.

At this point, in the context of the PMEES, that obligation to intervene only in pre-existences, allowed to extend the opportunity to rehabilitate the totality original buildings, decisively against a consumerist attitude that aspired to integral demolition to enable the construction from scratch. Naturally, this condition came to pose questions of technical and ethical nature in the development of intervention strategies and methodologies, mainly regarding buildings that completely lack remarkable qualities (Fig. 17). However, it presented the immense virtue of drawing attention to the possibility to face the built heritage with a broader, more integrated, and conscious patrimonial concern. Right away, for environmental and ecological questions, but also for raising awareness of the importance of taking care of the totality of the legacy built, for its material and immaterial value. As a constructed artifact, but also as a cultural landmark and social reference. As a moment that contributes to marking the identity of a group, collectivity, or society.

Fig. 17 School pavilion 3x3, with the evident lack of hierarchy and architectural qualification, *secondary school of Rio Tinto.*

This was one of the desires superiorly placed by the Program and manifestly achieved in the repercussions ensured by the results. The original schools, even those of lesser constructive value, spatial, and imagery, proved to be decisively effective in the process of transformation to turn into modern and attractive schools, capable of affirming contemporaneity. In some mode, it has demonstrated that the difference lies mainly in the attitude, and less in the intrinsic value of the architectural artifact to be recovered; it has confirmed that any building potentially presents conditions to be rehabilitated and reappointed in its future performance. In some mode, it became evident that the rehabilitation strategy can be extended to a far superior number of buildings and that its values transcend the mere material condition.

Thus, and towards this narrative, we affirm the first of the valences that the Program placed, on pedagogical value. Rehabilitate contradicting the tendency for constructing from scratch, and, mainly, allow to extend a concern of heritage preservation, beyond the physical condition of the architectures.

4.2 The school as an inclusive ideal ii)

The school is recognized as an entity involved in everyone's life, related to the sense of public equipment that promotes the process of social inclusion. In this sense, it has been developing a long and intense process of improvement of the teaching-learning methodology, that seeks to ensure a high quality teaching, aimed at a better education, as well as promoting the necessary link between the individuality and the community.

The transition to the 21st century emphasized and made clear the political awareness for the need to reorganize the Portuguese education system and, consequently, to restructure the pre-existing school universe, constituting new objectives and strategies capable of meeting the needs of an increasingly heterogeneous society. The most recent reflections on the dialectic between architecture and pedagogy are consistent on affirming the significant impact that the school environment has in the teaching-learning process. Thus, the school is recognized as an institution that, transcending the school building, assumes itself as a spatial tool that promotes the relationship between its users, the physical space, and the educational space.

The school assumes the commitment and the structural responsibility in the education, formation, and socialization of individuals, especially children and young people. This quality is emphasized when a pedagogical process is based on a curriculum that promotes the relationship between different individuals, mediated by school spaces. The school environment is recognized as *a space to inhabit, as a house*, supported by spaces that are increasingly more heterogeneous, stating a multiplicity in all senses, aware of their duty to society, committing themselves to responsibility "*... of schools must accommodate all children, regardless of their physical, intellectual, social, emotional, linguistic or other conditions…* " [29].

Fig. 18 ***Manuel Gomes de Almeida secondary school,*** **Espinho,**

"*If what we want is for the school to be inclusive, it is urgent to redefine the plans for an education geared towards global citizenship, full, free from prejudice and that recognizes and values differences.*" [30].

It is important, equally, to understand that we have "*…the right to be different when equality decharacterizes us and the right to be equal when*

difference makes us inferior." [30], being aware that the school must be responsible for equality in its spaces and for collective participation, translating them into an equipment representative of society.

The historical evolution of the school institution considered the inclusive process, which has gradually been implemented, to improve curricular practices and social interactions, soughing to encourage dialogue and to ensure a more universal and inclusive society.

In this sense, the school is fundamental in our society due to its commitment to the quality of education and professional training, simultaneously seeking to instruct the important collective bond of all who inhabit it, as well as those who are involved in it. School architecture is responsible for creating conditions of well-being for all, through its spaces, motivating and developing a learning process adapted to different needs, investigating and guaranteeing solutions that cover all communities, promoting social awareness, towards absolute inclusion.

