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Architectural standards of public kindergartens in Warsaw and supportive design for children's development

Abstract

The kindergarten classroom is a fundamental setting in every child's life. It plays a vital role in their emotional, social, and cognitive development. Although numerous theoretical studies emphasise the importance of space in early childhood education, there is still a lack of in-depth research examining the role of high-quality learning environments in contemporary preschool education.

The authors' objective was to assess the quality of contemporary kindergarten classrooms in Warsaw based on parameters recognised by research as beneficial to children's development and well-being. In the first stage of the study, they carried out a detailed field literature review to identify fifteen relevant characteristics of qualitative space. The second stage involved a study of ten nursery classrooms in newly built state-run nurseries in Warsaw. This part resulted in an assessment of the degree to which theoretical principles had been implemented in the examined facilities, where an average of 5.7 out of 15 indicators were met. The analysis carried out can be regarded as a first step towards identifying design gaps and outlining potential directions for systemic changes that may be relevant to design practice on a national scale.

Key words: kindergarten architecture, design for children, educational environment, early childhood education

Introduction

The environment and space in which children spend most of their time are of fundamental importance to their emotional, social, and cognitive development. The kindergarten classroom is therefore a fundamental setting in every child's life (Acer et al. 2016). Despite numerous theoretical studies on the role of space in early childhood education, there remains a lack of in-depth research on the actual quality of contemporary kindergartens in Poland. Questions therefore arise as to the extent to which the recommendations contained in the academic literature are reflected in specific design solutions, which recommended spatial characteristics are being incorporated into the design of newly built kindergartens, and which continue to be overlooked.

In seeking answers to these questions, research was conducted aimed at assessing the quality of contemporary kindergarten classrooms. This research represents an attempt to link theoretical knowledge with analysis of real kindergarten spaces. It began with a wide-ranging review of the subject literature, encompassing a search of sources available on academic platforms and online repositories. This stage aimed to identify the key spatial parameters influencing children's development. The second phase of the research involved an analysis of ten newly built public kindergartens in Warsaw against the established criteria. The findings may be regarded as a first step towards identifying design gaps and outlining directions for potential systemic changes that may be relevant to design practice.

State of research

The importance of thoughtful spatial design for children was emphasised by pioneers of educational methods such as Heinz Werner, Jean Piaget, Johann Heinrich Pestalozzi, and Maria Montessori at the beginning of the 20th century. However, the findings and observations of practitioners did

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not receive empirical validation until the 1980s. It was then that the first studies emerged confirming that the physical environment influences children's emotional, social, and cognitive development (Moore 1986). This thesis has been confirmed on numerous subsequent occasions. As Helen Knauf has observed, the physical environment is today widely described as the “third teacher”, and the architecture of space is an important element of education (2019). The younger the child, the stronger the connection between motor and cognitive development. The role played by the surrounding environment, as well as the opportunities and challenges it contains, is crucial in early childhood education (Berris, Miller 2011).

Many researchers emphasise the importance of appropriate organisation of the kindergarten classroom for the optimal development of the children who occupy it. An appropriately designed space can support young users at individual stages of development and help them to reach their full potential (Acer et al. 2016). For example, when activity corners are clearly delineated and well defined, children engage more readily and independently without adult assistance (Moore 1986). A key element of the kindergarten classroom is the appropriate spatial division into zones, which should include areas for play, learning, relaxation, and undefined (or flexible) open space (Brown, Burger 1984).

Among the most important parameters of the kindergarten classroom is the ratio of classroom area to the number of occupants. On average, this should be no less than 3 m² per child (Acer et al. 2016). Equally important is adequate daylighting of the interior. The literature highlights the advantages of natural lighting, which has a positive effect on children's mood and behaviour, as well as its limited bactericidal effect (Terczyńska 2021). Another significant parameter is the visual connection of the interior with outdoor greenery through low-set windows and direct access to a garden (Schutte, Torquati and Beattie 2017). Research findings also indicate that introducing plants, solid wood elements, and soft materials such as cushions, pouffes, or mattresses into the classroom has a beneficial effect on the wellbeing of its occupants (Hanták, Končėková 2023; Mohidin, Ismail and Ramli 2015).

