

CHARACTERISTICS OF THE FUNCTIONING OF EDUCATIONAL INSTITUTIONS IN MODERN CONDITIONS

CARACTERÍSTICAS DO FUNCIONAMENTO DAS INSTITUIÇÕES DE ENSINO NAS CONDIÇÕES ATUAIS

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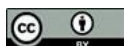
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Abstract

This study examines the specific features of architectural and planning solutions in preschool institutions. A kindergarten gives children their first experience of social interaction, aesthetic education, and psychological development. Therefore, the relationship between the architectural environment in preschool facilities and children's physical and mental health plays a crucial role in shaping these spaces. A well-designed environment supports a child's

Resumo

Este estudo examina as características específicas das soluções arquitetônicas e urbanísticas em instituições de educação infantil. O jardim de infância proporciona às crianças sua primeira experiência de interação social, educação estética e desenvolvimento psicológico. Portanto, a relação entre o ambiente arquitetônico nas instalações de educação infantil e a saúde física e mental das crianças desempenha um papel crucial na



harmonious development, influences both conscious and subconscious processes, and responds to their needs. The study aims to identify, examine, and clarify the most preferable architectural and planning solutions for preschool institutions. To achieve this objective, the authors applied mixed qualitative and quantitative methods. As a result, they identified the main types of architectural and planning solutions for kindergartens: centralized, block-based, pavilion, and gallery types. Based on an expert survey, the authors also defined the key requirements for designing preschool buildings and determined the most suitable type of architectural planning for the conditions of Russia and Kazakhstan. This allowed to propose a functional scheme for a preschool institution based on a centralized building type.

Keywords: Micro-Housing. Compact Apartment. Mini-Apartment. Design Concept. Convertible Furniture. Preschool Institution.

configuração desses espaços. Um ambiente bem projetado favorece o desenvolvimento harmonioso da criança, influencia tanto os processos conscientes quanto os subconscientes e atende às suas necessidades. O estudo visa identificar, examinar e esclarecer as soluções arquitetônicas e de planejamento mais adequadas para instituições pré-escolares. Para atingir esse objetivo, os autores aplicaram métodos mistos, qualitativos e quantitativos. Como resultado, identificaram os principais tipos de soluções arquitetônicas e de planejamento para jardins de infância: tipos centralizado, em blocos, pavilhão e galeria. Com base em uma pesquisa com especialistas, os autores também definiram os principais requisitos para o projeto de edifícios de pré-escola e determinaram o tipo de planejamento arquitetônico mais adequado para as condições da Rússia e do Cazaquistão. Isso permitiu propor um esquema funcional para uma instituição de pré-escola baseado no tipo de edifício centralizado.

Palavras-chave: Micro-Habitação. Apartamento Compacto. Mini-Apartamento. Conceito de Design. Móveis Conversíveis. Instituição de Pré-Escola.

1 INTRODUCTION

Currently, educators and researchers around the world place strong emphasis on shaping a well-rounded personality from the earliest stages of development. Architects, designers, and the broader scientific community are wondering how children will learn in the near future. In response to rapid changes in society and the environment, experts are rethinking the core principles behind the design of preschool educational buildings. They are testing new construction methods and introducing effective ecological and innovative solutions [24, 25]. The range of architectural typologies for children's facilities is also expanding, with flexibility and adaptability becoming their defining features [1].

This study focuses specifically on kindergartens within the broader spectrum of early childhood education institutions. It is widely accepted that preschool education lays the foundation for a child's future integration into society, i.e. school learning, interaction with peers, conflict resolution, decision-making, and personal responsibility [26, 27]. A

kindergarten should provide not only aesthetic development and basic academic knowledge, but also foster skills in drawing, music, choreography, and other creative activities [28].

