RETHINKING SCHOOL ARCHITECTURE: BRIDGING EDUCATIONAL SPACES AND THE URBAN FABRIC

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Abstract
The architectural design of school buildings needs to accommodate a shifting spatial context, fostering an environment that promotes dialogue and social interaction among students. The alternative models for educational buildings in Europe over the past decades have a fluid spatiality, with architects focusing less on form and more on creating a communicative atmosphere that fosters interaction and togetherness. Nevertheless, in most cases, the school remains strictly demarcated—an autonomous space with no connection to the socio-spatial environment or the urban fabric.

Contemporary education is directed towards fluid and interrelated networks within the urban environment. This research explores the spatial and conceptual boundaries of secondary education schools, focusing on their interaction with the surrounding urban fabric. It examines the relationship between the school building and the city, the interplay of indoor and outdoor spaces, to create the potential for extending educational activities beyond the confines of the classroom.

The article critically analyzes the legislative framework governing school design in Greece, identifying constraints that limit architectural flexibility and innovation. These regulations often produce rigid spaces that fail to support contemporary pedagogical approaches (adaptability, interactivity, dissolution of traditional spatial limits).

By bridging insights from architecture, pedagogy, and urban planning, the research seeks to redefine these boundaries between the typical classroom, the schoolyard and public spaces, trying to answer the broader question of whether teaching and learning should remain enclosed or expand into urban contexts. Creating adaptable and inclusive school spaces enhances the educational process and students' social development, while fostering stronger connections with the urban fabric. The challenge is to use school architecture as a medium for educational and societal progress, by establishing schools as active participants in the urban environment, where learning transcends physical and conceptual boundaries.

Key words: *school architecture, fluid networks, urban fabric, redefining the boundaries*

Introduction

The design of school buildings plays a crucial role in shaping the educational experience, yet traditional approaches often isolate schools from their surrounding urban environments. In an era of evolving educational methodologies, there is an increasing need to rethink how school architecture interacts with the city, fostering an open and engaging learning environment. This

article examines the issue of ineffective public spaces within the urban landscape and their relationship with school environments in the city. Alternative models of school design are being analyzed, emphasizing the importance of spatial fluidity and integration with urban fabric.

The dysfunctional public space

Open urban spaces play a crucial role in promoting community development and well-being, as they are accessible public areas, while some social science scholars have criticized the privatization and corporate management of such spaces, arguing that they should remain public, inclusive, and free from restrictions or discrimination (Carr et al., 1992). The term "public" should be reserved for gathering places that are truly open and accessible to all, such as streets, squares, and parks According to social scientists, these everyday spaces encourage coexistence and dialogue among people from diverse social backgrounds (Lofland, 1998).

However, the fragmentation of public spaces is a reality, and it affects many outdoor areas of public buildings. While public outdoor spaces are intended to function as open, shared environments, fencing and restricted entrances frequently discourage, or even outright prevent, pedestrian access. As E. Philippopoulou states, "The public space is the setting where the interests and objectives of diverse social groups intersect. The more fragmented a society is, the more dysfunctional its public space becomes" (Philippopoulou, 2014). Indeed, contemporary urban environments in most Greek cities suffer from a scarcity of open spaces and greenery.

From an urban perspective, a fence acts as a rigid vertical boundary that divides public space into accessible and inaccessible zones, embodying dichotomies such as inside-outside, introspection-extroversion, and order-chaos. Kahn observes that "the fence symbolizes the function of a refuge" (Ashraf, 2007). While it encloses a space, it also creates a distinction between the internal environment and the external urban space. The more obstructed visibility and audibility are from within the enclosed space, the greater the psychological and social detachment from urban life is. At the same time, the restriction creates a sense of exclusion for passersby, particularly when architectural elements such as difficult access points, imposing fences, or solid facades dominate the streetscape. In some cases, even visual contact with the interior is absent.

From another perspective, Hardin’s argument suggests that if access to common resources is entirely unrestricted, users may exploit them unsustainably until they are depleted (Hardin, 1968). The responsible use of these resources, therefore, necessitates a regulatory framework. Over the past few decades, rigid boundaries have become increasingly prevalent (Caffentzis, 2010). In "gated communities," a phenomenon especially common in the United States, entire residential areas are enclosed by tall fences, restricting access to public spaces exclusively to residents. "Architectural elements such as inconspicuous or inaccessible entrances, solid facades, or iron fence openings do not attract the potential user to approach the space" (Philippopoulou, 2014). Even architecturally attractive buildings and public areas can create an unintended sense of exclusion if their design is characterized by excessive scale or monumentality.