The development of the Childcare Physical Environment Rating Scale (CPERS) by Gary T. Moore and Takemi Sugiyama represented an important step in the assessment of educational space quality (2007). This scale enabled the assessment and comparison of facilities in terms of their environmental and spatial qualities – aspects that were practically absent from other quality assessment tools available at the time. Building on the CPERS scale, the Visual Environment Analysis was developed, which involves the detailed mapping of kindergarten interiors in their existing state and the analysis of their spatial characteristics in order to identify ways in which these spaces could function more effectively (Knauf 2019).

Some researchers have proposed systematising a list of characteristics and parameters considered most important for children's development and behaviour. Konstantina Rentzou identified such factors as: school size, number of children per square metre, spatial organisation (zoning), furniture and equipment, availability of spaces for individ-

ual work, ceiling height, colours, and noise levels (2014). In Poland, Ewa Terczyńska developed a classification of factors influencing the character of a place, including: intimacy and sense of security, ease of movement and orientation in the surroundings, quality of lighting, acoustic quality, climatic quality, aesthetic impressions, spatial arrangement, and the manner of spatial differentiation (2021).

Methods

Selected spatial parameters

On the basis of the literature review, a checklist of architectural parameters was compiled to serve as a framework for assessing kindergarten classrooms. The review identified 15 spatial parameters that appeared most frequently in the analysed sources or were supported by compelling empirical evidence. For greater clarity, these were grouped into three thematic categories: architecture, equipment, and interior design. For each selected parameter, specific assessment criteria were defined on the basis of the literature reviewed.

Legal context

Prior to assessing kindergarten classroom spaces against the listed parameters (Table 1), a review was also conducted of the applicable legal and technical regulations governing preschool establishments in Poland. These requirements derive from the Building Law Act (Ustawa... 1994), the Regulation on Technical Conditions (Rozporządzenie... 2002), the Regulation on the Conditions for Operating Kindergartens (Rozporządzenie... 2017), sanitary regulations (Rozporządzenie... 1997), and fire protection regulations (Rozporządzenie... 2010). Additionally, in May 2021, the Capital City of Warsaw issued a set of design standards and tools for the shaping of functional, flexible, pro-ecological, and inclusive school and kindergarten architecture, entitled “Szkoła dobrze zaprojektowana” [Well-Designed School] (Zarządzenie... 2021). This document serves as a source of knowledge on the expectations of local authorities regarding newly established facilities and was used as a reference point in the analysis. It should be noted, however, that given the construction timeline of the selected buildings, it may be assumed that all of them were designed prior to the publication of the guide.

Field research process

The field research focused on public kindergartens built in the last decade and located in Warsaw. The capital, owing to its intensive recent investment in educational infrastructure, provided a sufficiently large and stimulating research context, not least because of the relatively high quality of its public architecture. The ten-year period was adopted as the boundary enabling the capture of contemporary design approaches. Sample selection was exploratory in nature and was constrained by the availability of facilities for which consent to conduct research was obtained from district offices and the management of individual kindergarten establishments. During the period under consideration,

Table 1. Summary of spatial parameters conducive to the development and proper functioning of children
(elaborated by M. Neumann, A. Krupa)

Tabela 1. Zestawienie parametrów przestrzennych sprzyjających rozwojowi i prawidłowemu funkcjonowaniu dzieci
(oprac. M. Neumann, A. Krupa)