Ideas embodied in architecture and the broader ways we understand life and its patterns play an important role in forming a child's personality. Since preschool children spend much of their time in these institutions, the quality of that environment matters greatly [29]. When architects design spaces, they need to think in terms that resonate with children (color, scale, and form) and translate the insights of psychologists and educators into the built environment [30, 31]. Such spaces should feel clear and engaging to a child, while offering both informational and aesthetic value [2, 32]. Many older facilities no longer meet current standards and require significant updates [33, 34]. In many cases, kindergartens still occupy buildings based on standard Soviet-era designs, which fall short of modern expectations, i.e. not only in aesthetics but also in ergonomics [35, 36].

Preschool institutions have become an integral part of social life. Unfortunately, most of them are outdated and need modernization. Over time, many were repurposed or shut down, which has led to a shortage of preschool facilities in large urban areas. As a result, it is a challenge to design modern kindergartens that reflect the current level of social development and meet new demands. Limited funding often forces local authorities to upgrade old Soviet-era buildings in a piecemeal way, which leads to inconsistent and functionally inefficient architectural solutions [37-39].

As society and the environment continue to change, professionals are rethinking existing approaches and developing new concepts for the design and construction of preschool institutions. At the same time, the architectural typology of these facilities is becoming richer and more diverse [3, 40]. The relevance of this study lies in identifying ways to improve and modernize preschool design, especially given the shortage of such facilities in residential areas and the growing need to build new ones. Designing these institutions calls for the use of the latest approaches, which now shape how kindergartens are built [41].

Thus, it is important to analyze current approaches to architectural planning, spatial design, and functional organization in preschool institutions. Such analysis helps incorporate successful practices and avoid ineffective ones while creating a new typological framework for these facilities [42, 43].

This study focuses on identifying the most effective types of preschool institutions in order to outline the key principles that govern their design and operation. In addition, it looks specifically at standalone kindergarten buildings, rather than facilities integrated into or attached to other structures.

Given this context, the objective of the study is to identify, examine, and clarify the spatial and planning solutions used in preschool design.

2 LITERATURE REVIEW

A large body of research is dedicated to studying design practices for kindergartens. For example, study [4] analyzes the principles of creating the architectural environment of preschool institutions. Research [5] shows that the functional and spatial organization of kindergartens should allow for change over time, spatial transformation, and adaptability to different types of learning activities. Scholars argue that new preschool designs rely on updated approaches to architectural planning and compositional structure [6].

Study [7] highlights the potential of flexible planning schemes, which give preschool buildings a sense of dynamism. One particularly convenient and effective solution is to integrate kindergartens with extracurricular education facilities and primary schools within a single complex [8, 44]. Scholars also emphasize the relevance of the open-space concept, which enables children to move freely throughout the preschool environment by removing age-group divisions [9].

Researchers [10] argue that kindergarten architecture should be considered through a “environmental approach” and developed through close collaboration between architects, educators, and psychologists. Designers should place the child at the center of the process. The entire kindergarten environment (spaces, furniture, and surroundings) should respond to children’s needs, as they are the ones who interact with it from early childhood [11, 45]. According to [12], modern kindergartens must meet a wide range of criteria, including designated areas for sleep and play, spaces for creative activities, outdoor playgrounds, and, importantly, thoughtful and expressive design of both interiors and façades.

Studies also define key principles for designing preschool institutions that consider regional and cultural characteristics [13], the existing education system [14], and the need for individualized design solutions for each specific case [15]. According to [16], preschool buildings should have a spatial and planning structure that allows for transformation when needed, considering demographic, economic, social, educational, and other factors [46, 47].

Studies highlight that design proposals should generally incorporate complex spatial and planning structures [17]. They also emphasize the importance of applying principles of sustainable architecture [18] and ensuring maximum integration with the surrounding environment [19]. Another frequently mentioned solution is the use of green roofs, which can also serve educational and play purposes [20, 48]. Researchers further note the value of designing “metaphor buildings” that reflect children’s psychological perception of space [21]. Other approaches include combining preschool institutions with public community centers [22], as well as converting industrial and other abandoned buildings into kindergartens [23, 49, 50].

3 METHODS

To achieve the research objective, we used mixed qualitative and quantitative methods.

At the first stage, we selected and reviewed academic sources on the design and construction of preschool institutions.