Hardt and Negri propose an alternative perspective on public space, arguing that the notion of "commons" extends beyond traditional community frameworks—which can sometimes impose limitations on individual freedoms—toward a model of open and free communication among individuals in a shared space that emerges through collaborative social processes (Daflos, 2014). A growing yet underexplored category within this concept is the "urban commons," which offers a new lens for rethinking both the management of public spaces and broader production processes (Karavasili, 2018). According to Hardt and Negri,

cities should be viewed as hubs of collective resources, where individuals interact, share, and exchange goods, knowledge, and experiences (Daflos, 2014). From this viewpoint, the city itself functions as a dynamic arena for participation and collaboration, fostering social engagement and empowerment.

In contemporary discourse, numerous researchers emphasize the importance of inclusive design, which prioritizes accessibility for the widest range of users, regardless of age or ability. This philosophy, also known as universal or design-for-all, represents a shift towards a more equitable approach to spatial planning (Burton et al., 2006). Additionally, inclusive urbanism seeks to integrate diverse social groups, ensuring equal opportunities for participation in public life (Espino, 2015). Neal outlines key aspects of public space, emphasizing that public space is not confined to designated physical areas but can encompass any setting—physical or virtual—that facilitates interaction. He also states that public spaces should be universally open and free from material or symbolic barriers, while they must be available and relevant to all members of society. The practical ability to access and use public spaces is often impeded by poor design choices, including inadequate seating arrangements, lack of greenery, inappropriate construction materials, complex layouts, insufficient lighting, or explicit restrictions on access (Karavasili, 2018).

Historically, cities serve as hubs for socialization, leisure, and spontaneous encounters. Citizens engaged with the urban environment through leisurely strolls, informal gatherings, and the exploration of public spaces. The benefits of outdoor activities have been widely documented, with research indicating that exposure to green spaces can yield significant psychological, cognitive, social, and even spiritual benefits. Studies suggest that the presence of greenery in public areas encourages their use, fostering social interaction and cohesion (Coley, et al., 1997). However, recent trends indicate a shift away from these urban dynamics. The modern city is increasingly perceived as unwelcoming, with people moving predominantly between private spaces via private transportation, primarily cars. This transformation underscores the urgent need to reconsider the role of public space in contemporary urban life and to reimagine schools as integral components of the urban commons.

The Evolution of Educational Spaces

Over the past decades, European architects have shifted their focus from rigid, form-driven designs to more dynamic and interactive spaces. These contemporary models promote communication and social interaction among students, facilitating an educational atmosphere that extends beyond the traditional classroom setting. However, despite these advances, many schools remain physically and conceptually isolated, lacking direct connections to their socio-spatial environments (Tsoukala, 2017).

Especially the management of the boundary between the schoolyard and the urban landscape is an issue with pedagogical, architectural, and social dimensions. This relationship depends on the form and materiality of the school's spatial limits. This form can either lead to isolation and introversion or foster connection with the city and extroversion.

Modern education increasingly aligns with networked, interrelated systems that engage with the broader cityscape. Schools have the potential to function as open, adaptable spaces that encourage interaction between students, educators, and the wider community. This requires a reevaluation of the spatial and conceptual boundaries of secondary education institutions, examining how the interplay between indoor and outdoor spaces can create opportunities for extending learning beyond conventional classroom settings.

Since the late 1980s, the Organization of School Buildings in Greece (Organization of School Books S.A., 2008) has encouraged the expansion of the school's social environment,

promoting the integration of community-accessible spaces within school premises. The multipurpose hall, courtyard theater, library, and event hall are some of the facilities that the Ministry recommends be available for community use.

According to current regulations:

- School courtyards should include areas for gatherings, relaxation, play, greenery, and events. If possible, an open-air theater with concrete seating (circular or semicircular) should be installed to host events for both the school and the community during warm seasons.
- The library should be located near administrative offices, be easily accessible from all school areas, and be available for community use outside school hours.
- The event or multipurpose hall should provide direct access for the community, have a covered extension area, and comply with fire safety regulations. It must also feature independent lighting, heating, and air-conditioning systems to function separately from school hours.
- The school canteen should be centrally located, serving students during breaks and, if possible, be linked to the multipurpose hall to support events.