Parameters		Description	Source	To determine	Research process
ARCHITECTURE	Density	Density, i.e., the number of children, has a significant impact on their group behaviour. Excessive density leads to more frequent aggressive and destructive behaviour.	Moore (1986); Şahin, Dostoğlu (2016)	What is the number of children and teachers? What is the room area? What is the ratio of children to floor area?	1. Environmental survey 2. Measuring the classroom 3. Determining the ratio of children per m ²
	Zoning	Zoning enhances the quality and complexity of play, extends engagement time, and strengthens concentration and interest. It comprises: a play zone, a learning zone, a relaxation zone, an intimate space, and an undefined (open) space.	Brown, Burger (1984); Rentzou (2014)	Can zones be distinguished and which ones? What part of the space remains undefined?	1. Identifying zones, taking basic measurements and photographs 2. Marking zones on the floor plan 3. Determining the number of zones
	Spatial layout	Children are more inclined to engage in various activities in an open space that provides good visibility of individual activity corners. Significant visual barriers limit opportunities for collaborative play and hinder spontaneous interaction.	Legendre (1999); Moore (2002)	How are individual zones delineated? Are they open, semi-open, or closed? Are there significant visual barriers?	1. Checking whether the zoning criterion is met; if so: 2. Determining whether individual zones are open, partially open, or closed to the undefined (open) space 3. Identifying visual barriers 4. Marking on the floor plan 5. Preparing a photographic inventory
	Natural daylighting	The benefits of natural lighting should be maximised, as it has a positive effect on mood, behaviour, and concentration, and has a bactericidal effect. It is desirable for daylight to enter from more than one direction to avoid strong contrasts.	Sanoff (1995); Terczyńska (2021)	What is the ratio of window area to floor area, and what is the distance from the window to the furthest point in the room?	1. Calculating window area 2. Checking the distance from windows to opposite walls
	Variable ceiling height	Changes in ceiling height make children experience the space as more welcoming and conducive to cooperation, naturally encouraging them to engage more frequently in collaborative activities and cooperative play.	Read, Sugawara and Brandt (1999)	Is there a difference in ceiling heights? If so, what is the height difference and over what area?	1. Measuring ceiling heights and their areas
	Functional and visual connection between interior and exterior	A functional and visual connection between the classroom and the outdoor space promotes children's motor development, supports brain activity, and ensures better oxygenation. Large glazed surfaces, low-set windows, and direct access to a terrace, garden, or playground make the outdoor zone an extension of the classroom.	Moore (2002)	Is there a view from inside the classroom to an outdoor play/learning area? What design treatments were used to strengthen the interior–exterior relationship?	1. Photographic inventory 2. Determining whether there is a view from inside to an outdoor play/learning area 3. Determining whether and what design treatments were used to strengthen the interior–exterior relationship

Table 1 cont. Summary of spatial parameters conducive to the development and proper functioning of children
(elaborated by M. Neumann, A. Krupa)
Tabela 1 cd. Zestawienie parametrów przestrzennych sprzyjających rozwojowi i prawidłowemu funkcjonowaniu dzieci
(oprac. M. Neumann, A. Krupa)

Parameters		Description	Source	To determine	Research process
EQUIPMENT	Multi-functional equipment	Children's sensory and creative development can be supported through the flexible shaping of the educational space, adapted to their individual capabilities. Mobile and multi-functional equipment promotes the creation of an environment that stimulates imagination and activity.	Şahin, Dostoğlu (2016)	Is there equipment with variable functions? In what way can it be changed? Is it used in accordance with its intended purpose?	1. Photographic inventory 2. Marking on the floor plan 3. Determining how these elements can change 4. Asking the caregiver whether they are used in a positive way
	Equipment supporting motor development	Access to equipment supporting gross motor development – both indoors and outdoors – encourages children to be more physically active. This favours the importance of physical fitness and strengthening their sense of agency.	Maxwell (1996)	Are there items of equipment in the classroom that support motor development, e.g., for climbing or pulling up? How and whether children use them?	1. Identifying equipment supporting motor development 2. Marking on the floor plan 3. Photographic inventory 4. Asking the caregiver whether they are used in a positive way
	Presence of soft elements	The use of materials and furnishings such as carpets, cushions, and upholstered seating in the kindergarten classroom increases the comfort of the space, improves acoustics, and promotes a sense of safety and cosiness.	Mohidin, Ismail and Ramli (2015)	Are there soft elements such as carpets, sofas, pouffes, or cushions? If so, what kind?	1. Photographic inventory 2. Marking on the floor plan
	Presence of wooden elements	Introducing solid wood furnishings and detailing to the classroom – with which children have visual, tactile, and olfactory contact – has a beneficial effect on their emotional and physiological wellbeing, and supports the creation of an inclusive environment for all children, regardless of their abilities and limitations.	Hanták, Končėková (2023)	Are there solid wood elements? If so, what kind?	1. Photographic inventory 2. Marking on the floor plan