Thus, the school institution *entitled* is intimately related to the idea that "*... all individuals are to a quality educational facility* (...) *that encourages social participation, providing a healthy, comfortable, safe, protected, and inspiring environment for students its occupants.*" [31]. In this perspective, the PMEES assumes itself as a systemic architectural process that proposes the modernization of pre-existing buildings, assuming a participatory model in the process of project management of each school and promotes objectives and requirements for inclusion. Considering that, it becomes important that "*... learning spaces should be reconfigured to support changes in the social context of education and respond to different teaching and learning practices, as well as to a more decentralized learning process, which are no longer restricted exclusively to the space and time of the classroom.*" [31].

The classroom was the only space, until the beginning of the 21st century, on which school architecture focused its concerns on structuring and organization. In a consequence of the most recent reforms and new educational processes, school spaces have multiplied and diversified, even though the space distinguished for the traditional practices of knowledge transmission continues to be represented by the classroom, qualified as the spatial organization that can respond to the formal learning curriculum. Nevertheless, currently, the school is "*... considered as one organization; it emerges as a possible alternative in a search for meaning, which seeks the construction of a space of interaction and cooperation locally contextualized,* (…). *Ceasing to be faced as a group of buildings or classrooms, the school assumes itself as a concrete place for various investments, with an identity.* " [32].

The teaching-learning process is seen, through the lens of pedagogy, devoid of versatility and diversity in spaces. In this sense, the awareness of the school body to improve this insufficiency for the efficient reach of qualifications by the students, for their insertion in the society, is fundamental in the search for more dynamic pedagogical processes. For these processes it is essential to rethink the reorganization of the school space and to consider its various needs, as well as of its communities, aiming to reach an adapted and flexible school.

In this sense, the recent educational and architectural programs have searched to provide informal learning spaces, in tune with the traditional school program. These new spaces provide different environments from those of the classroom, assuring a collective and socialization character - encompassing the entire school community -, and stimulating knowledge in curricular and extracurricular activities, valuing the formation of both individuals and the collective.

The interactions with the different members of the school community enable learning experiences different from those produced in a formal environment, where there an exclusive relation between the student and the teacher. The objective of providing coexistence and relevant relationships outside the classroom space,

finds in informal teaching spaces its materialization, envisaging the possibility of knowing and learning from the other, opening up varied possibilities.

Fig. 19 ***Rodrigues de Freitas secondary school,*** **Porto.**

These socialization spaces interpret a duty of responsibility to support the conditions necessary to welcome the entire school community, as well as the outer community. These spaces thus become protagonists in a dialogue on the importance of the school space, essentially posing a solution for the longed-for social inclusion. It is this way, that it becomes so essential to evoke conscious school architecture on the search for the best results in all spaces of the school.

Fig. 20 ***Rodrigues de Freitas secondary school,*** **Porto.**

The Program foresees a conceptual model for the reorganization of the school space that is intended to be promoted through the relationship of spaces and their functions, in a school environment related to educational practices, and, consequently, promotor of inclusivity.

The perspective of ensuring different functional spaces capable of satisfying educational needs is translated into the distinction and categorization of different learning moments. Therefore, various spatial typologies have been defined in correspondence to the three teaching valences: formal curriculum, that involves the need for the classroom space reformulated consonant to the curricular needs; informal curriculum, which arises from the ambition to develop learning processes in spaces outside the classroom, to occur in social and circulation areas; and the hidden curriculum, that stems from the stimuli perceived when crossing the school space.

The three types of space mentioned above, as well as the articulation with pedagogical requirements, respond to the objectives set for an attractive and multiple school environments.

Fig. 21 ***Secondary school of Canelas,*** **Vila Nova de Gaia.**

The PMEES aims to promote attractive and flexible spaces, predicted to support good teaching practices, adaptable to possible changes in the school curriculum. The promotion of a participatory model in the (re)construction of school spaces assumes itself as another of the strategies to promote inclusion and to capacitate the relationship between individuals and the school environment.

The spatial multifunctionality allows diverse and transversal use by all agents of the school community. In this way, the adoption of the *learning street* model, due to the varied spatial possibilities it ensures, incorporates informal learning resources, in the relationship with the spaces that promote formal learning. Allied to this objective, there is an ambition to promote permeability in spaces, making it easily and safely accessible for everyone with reduced mobility and special educational needs.

The strategy of opening school doors to the out-of-school community and to the context in which each building is inserted, affects the organization of the school building program, to separate itself from the "… *notion of school/building understood as an arm of the State, and that is limited to reproducing centrally defined policies, [that] tends to progressively evolve for the notion of school/educational community, a notion that evokes the construction of a social space anchored in a system of interactions and the sharing of common values and objectives* ." [32].