These regulations reflect a broader vision of schools as community hubs, reinforcing social interaction and shared educational experiences beyond traditional school functions. However, despite these regulations and global advancements in this field, most of the school buildings in Greece remains inflexible and outdated, while Greek legislative framework governing school design remains rather restrictive. Current regulations impose rigid spatial structures that hinder architectural innovation and limit the potential for adaptive, interactive learning environments. The inability to dissolve traditional spatial boundaries results in schools failing to accommodate contemporary pedagogical approaches, such as flexibility, interactivity, and openness to public spaces.

The term adaptability refers to the ability of an object or organism to change, in order to adjust to the constantly evolving conditions of its environment. The broad scope of the term allows for various interpretations and definitions within the field of architecture. To understand and define adaptability for the design of school architecture, possible research needs to be approached through the lens of potentiality and systems theory, framing the designed space as a potential space, a node of problems. These problems are in a state of continuous transformation, and consequently, their solutions evolve at the same pace. Thus, the adaptation of space concerns the process through which a solution is activated, with the system serving as its tool.

Below are examples of remarkable school architecture in Greece, where architects made a significant effort to integrate these environments into the urban fabric of their surroundings with an adaptable design. They aimed to foster interaction with public spaces, as much as possible within the constraints of Greek legislation.

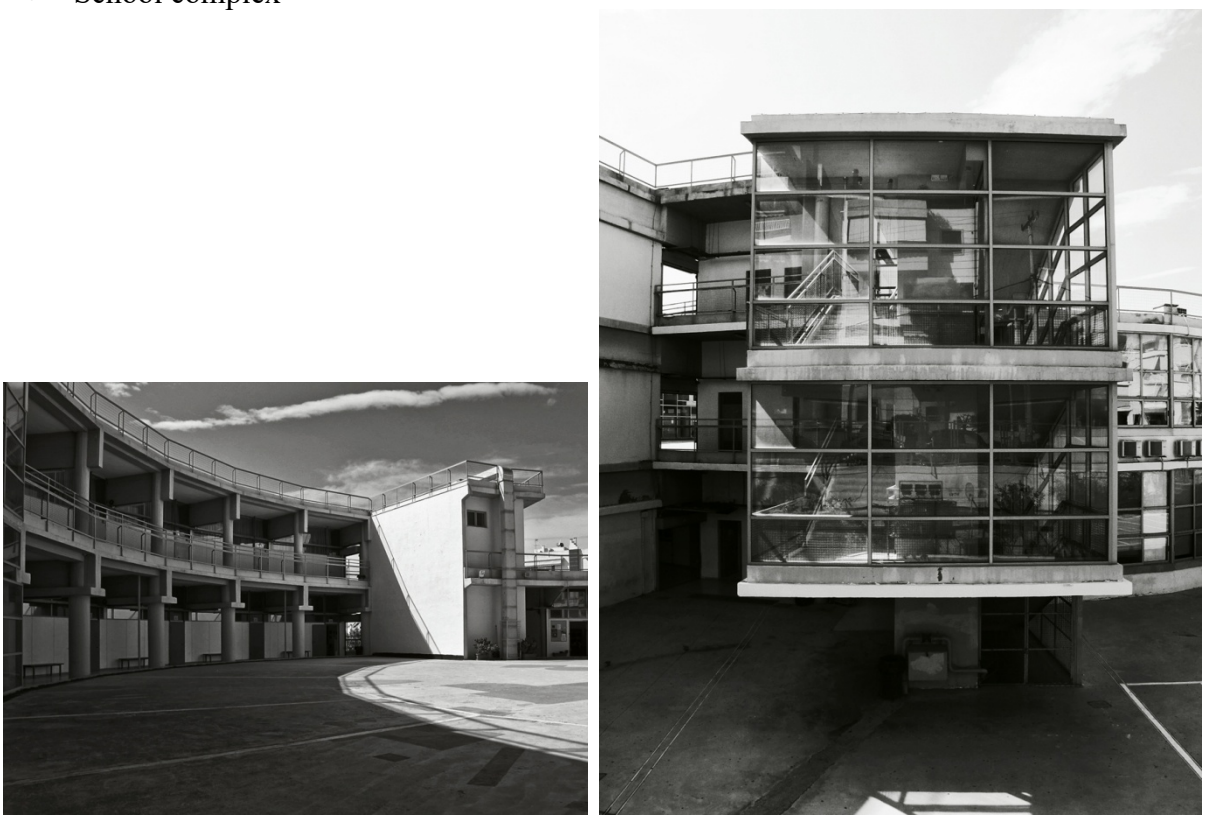
The round school, by T. Zenetos

T. Zenetos (1926-1977) experiments with the existing Greek landscape and contemporary society. He challenges the perception of space and time of his era with proposals such as the “round” school in Agios Dimitrios. His technical and technological proposals are characterized by plasticity and a desire to harmonize with the landscape – not only the natural landscape but also the social, political, and economic one, which he sees as inevitably changing. His attempt to compose a multi-layered design led to a distinct, characteristic, open-ended architecture, rooted in the contemporary context while simultaneously projecting into a possible future state. D. Papalexopoulos and E. Kalafati (2006) describe Zenetos’ work as a continuous projection into the future, a detachment from the present. The fluidity and

rapid change of conditions lead him to avoid static solutions – since there is no single spatial solution – but rather to design transitions from one state to another. Zenetos' views and explorations were considered pioneering in his time and, by many, perhaps disconnected from reality. Specifically, he had, earlier on, described the new type of architect who "begins to become a collaborator with the residents, shaping the environment together with them" (Papalexopoulos, Kalafati, 2006). His inquiries regarding education follow a similar trajectory, as he actively seeks to contribute to shaping the "school of the future". Notably, before designing the school in Agios Dimitrios, he conducted a six-month study on emerging educational trends in Europe. Through this research, he concluded that the school environment should not only keep pace with social and educational changes but also lead them. He believed that the educational process should be in direct and interactive dialogue with its social surroundings, expanding its boundaries to engage with the broader community , (Papalexopoulos, Kalafati, 2006).