Parameters		Description	Source	To determine	Research process
INTERIOR DESIGN	Access to greenery	The opportunity for children to have daily contact with the natural environment, such as a garden, a playground with vegetation, or green areas in the immediate vicinity of the kindergarten, supports concentration, self-regulation processes, and attentional recovery.	Schutte, Torquati and Beattie (2017); Faber Taylor, Butts-Wilmsmeyer (2020)	Is there a view of greenery from the kindergarten classroom? What plants are present in the classroom? How can access to greenery be rated on a scale from 0 to 5?	1. Photographic inventory 2. Determining whether there is a view of greenery from inside 3. Inventory of indoor plants – marked on the floor plan 4. Rating access to greenery on a Likert scale
	Layout flexibility	The ability to transform space, furnishings, and materials by moving or combining them promotes children's experience of environmental variability, stimulates imagination, supports creative thinking, and encourages the development of new solutions and approaches.	Rentzou (2014); Şahin, Dostoğlu (2016)	Do the classroom furnishings consist of permanently fixed elements or movable furniture? What is the degree of layout flexibility on a scale from 0 to 5?	1. Photographic inventory 2. Marking elements (fixed/movable) on the floor plan 3. Determining the degree of spatial flexibility 4. Asking whether, how, and how often the space is rearranged
	Spatial definition	Clear delineation of activity zones promotes more frequent, more positive social interactions among children, based on cooperation rather than competition or aggression.	Moore (1986)	How can the kindergarten classroom be rated in terms of spatial definition on a scale from 0 to 5?	1. Photographic inventory 2. Rating the degree of spatial definition on a Likert scale
	Attractiveness, cosiness and "home-like" atmosphere	The classroom space should be attractive, evoking in the child a sense of security and associations with something familiar and welcoming.	Rentzou (2014)	How can the kindergarten classroom be rated in terms of attractiveness, cosiness, and a "home-like" atmosphere on a scale from 0 to 5?	1. Photographic inventory 2. Rating attractiveness, cosiness, and „home-like” atmosphere on a Likert scale
	Balanced colour palette	The colour palette in the kindergarten classroom should be balanced – an excess of white and monochromatic shades may cause tension, while an overabundance of colour leads to sensory overstimulation. As a base, warm natural skin or sand tones are recommended, supplemented by considered colour accents that organise and enliven the space.	Gaines, Curry (2011)	What colours/shades appear in the classroom on walls, floors, and ceilings? How can the degree of colour palette balance be rated on a scale from 0 to 5?	1. Photographic inventory 2. Preparing a colour scheme for the classroom 3. Rating the balance of the colour palette on a Likert scale

21 capital-city kindergartens were built and commissioned, but the final research sample comprised 10 facilities located in the districts of: Włochy, Żoliborz, Wola, Wawer, Targówek, Praga-Północ, and Wilanów¹.

¹ Kindergartens nos: 183, 424, 426, 427, 432, 433, 437, 440, 443, and 446.

In each of the studied kindergartens, designated BT01 through BT10, an on-site inspection was carried out involving observation, photographic inventory, and measurements of a typical classroom for that kindergarten, as indicated by the management. Kindergarten classrooms exhibit a high degree of repetition – they have similar spatial layouts, interior character, and equipment within a single building – so selecting a place for research was not a prob-

lem for the staff. The research was conducted by one team member performing the tasks described in the “Research Process” column (Table 1). An additional element of the research was a supplementary interview conducted with the management or teachers in order to specify certain information in detail, e.g., the availability of soft elements or the number of children in a group.

On the basis of the collected materials, building data sheets were prepared (Fig. 1), comprising floor plans, photographic documentation, and an assessment of selected parameters. In the case of features that are difficult to subject to dichotomous assessment, a five-point Likert scale was used, based on the subjective perception of the researcher. Values of 0 and 5 points corresponded to two extreme levels of criterion fulfilment. For example, for the parameter “attractiveness, cosiness, and ‘home-like’ atmosphere”, a score of 0 indicates the absence of elements such as soft furnishings, plants, decorations, or children’s artwork, resulting in a neutral, unfamiliar character of the space. Intermediate values (2–3 points) indicate the presence of at least two of the listed elements, while a score of 5 corresponds to their clear diversity and accumulation, conducive to the creation of a home-like atmosphere.

The building data sheets provide a concise characterisation of each of the analysed preschool classrooms, being at the same time a base for assessing the degree of fulfilment of individual criteria in the parameter summary (Table 1).

They were prepared by one of the researchers and subsequently formed the basis for discussion and the formulation of a joint final assessment of each parameter by both authors. The compilation was designed with the assumption that the analysis would be conducted by persons with architectural training and design experience, since some parameters required expert assessment. Both researchers are competent in this field, with five and ten years of professional practice respectively. Furthermore, the preparation of building data sheets was an attempt to ensure transparency and to enable scrutiny of the basis for decisions made and assessments given.