As a goal of the Program, the proximity to the community and the context in which the school is inserted recognizes itself as a strategy that seeks the inclusion of society in the educational processes. The participation of the out-of-school community is now possible through spaces, which offer environments that assure new self-taught dynamics for everyone, such as the library; others that motivate the exposure of particular and common knowledge and skills in the most varied activities, as is the case of polyvalent rooms; or even others that provide one more frequent use, such as sports pavilions qualified for the sports activity of the school of the out-of-school community, in addition to school hours.

The central position in the school's spatial and functional organization is emphasized, with the library as a symbolic center of the school, destined to universal access to knowledge, promoting a sense of intellect to society.

Fig. 22 ***Garcia de Orta secondary school*****, Porto.**

"*The rich variety of personal situations, origins, and developments that constitute the fabric of society must rediscover at school its replica; the full acceptance of their diversity implies the rejection of any exclusion, namely of the elements that, under any circumstances, are more limited in their possibilities of full fruition of human capacities.*" [33].

It is important to understand that the school institution permanently provides opportunities for everyone, welcoming "… *all children, regardless of their physical, intellectual, social, emotional, linguistic conditions* (…), *disabled or gifted children, street children, and those who work, those of nomadic or remote populations; those of ethnic and linguistic minorities and those belonging to disadvantaged or marginalized areas or groups.* " [29]. The school space represents for many a security reference, where everyone should be considered equal, in which opportunities and the satisfaction of needs are met.

Fig. 23 ***Secondary school of Barcelos*****, Barcelos,**

4.3 The school as a space for universal debate iii)

In this rehabilitation process, it was also important to consider the school as a democratic and universal space, in which a wide range of knowledge, which summons diverse political, cultural, pedagogical, and social agents, are invited to participate in its transformation and evolution process. From this essential condition, it was also important to explore the pedagogical aspect, that proved capable of participating in the process of modeling the school space.

The universal condition of the school space that was, in the heart of this Program, central to the construction of its conceptual model, goes beyond the ambition of creating spaces capable of receiving and welcoming all members of the school community - a major issue addressed in subchapter 4.2 ii), and incorporates issues related to the participation in the actions and political decisions of the different agents that are members of the community in the construction of rehabilitation projects, for their awareness of the management of spaces, for the involvement of all members of society in events and cultural actions, capable of celebrating and strengthening social ties, and in its motivation for the use of the renovated spaces be done with careful attention.

Concerning the design of the intervention projects of each of the schools, awareness of the opportunity to explore the pedagogical dimension is immediately felt in the design of the management model, which, capable of responding to the orientations of the renewed policy national educational system, advocates the development of sustainable and long-lasting solutions in physical, environmental and functional terms, to also guarantee a reduction in management and maintenance costs [1].

The management model, as well as the conceptual model of this Program, was designed and monitored by a vast number of professionals from different disciplinary fields, who are not only concerned with political agents. Although the Program has been promoted and has gained space and conditions for its consummation by political will, the disciplinary areas of pedagogy and architecture have contributed to this process, as well as school communities that, through the experience of use and knowledge from each context, were able to make very important contributions, in a process largely supported by analysts from the *Organization for Economic Cooperation and Development* (OECD) and by a vast number of international experiences [23].

In fact, this complex process of rehabilitation of Portuguese school heritage was born from the awareness of the Portuguese government that it was necessary to reinvent an intervention methodology capable of recovering the vision of the national school network, by adopting clear criteria in the identification of each school and by defining the scope of the interventions, which are indispensable for the requalification of buildings and adaptation to the current teaching requirements [34]. Due to the magnitude of this Program, its success would depend on the intervention methodology and on the guarantees of its sustainability, namely regarding the definition of financing sources and the previous allocation of financial resources, whose control and management was imposed from the beginning to guarantee the feasibility and success of interventions [6] [35].

The tight financial control that proved to be necessary resulted from a process of cooperation between political and economic decision-makers with technical teams, based on the cataloging processes of each school according to its type, as well as the consequent analysis of the real estate and equipment value, the equity value, the adequacy of the infrastructures to the current legislation and to the educational requirements [23].

In addition to financial management, project management was also supported by the association of different disciplinary areas, in systems capable of accompanying the different teams throughout the process, both through consultation with school

communities, and in particular from school boards, and through the production of a set of guiding documents for architects to meet deadlines, budgets, legal frameworks, as well as conceptual designs.