The most well-known realized example of this approach is the round school (Zenetos, 1971). The unit was designed in 1969 for 1,500 students, with a planned gradual reduction to 750. Zenetos redefines the hierarchical relationship between teacher and student, aiming to create multiple layers of interaction that reflect the dynamics of social reality. Specifically, he proposes a structured and complex arrangement:

- Groups of 2-6 children
- Larger groups of 40 children
- Classes of 100-160 children
- School unit
- School complex



Images 1, 2. "He considers the building as a transition tool, whose specific form at any given time will reflect the balance of forces that define this transition toward the information society" (Papalexopoulos, Kalafati, 2006). Photo by K. Ploumpis (www.mancodestyle.com--strongylo-scholio-ston-agio-dimitrio).

Spatially, this intention is expressed through flexibility in design (Papalexopoulos, Kalafati, 2006). Although he was aware that the linear arrangement of classrooms connected by an external corridor was the only solution accepted by the Organization of School Buildings in Greece, he did not hesitate to propose a groundbreaking design for school facilities. After a lot of discussions with the Organization of School Buildings, his proposal was approved on the condition that it could also accommodate a traditional school. This design was implemented in the school complex of Agios Dimitrios, featuring a circular floor plan where multipurpose classrooms and workspaces are arranged along the perimeter, enclosing an open central space. The circular shape of the school is dynamic, innovative for its time, and remains distinctive even today. The circle signifies the school as the center of the community – a space that, in the future, would connect students, teachers, and the wider community through the internet. The school was built along the perimeter of the circle, leaving its center empty, awaiting future development. The architect's plan envisioned the gradual filling of this void with activity units such as an amphitheater, computer rooms, and holographic learning systems (Doumanis, 1978).

Each unit corresponded to potential future needs of the school, as envisioned by Takis Zenetos (Zenetos, 1971). Although the central space follows a plug-in logic, it does not include prefabricated units. The activity units appear as segments of the circular disc that can be added or removed, allowing the school environment to spatially adapt to the needs of students and their curriculum while maintaining structural and formal coherence. Comparing Zenetos' original designs with the building as it exists today, it becomes evident that the structure ultimately was used neither as a tool for transitioning into the digital age, nor as the center of the community. The building's flexibility was limited to the light partition walls of the classrooms. Although digital technologies play a crucial role in everyday life in the 21st century, and the educational system has evolved significantly, the appropriate framework for fully utilizing the school building, as Zenetos had envisioned, has yet to be established.