At the second stage, we analyzed how different groups of premises relate to one another and, based on these relationships, identified the main types of architectural planning solutions for preschool buildings: centralized, block-based, pavilion, and gallery types.

At the third stage, we selected respondents (employees of construction companies) and invited them to take part in the study by email. In total, 72 respondents from Kazakhstan and Russia participated. Each received an email outlining the purpose and structure of the research.

The first question was formulated as follows: What key requirements, in your opinion, should guide the architectural design of preschool buildings? After collecting the

responses, we sent a follow-up email. In this message, we asked participants to rank the importance of each requirement and assign scores accordingly. We then calculated the ranks based on the scores provided by the experts, as well as weight coefficients, where the final values reflect the relative importance of each requirement.

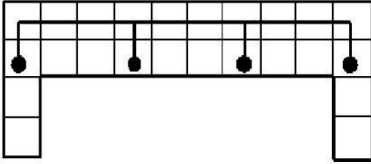

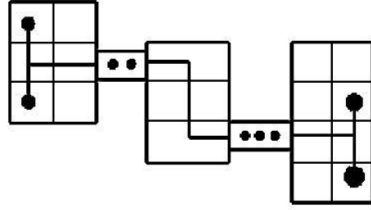

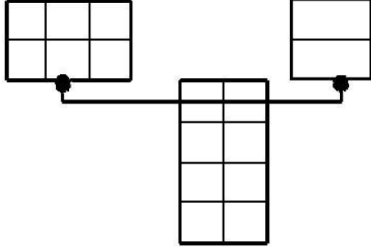

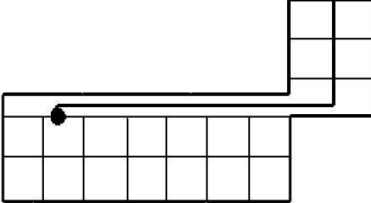

At the fourth stage, we sent the same respondents a second question: Which type of architectural and planning solution for preschool institutions do you consider the most preferable in terms of design requirements, as well as urban planning, natural, and climatic conditions in Russia and Kazakhstan? We again determined rankings and weight coefficients based on the assigned scores, which allowed us to evaluate the significance of each architectural planning type.

To process the collected data, we used Microsoft Excel and Adobe Photoshop for image-based data handling and visualization.

4 RESULTS

Based on the analysis of literature sources on the design and construction of preschool institutions, it was established that the most significant factor shaping the architectural composition of kindergarten buildings is the relationships between individual groups of spaces. On this basis, we identified the main types of architectural and planning solutions: centralized (Scheme 1, Photo 1), block (Scheme 2, Photo 2), pavilion (Scheme 3, Photo 3), and gallery types (Scheme 4, Photo 4) (Table 1).

Table 1*Architectural and planning solutions for preschool institutions*

Description of the schemes	Planning scheme	Example
Scheme 1. Centralized building type. Functional groups of spaces are connected within a single building	 <p style="text-align: center;">Scheme 1</p>	 <p style="text-align: center;">Photo 1</p>
Scheme 2. Block-type building. Functional groups of spaces are linked through a heated corridor or passage	 <p style="text-align: center;">Scheme 2</p>	 <p style="text-align: center;">Photo 2</p>
Scheme 3. Pavilion-type building. Functional groups of spaces are connected via the site area or through covered, unheated passages	 <p style="text-align: center;">Scheme 3</p>	 <p style="text-align: center;">Photo 3</p>
Scheme 4. Combined (gallery) building type. Children's and administrative/service spaces are connected through an open or glazed gallery	 <p style="text-align: center;">Scheme 4</p>	 <p style="text-align: center;">Photo 4</p>

Based on the expert survey results, the key requirements for shaping the architecture of preschool buildings were identified (Table 2, Figure __ – insert a scheme based on Table 2 showing impacts).