The monitoring of projects by *Parque Escolar* was developed from a posture based on complicity, which led the project teams to assume levels of commitment, responsibility, and availability that exceed the inherent obligations of normal professional performance. The action methodology, which is based on the principles of active participation of all stakeholders, also included the participation of school and educational communities, which, through the writing of the *Plano Estratégico* document, were able to outline the specificities of each community, for an effective interrelation with the productive and economic tissues [23].

In addition, mechanisms were developed to monitor the evolution of each project, which, in addition to being evaluated and approved by *Parque Escolar*, were presented, and validated by the school management [23].

The hiring of external consultants was also a constant practice throughout the process, even before hiring the project teams, for the preparation of support material that should be universal and transversal to all teams. Also, during the projects, consultants were hired to provide support on specific issues, such as the layout of libraries and kitchens, to ensure homogeneity and greater control in the projects' development [23].

The concerted management strategy between the different stakeholders extended from the project's creation process to the construction of the project and the phase of use of the school building, which is long-term, with an increasing involvement of agents from the school community and, on the other hand, of politicians.

The management model includes the articulation between the contractors and the various construction and inspection teams, in the definition of deadlines for the different phases, as well as in the relationship with the materials market sector. Also, at this stage, it was necessary to develop a concerted strategy between these teams and the community for constructive phasing, ensuring school functioning during the intervention period, with guarantees of tight security conditions [23].

Finally, to ensure greater sustainability of the school buildings under intervention, the management of the building was ensured for a period of thirty years of use, with the implementation of a long-term maintenance and prevention systems, which was considered to be fundamental to achieve the goals of creating a sustainable edified educational universe, capable of meeting long-term education needs [5].

Due to the way this rehabilitation process of schools with secondary education took place, both from the point of view of raising awareness for the considerable spatial and infrastructural improvements, resulting from the enormous financial effort employed, as well as from the involvement that was sought from all agents of the school community before and after the rehabilitation, it was possible, with this Program, to captivate the various members for a rapprochement with the schools, as well as for a conscious use and care from those who use the school facilities daily, and those who, by the approximation to urban life, now find, in these facilities, spaces belonging to the social and cultural life of their communities. Thus, it is considered that it was possible to explore the operational character that architecture has to encourage participation in the processes of transformation and evolution of realities, in coordination with other disciplines in a pedagogical process.

4.4 Rehabilitation as a process of technological and environmental renewal iv)

The rehabilitation strategy that characterizes the intervention context in which this Program unfolds, allowed, by ensuring the functional and social

conditions for the use of the building, another pedagogical input, renewing the attractiveness of architecture, through the incorporation of technologies aimed at increase environmental quality, as well as the sustainability of buildings and interventions.

The Program determines that the modernization interventions maintain about 80% of the original construction, so the teams of designers had to analyze and comprehend the visibility of reconstruction of each part of the buildings and define the parts that would be maintained and the small part that could be demolished. The option of rehabilitating pre-existing buildings encourages energy efficiency, by saving energy and water consumption [36].

As mentioned above, the definition of particular intervention strategies was based on the analysis of the typological diversity of preexistence, from which it was possible to find properties and characteristics transversal to the majority of school buildings belonging to each construction period, which resulted in the cataloging of buildings in three typological groups, allowing the Program to be structured to respond to the overall spatial and infrastructural requirements of the universe in question [14].

The first group, which stretches from the second half of the 19th century, with the construction of the first national high schools, until 1935, is characterized by a unique and compact building model, which normally occupies the entire block in the center of the urban grid, and with closed courtyards. These are historic buildings, with enormous patrimonial value, in general with a prominent position in the urban environment, as well as enormous social and cultural value for the community it serves. It is precisely this identity value and relevance that was sought to elevate in a large part of the interventions undertaken in these buildings, in the affirmation of the school's commitment to the fabric of the city [37]. For this reason, the structure of the building, as well as its expression, is entirely maintained, wherein the articulation with the new infrastructure load constitutes a huge challenge. An example of this process is the *Rodrigues de Freitas secondary school* (Fig. 24).

Fig. 24 Integration of infrastructural systems in high-value buildings, *Rodrigues de Freitas secondary school*, Porto.

The second is made up of commercial or technical schools built from 1936 to 1968, usually composed of longitudinal buildings, which concentrate teaching, administrative and social activities in height, usually implanted in areas with easy road access and in large lots, in expanding city areas.