Limitations

The empirical research conducted was primarily exploratory in character and may be regarded as a first step towards broader analyses of the quality of contemporary kindergartens in Poland. This gives rise to several limitations. The first is reliance on the opinions of only two experts, which introduces an element of subjectivity and personal perception on the part of the researchers, despite an attempt to apply standardised assessment criteria. The second is the uncontrolled selection of the research sample, which was based on availability – i.e., consents obtained – rather than a precise selection procedure. Furthermore, none of the studied kindergartens were designed after the publication

BT01 - BUILDING DATA SHEET

(01) FLOOR PLAN

(02) WALL ELEVATIONS

WARSAW - WŁOCHY DISTRICT

25 children
64,5 m²
Room height: 3m
Window area: 16,25 m²

(03) ZONING

(04) FUNCTIONAL AND VISUAL CONNECTION BETWEEN INTERIOR AND EXTERIOR

(05) ACCESS TO GREEN SPACE

0 1 2 3 4 5

(06) FLEXIBILITY OF ARRANGEMENT

0 1 2 3 4 5

(07) SPATIAL DEFINITION

0 1 2 3 4 5

(08) ATTRACTIVENESS, COSINESS AND "HOME-LIKE" ATMOSPHERE

0 1 2 3 4 5

(09) BALANCED COLOUR PALETTE

0 1 2 3 4 5

Fig. 1. Building data sheet – template (elaborated by M. Neumann, A. Krupa)

Il. 1. Wzór karty obiektu (oprac. M. Neumann, A. Krupa)

of “Szkoła dobrze zaprojektowana” (Zarządzenie... 2021), meaning that this analysis does not account for the influence of that guide on spatial quality.

The identification of these shortcomings provides a good starting point for further research. In future analyses, it would be advisable to expand the qualitative component – in particular to include in-depth interviews with teaching staff and users – as well as to involve a greater number of experts and to extend the research sample in terms of construction period and location.

Results

The results of the analysis of building data sheets are presented in Table 2, in which fulfilment of a given criterion by individual classrooms is indicated by a plus sign. Despite the limitations mentioned above, the data obtained allow for the identification of dominant design tendencies, showing which architectural aspects are systematically taken into account in the design process and which are marginalised. The degree of fulfilment of the adopted criteria for individual kindergartens ranges between 3 and 10 out of 15 parameters, with an average of 5.7.

The assessment of individual items is presented in the form of bullet points below.

1. Architecture parameters.

Density – in eight out of ten analysed classrooms, the maximum permissible group size of 25 children was recorded. Only three classrooms meet the standard of 3 m² per child recommended in the literature (BT03, BT04, BT10). The remaining facilities mostly correspond to the minimum indicator of 2.5 m² recommended for new developments, while two classrooms have an indicator of 2.35 m². Given the considerable floor area of the classrooms (an average of 67.8 m²), it may be concluded that the problem lies not in insufficient floor area but in group size.

Zoning – the functional layout of classrooms in all analysed kindergartens is similar, consisting of three basic zones: a didactic zone (with tables), a didactic-play zone (carpet), and an area of indeterminate purpose between them. In three of the ten classrooms, a relaxation zone was additionally identified, enabling these spaces to meet the adopted criterion (BT04, BT06, BT07).

Spatial layout – the majority of classrooms are characterised by an open, rectangular plan without delineated semi-open zones. Exceptions include: a classroom with an irregular shape (BT04) and a classroom with a delineated relaxation zone (BT06).

Natural daylighting – in the majority of analysed kindergarten classrooms, the ratio of window area to room area is higher than the required 1:5. At the same time, only two classrooms (BT01, BT04) met the criterion for the maximum distance to the opposite wall (< 7 m). In many cases, a single large window was placed on the shorter wall, which limits the depth of daylight penetration and leads to a requirement for constant use of artificial lighting. The key problem proves to be the uneven distribution of natural light in the classroom space.

Variable ceiling height – variation in ceiling height was recorded in only one classroom (BT04), where in the

semi-open zone the ceiling was lowered by approximately 80 cm, probably in order to conceal technical installations rather than as a deliberate design choice. Despite this, the area naturally functions as a zone with a somewhat distinct character. It was also noted that all analysed rooms have a ceiling height of at least 3 m, which exceeds the statutory minimum of 2.5 m and appears appropriate to the room size.