Table 2*Key requirements for the architectural design of preschool buildings*

Main requirements	Ranking	Impact
Generous, spacious room dimensions	1	0.23
Strong visual and physical integration with the surrounding environment	2	0.19

A building layout that supports a variety of learning and developmental activities, regardless of changes in group size, composition, furniture arrangement, or teaching equipment	3	0.16
A unified approach to designing both the building and its surrounding site with due regard to the urban context while ensuring optimal conditions for children and protection from external disturbances	4	0.13
The ability to transform spaces, making them multifunctional, for example, through the use of movable partitions	5	0.11
The use of structural systems and unconventional architectural solutions to maintain a comfortable indoor microclimate	6	0.08
Active use of architectural and artistic techniques such as planar applications and the visual articulation (indexing) of façade elements	7	0.06
The use of varied surface textures on walls to highlight different parts of the building, including projections in various geometric forms	8	0.04

Note: Based on an expert survey.

In accordance with the existing types of architectural and planning solutions for preschool institutions and the key requirements for their architectural design, the expert survey identified the most preferable type of architectural and planning solution for the urban planning and natural conditions of Kazakhstan and Russia (Table 3, Figure __ – insert a scheme based on Table 3 showing impacts).

Table 3

Expert evaluation of architectural and planning solutions for preschool institutions

Type of architectural and planning solution	Ranking	Impact
centralized	1	0.42
block-based	2	0.31
pavilion	4	0.08
gallery	3	0.19

Note: The assessment is based on an expert survey.

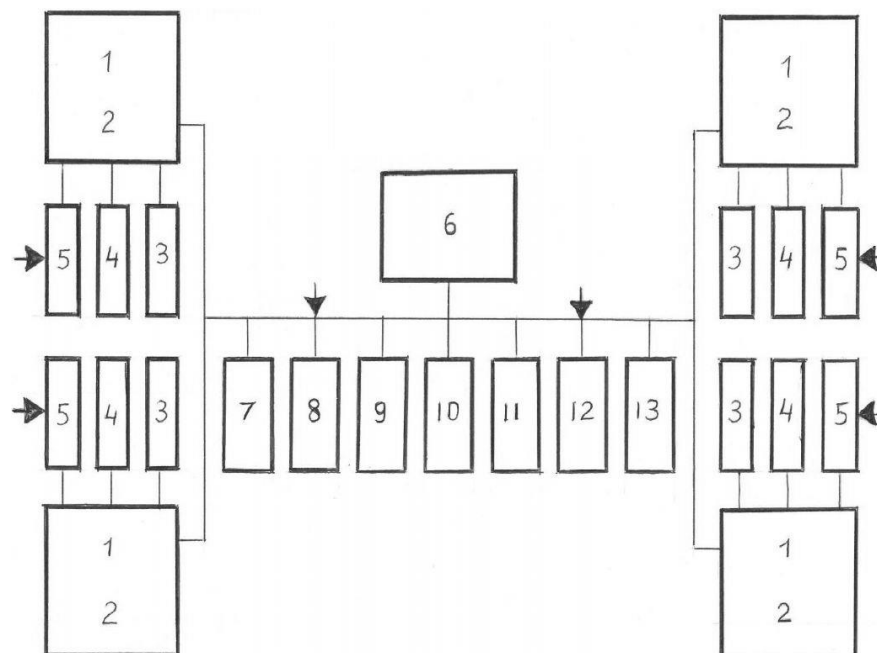
As the results of the expert survey show, the centralized type is the most preferable in terms of key requirements for the architectural design of preschool buildings, as well as in relation to urban planning and natural conditions in Kazakhstan and Russia, construction costs, and operational efficiency. Moreover, in most regions of Kazakhstan and Russia, which are characterized by harsh climatic conditions, this type of building is often the only viable option. Centralized preschool buildings are compact, cost-efficient, and ensure short connections between different functional zones.

Based on the ranking results of the preferred building type, we were able to develop a set of recommendations with due regard to the main requirements for preschool architectural design. Our project, based on the centralized building type, can be proposed

as a functional scheme for a preschool institution (Figure 1). Its core concept is the integration of functional groups of spaces, including children's group areas (play, learning, and sleeping zones), rooms for music and physical education, administrative and medical facilities, as well as the kitchen and laundry block.