The third group, consists of buildings that, constructed since 1968, resulted from the multiple programs of construction of modular and standardized structures, namely in pavilion-type solutions, multiplied throughout the national territory, in areas of low urbanization and, therefore, largely disconnected from a city-based logic or any cultural or identity meaning [37].

Fig. 25 Infrastructure concealment. *secondary school of Maia*, Maia.

Given these circumstances, and the poor constructive and environmental quality that characterizes this typology, in most of these buildings, as well as in some buildings that make up the second group, the changes were more profound, to reverse the realities from the spatial point of view, from the spatial and functional organization to the expression of the buildings, so the association of spatial and infrastructural requirements can be done in many ways, from the concealment of systems, as happens in the circulation spaces of the *secondary school of Maia* (Fig. 25), until its clear statement in the image of the building, as is the case of the *secondary school of Santa Maria da Feir*a (Fig. 26).

Fig. 26 Affirmation of infrastructures, secondary *school of Santa Maria da Feira*, Santa Maria da Feira.

The obligatoriness of maintenance of a large part of the building promoted a double pedagogical condition. If, on the one hand, a process of rehabilitation of all school buildings was promoted, even in the face of less valuable cultural and cultural architectures, on the other hand, there was an enormous contribution to the values of sustainability and ecology, due to the minimization of expenses water, materials, and energy.

The Program defined that the transformations of the structural and infrastructural systems should meet the current standards of comfort and sustainability, to envisage schools in the future, which happened in a process that accompanied the evolution and the introduction of new technical guidelines resulting from the *Kyoto Protocol*[21], with the transposition of a wide range of legal diplomas from European to the Portuguese legislation, which has profoundly changed the Portuguese legal framework. By chance, due to the temporal proximity between these new legal diplomas and the implementation of the Program, this was the first moment of experimenting with the new constructive paradigm, that, therefore, affirmed, not only as experimental but also as singular and paradigmatic.

Between 2006 and 2008, there were a large number of changes in several diplomas with technical repercussions, such as the *Energy Certification System and Indoor Air Quality* (SCE), the *Energy Systems for Air Conditioning in Buildings* (RSECE), the *Regulation of Characteristics for Thermal Behavior of Buildings* (RCCTE), as well as legislation regarding the improvement of Accessibility Conditions, Acoustic Requirements and Fire Safety (SCIE) [23].

It should be noted that, after a considerable period of experimentation and use of the renovated school facilities, the conclusion was reached that the enormous infrastructure load has led to an exponential energy cost, which is difficult for most schools and which calls into question the previous expectation of inducing (and achieving) effective energy sustainability.

"Due to the strict energy efficiency criteria and the effectiveness of the passive measures implemented during the modernisation process, the outcomes illustrate a significant difference in relation to non-renovated schools which have less equipment and therefore lower energy costs. Indeed, the need to create better conditions in school facilities, in terms of capacity as well as functionality and comfort, has led to a greater recourse to systems." [38].

Thus, it is verified that these legislative impositions, contrary to what was desired, proved to be a huge

[21] The Kyoto Protocol was signed by 55 countries on December 11, 1997, framed by the growing concerns about the emission of polluting gases.

obstacle to the efficiency and sustainability of school buildings. It should also be noted that this situation was anticipated and that a large number of photovoltaic panels were foreseen to be installed, which, although providing a more balanced energy balance, would mitigate this problem. However, this perspective did not materialize, and only solar panels were installed for heating sanitary waters. [38].

It is considered, therefore, that there is a clear mismatch between spatial and comfort needs with the infrastructure load, which resulted from a transposition of legislation that was not appropriate to Portuguese geographic, climatic, and economic realities.

Despite this bewilderment, which has nothing to do with the conceptual and management models designed by *Parque Escolar* for the PMEES, it asserts itself as well, concerning the adequacy of the pre-existing heritage to the contemporary constructive and infrastructural reality, as a paradigmatic model in regard the pedagogical dimension and the promotion of sustainability, overcoming environmental issues, and overflowing to cultural, economic and usage values, which must be taken into account in the structuring of future identical programs, both inside and outside Portugal.

For this reason, OECD technicians consider that the Portuguese experience "… reflects or exceeds the best international practices." [5].