Zenetos' research within the Greek context and landscape provides a model for composing flexible and adaptable systems that respond to their surroundings and technical heritage. His strategic approach to designed, adaptable spaces, creates a flexible, open-ended system aimed at sustainability and establishing a foundation for future living, as envisioned in the 1960s. His proposals aim to free the environment from the permanence of construction so that it cannot only change function and properties but also disappear entirely, leaving no trace of its existence. Zenetos' strategy will form the core framework for developing the experimental design method, supplemented by contemporary tools such as algorithmic logic and robotic construction platforms.

The Gymnasium-Lyceum, by D. Fatouros

D. Fatouros designed the Gymnasium-Lyceum building in Lagadas, Thessaloniki, in 1966, in collaboration with architect V. Giannakis, with the project being completed in 1970. Its location near the lake of Lagadas played a crucial role in shaping the architectural composition, with the complex aligning harmoniously with the horizontal landscape. The Organization of School Buildings program required the project to be completed in two phases, which significantly influenced the design process. The architects proposed a flexible solution that allowed for size modifications without making the complex appear unfinished. The design follows a center-oriented approach, fostering interaction around a large central courtyard with smaller outdoor areas along its perimeter.

The core concept of the design is based on the repetition of a modular unit, which forms the most quantitatively dominant and qualitatively characteristic element of the project. This module is the classroom, designed in an octagonal shape, which, when doubled or tripled,

generates specialized rooms, such as laboratories. As D. Fatouros notes, "this school is probably the first implementation in Greece of a non-rectangular composition, with polygonal classrooms as fundamental units, creating a complex typological structure" (Papadopoulos (ed), 2009: p. 69).

Dimitris Fatouros and his collaborators approached the design of the school in Lagadas with both originality and responsiveness to the evolving demands of educational reality, while simultaneously engaging with the most experimental and innovative trends in architecture and pedagogical theory. His deep interest in educational issues was rooted in a humanistic perspective, which is evident in his design philosophy. He placed the child and its needs at the center of his architectural concerns, drawing from the educational theories of Jean Piaget and the New Education movement (Papadopoulos (ed), 2009). He believed that designing a school should involve collaboration between architects, educators, and psychologists, ensuring that the spatial organization truly serves the child's development. His thinking was shaped by child psychology, leading him to integrate social dimensions into his educational design principles. He recognized that school spaces shape a child's personality, but he also argued that the architect's responsibility should extend beyond the school building to the broader environment (Fatouros, 2008).

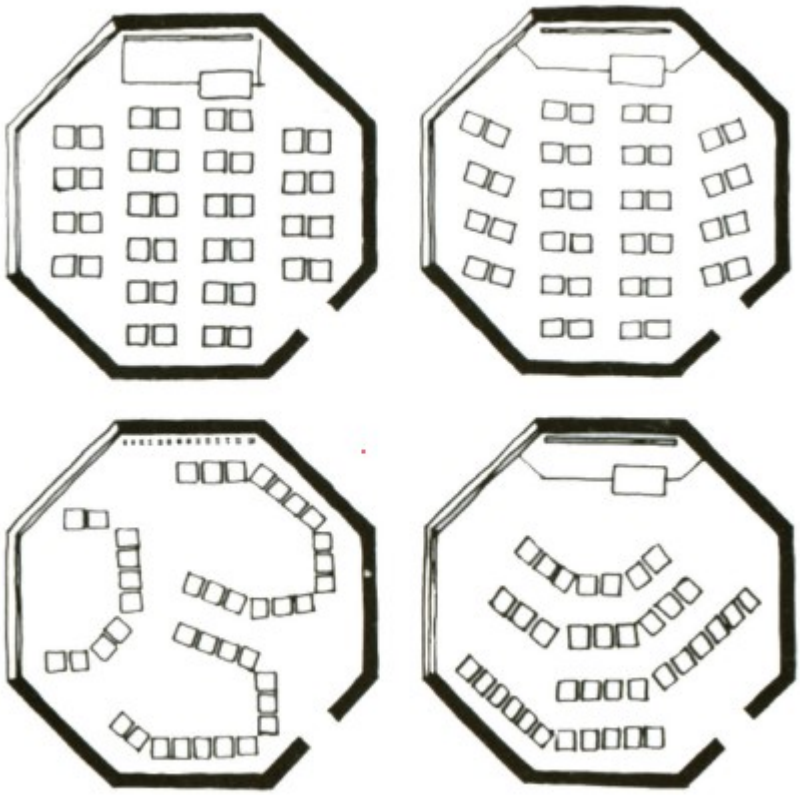


Image 3. Possible desk-board arrangements that foster a new teacher-student relationship (Fatouros, 2008).