Figure 1

Functional scheme of a preschool institution



Note: Ground floor: 1 – learning and dining area; 2 – play area; 3 – sanitary unit; 4 – sleeping area; 5 – cloakroom.

First floor: 6 – medical facilities; 7 – music and physical activity area; 8 – laundry and linen rooms; 9 – kitchen; 10 – food storage area; 11 – storage room; 12, 13 – administrative offices.

5 DISCUSSION

The results of the empirical study show that architectural and planning solutions, as well as the internal organization of preschool institutions, should be diverse and designed to create a comfortable environment for children. These findings allow to draw both theoretical and practical conclusions.

5.1 Theoretical conclusions

Overall, our results are consistent with previous studies, which suggest that the centralized type of preschool building is the most preferable option for Kazakhstan and Russia in terms of construction cost and operational convenience.

It was also expected that, based on expert ranking, block-type buildings may become more widespread in the future. Scholars explain this trend by rising birth rates and the resulting increase in the size of preschool facilities. According to [12], this building type provides better separation between children's groups and more convenient access to outdoor play areas compared to centralized buildings. However, it is less efficient in terms of cost and compactness, which is particularly important in dense urban environments. In general, block-type kindergartens are designed for a larger number of children (100-200), may include temporary residence units, require larger land plots than centralized buildings, and typically have a more complex spatial layout.

The pavilion type, which ranked last in the expert evaluation and is considered the least suitable for Russia and Kazakhstan, is mainly intended for regions with a warm and mild climate. According to [23], in such conditions individual pavilion blocks can be connected through open galleries or pathways.

5.2 Practical conclusions

The results obtained allowed to propose a design based on the centralized type of preschool building. In this concept, children's group rooms are arranged in separate blocks and maintain convenient functional and visual connections with spaces for music and physical education classes, as well as the medical unit. The group rooms are located on the ground floor and are directly connected to a well-planned outdoor area. Each group space includes a changing area, a learning and dining zone, a play and rest area, a sleeping area, and a bathroom. The sleeping area is located within the same zone as the play space. The sanitary unit consists of separate toilet and handwashing areas.

The project also includes a multipurpose hall for gymnastics, with direct access to outdoor sports and play areas. In addition, it provides flexible, multifunctional spaces for

creative activities such as drawing, music, singing, and dance, as well as for ceremonial events [51, 52].

The design further incorporates a set of medical facilities, including a doctor's office, a treatment room, and an isolation unit. The isolation rooms are designed for one or two children and include a private sanitary facility and a separate entrance. The administrative and service block consists of the director's office, deputy director's office, head of maintenance office, a methodological room, storage spaces, staff sanitary facilities, and a laundry room. The preschool institution also includes a dedicated food preparation unit.

Therefore, this design creates a convenient and comfortable environment that supports children's full stay, development, and preschool education.

6 CONCLUSION

A modern kindergarten is a combination of engineering systems, architectural elements and forms, as well as innovative construction and design solutions. If we take all these components into account, we can not only develop cost-effective projects, but also visually enrich children's environments, placing strong emphasis on the architectural and aesthetic quality of preschool buildings. When analyzing architectural and planning solutions for kindergartens, one common feature becomes clear: the consistent aim to create conditions in which children can grow and learn in the most comfortable environment possible.

By examining architectural and planning approaches in preschool design, it is possible to identify the main spatial principles that determine their architectural form. In particular, the centralized building type appears to be the most preferable in terms of core design requirements, as well as urban planning and natural conditions in Kazakhstan and Russia, construction costs, and operational efficiency. Depending on climatic conditions, large-capacity preschool institutions are best designed as either block-type or pavilion-type buildings. All such facilities should be located in green areas or in zones protected from noise and industrial influence. For kindergartens integrated into urban structures, designers should ensure the inclusion of isolated internal courtyards intended for children's play and social interaction.

The limitations of this study include difficulties in involving parents of preschool children, who act as indirect users of preschool facilities. For this reason, future work will include an additional study focused on assessing conditions within kindergartens in order to validate the proposed functional scheme of a preschool institution.

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