5. Conclusion

Taking as a starting point a political strategy, which focused globally on the reformulation of the national school network, as well as on the redefinition of the pedagogical curricula, the patrimonial legacy expressed by the various buildings corresponding to different typologies, was profoundly altered with the implementation of the *Programa de Modernização das Escolas destinadas ao Ensino Secundário*. Despite this operation only focusing on schools with secondary education [22] (as well as some that include basic education), its territorial, social and cultural expression has assumed itself expressive and notorious on a national scale. Bearing in mind that, from the 477 schools that existed before the Program was implemented, were intervened more than half of the schools selected to remain active, the Program revealed an implementation rate significantly expressive.

Considering also that the operation focused on the school function, and that it is the most universal of all public functions, obligatorily attended by the entire population, this Program increased its visibility and consequently the awareness of its multiple consequences and results.

It is in this context that it was considered opportune to summon several of its pedagogical dimensions, in its ability to interact socially and awaken to new environmental and social paradigms, such as raising awareness of the strategy to rehabilitate i), the affirmation of the school space as a support for an inclusive ideal ii), the construction of a space that integrates knowledge and capable of promoting a universal debate iii) and, finally, the intelligence to connote rehabilitation as a process of technological and environmental renewal iv).

Image Credits

Fig. 1 ***Conde de Ferreira school,*** **Lagos, inaugured in august 23rd, 1868**, © A. Santos, 2012.

Fig. 2 The traditional classroom organizes their occupation and dynamics in a relatively unidirectional and rigid manner, invoking the concept of staticness, © Arquivo SGEC

Fig. 3 ***D. Manuel II lyceum*** **(*Rodrigues de Freitas secondary school*), Porto**, © Fundação Marques da Silva

[22] In Portugal, the education system is structured on four levels, and, as of 2012, it is entirely mandatory. Secondary education corresponds to the penultimate of these levels and comprises from the 10th to the 12th year of schooling. Basic education precedes it (from the 1st year to the 9th year), making a total of 12 years of compulsory education.

Fig. 4 ***Carolina Michaëlis lyceum*** **(*Carolina Michaëlis secondary school*), Porto,** © Arquivo SGEC.

Fig. 5 ***Filipa de Vilhena secondary school*****, Porto,** © Arquivo SGEC.

Fig. 6 ***Padre António Vieira lyceum*****, Lisboa, architect Ruy Jervis d'Athouguia,** © Arquivo SGEC.

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Fig. 9 ***Dr. João Araújo Correia secondary school*****, Peso da Régua,** © F. Mendonça, 2019.

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Fig. 11 The degraded state of pre-existing buildings, ***secondary school of Canelas*****, Vila Nova de Gaia,** © A. Santos, 2011.

Fig. 12 ***Conceptual Model*** **scheme developed** ***by Parque Escolar,*** © Parque Escolar.

Fig. 13 ***Functional Heparinization scheme*****, developed by *Parque Escolar***, © Parque Escolar.

Fig. 14 The structural character of school buildings in the urban context as a motivator and transformer of society, © Filipe Jorge, (O Porto visto do céu, Lisboa, Argumentum, Edições Lda., 2000, p. 69).

Fig. 15 View of the main façade of ***Carolina Michaelis secondary school*****, built in 1951, under the** ***Plano of 38*****,** © A. Santos, 2012.

Fig. 16 View of the residential buildings on the Porto riverside that have been subject to rehabilitation, © A. Santos, 2020.

Fig. 17 School pavilion 3x3, with the evident lack of hierarchy and architectural qualification*, secondary school of Rio Tinto*, © R. Mealha.

Fig. 18 ***Manuel Gomes de Almeida secondary school*****, Espinho,** © A. Santos, 2011.

Fig. 19 ***Rodrigues de Freitas secondary school*****, Porto,** © A. Santos, 2008.

Fig. 20 ***Rodrigues de Freitas secondary school*****, Porto,** © A. Santos, 2008.

Fig. 21 ***Secondary school of Canelas*****, Vila Nova de Gaia,** © F. Mendonça, 2019.

Fig. 22 ***Garcia de Orta secondary school*****, Porto,** © A. Santos, 2011.

Fig. 23 ***Secondary school of Barcelos*****, Barcelos,** © C. Monteiro, 2019.

Fig. 24 Integration of infrastructural systems in high-value buildings, ***Rodrigues de Freitas secondary school*****, Porto** © S. Santos, 2008.

Fig. 25 Infrastructure concealment, ***secondary school of Maia*****, Maia,** © A. Santos, 2011.

Fig. 26 Affirmation of infrastructures, ***secondary school of Santa Maria da Feira*****, Santa Maria da Feira,** © A. Santos, 2012.

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