The Lagadas Gymnasium-Lyceum embodies the fusion of theory and practice. The architects prioritized accessibility, designing the school with two entrances for students and the local community. The classroom layout was carefully chosen, combining the advantages of both the square and the circle, ensuring centrality, clarity, and defined boundaries. This design allowed for flexible desk and blackboard arrangements, fostering a new student-

teacher relationship. Additionally, traditional hallways were replaced by communal gathering spaces, promoting interaction. The additive principle of modular classrooms enabled the creation of distinct groupings, adaptable to different educational needs. These features reflect Fatouros' pedagogical research, demonstrating his commitment to intervening in the educational process, despite the initial constraints set by the Organization of School Buildings (Fatouros, 2008).

Image 4, 5 Views of the classrooms in the school complex (Fatouros, 2008).

The final school building constructed by the Organization of School Buildings was not the preferred version among the alternative proposals submitted by the designers. Legal restrictions prevented the architects from supervising the project's execution, although they made limited efforts to ensure that key organizational principles were respected. A significant modification was the elimination of the second entrance, as delays in road construction prevented access to it. These alterations ultimately weakened the envisioned relationship between the school building and the educational program, as well as its integration with the city of Lagadas.

Redefining Boundaries: Architecture, Pedagogy, and Urban Planning

The boundary between the school environment and the public spaces around it varies significantly, sometimes taking the form of solid, opaque materials that obstruct visual contact with the surrounding public space, while in other cases, it consists of perforated or lightweight materials or even remains rudimentary. The way this boundary is formed plays a decisive role in determining whether a school becomes an isolated and inward-looking entity or one that fosters openness and engagement with the city. Also, the relationship between the schoolyard and the urban landscape is largely shaped by the structure and materiality of this boundary. This connection profoundly influences the pedagogical and social aspects of educational experience. A boundary delineates the school from the rest of the public space while simultaneously defining points of entry and exit, regulating access as needed. Fencing serves as a defining feature of enclosed schoolyards, marking clear thresholds and reinforcing an inward-oriented approach. Such barriers hinder the relationship between the school building and the surrounding city. The ability to access public space extends beyond the physical realm to include visual and psychological or symbolic dimensions (Carr et al., 1992). This multifaceted inaccessibility reinforces the separation between schools and their urban surroundings, highlighting a disconnect that affects both the students inside and the broader community outside.

The benefits of spending time outdoors have been widely recognized, with research showing that exposure to outdoor environments can provide significant psychological, cognitive, social, and spiritual advantages (Irvine & Warber, 2002). Moreover, studies indicate that the presence of green spaces in public areas encourages their use and promotes social interaction, contributing to social cohesion (Coley et al., 1997). By integrating insights from architecture, education, and urban planning, it is possible to redefine the relationship between school spaces and their urban contexts. The dissolution of strict physical boundaries – between the classroom, schoolyard, and public spaces – encourages learning environments that are more inclusive, dynamic, and socially engaging. Schools can transform into active urban participants, where education transcends physical and conceptual limits, fostering stronger connections with the community.

Conclusion

In recent years, homeschooling has gained significant traction, driven in part by a growing distrust in traditional schooling systems. Many parents opt for homeschooling due to concerns about educational quality, curriculum flexibility, safety, and individualized learning approaches. The rise of digital learning tools and online resources has further facilitated this shift, making personalized education more accessible. This trend raises debates about socialization, standardized assessments, and long-term academic outcomes. As this continues to expand, it challenges conventional educational models and prompts discussions on the future of learning.

The challenge of contemporary education and school architecture is about shaping environments that support both educational progress and social development. By rethinking school architecture as an open and adaptable system, schools can become vibrant hubs that enhance student learning while strengthening ties with the urban fabric. The future of education lies in spaces that are not confined by walls but enriched by the city itself, creating a seamless integration between learning and everyday life.

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