Functional and visual connection between interior and exterior – the great majority of classrooms afford a view of a green garden or terrace (all except BT09). The interiors were designed to emphasise the connection with the surroundings – most commonly through low-set windows or direct access to a patio.

2. Equipment parameters.

Multi-functional equipment – no elements with an adaptable function were identified in any of the analysed classrooms. These do not constitute a standard feature of kindergarten equipment, which may be attributable both to their limited availability and to management preferences for readily available, certified furniture with a clearly defined function.

Equipment supporting motor development – no permanent equipment for motor development was found in the analysed classrooms. In one case, such items were stored in a storeroom; in the others, they were located in separate multi-purpose rooms. This approach is consistent with the traditional model of preschool education, in which physical activity takes place at designated times and places, and the presence of physically engaging elements in classrooms might disrupt the daily routine.

Presence of soft elements – the presence of such elements in the classrooms is limited and amounts to a carpet and, at most, a few cushions or pouffes. Their impact on sensory experience is negligible, particularly as some are made available only occasionally, for example at children's request. Only in three classrooms (BT06, BT07, BT09) was a permanent area with a sofa or nap cot identified, enabling them to be considered as meeting the criterion for the presence of soft elements in a measure capable of influencing children's perception and behaviour.

Presence of wooden elements – the level of criterion fulfilment is very low. Elements made of natural wood were found in only one classroom (BT06), in the form of plywood chairs. In the remaining spaces, laminate furniture imitating wood predominates, along with flooring or panels featuring a wood-grain pattern, which – owing to their different texture, manner of reflecting light, and thermal conductivity – are not classified as wooden materials. The limited presence of wooden elements is probably attributable to their higher cost and the limited availability and variety of such items in the market offering intended for educational establishments.

3. Interior design parameters.

Access to greenery – eight out of ten analysed kindergartens meet the criterion for access to greenery, primarily through a visual or direct connection with a garden (BT01, BT02, BT03, BT06, BT07, BT08, BT09, BT10). This applies also to facilities in dense urban developments. Potted plants inside kindergarten classrooms have a lesser effect.

Table 2. Degree of compliance with parameters by the surveyed kindergartens (elaborated by M. Neumann, A. Krupa)
 Tabela 2. Stopień spełnienia wybranych parametrów przestrzennych przez badane przedszkola (oprac. M. Neumann, A. Krupa)

Parameters / building data sheet	Criterion requirements	BT01	BT02	BT03	BT04	BT05	BT06	BT07	BT08	BT09	BT10
		classroom area > 3 m ² per child	at least 4 different zones present	open or semi-open activity zones without significant visual barriers	window-to-floor ratio $\geq 1:5$ and furthest point from window ≤ 7 m	ceiling height difference ≥ 80 cm over an area ≥ 2 m ²	view of a play/learning area from the classroom; one of the following design treatment procedures implemented: large glazing, low sill, or direct outdoor access	at least one item of adaptable equipment with a positive assessment by the caregiver	at least one item supporting motor development with a positive assessment of the caregiver	soft elements present to a degree that may influence children (own assessment)	solid wood elements present to a degree that may influence children (own assessment)
ARCHITECTURE	Density	2.58 (-)	2.80 (-)	3.03 (+)	3.30 (+)	2.35 (-)	2.66 (-)	2.74 (-)	2.35 (-)	2.86 (-)	3.13 (+)
	Zoning	(-)	(-)	(-)	(+)	(-)	(+)	(+)	(-)	(-)	(-)
	Spatial layout	(-)	(-)	(-)	(+)	(-)	(+)	(-)	(-)	(-)	(-)
	Natural daylighting	1:4.6 distance from the window: 6.23 m (+)	1:2.6 distance from the window: 7.32 m (-)	1:4.7 distance from the window: 8.02 m (-)	1:4.3 distance from the window: 6.2 m (+)	1:4.4 distance from the window: 9.62 m (-)	1:4.1 distance from the window: 8.7 m (-)	1:4.6 distance from the window: 9.6 m (-)	1:5.6 distance from the window: 8.7 m (-)	1:5.3 distance from the window: 6.5 m (-)	1:6.7 distance from the window: 7.8 m (-)
	Variable ceiling height	(-)	(-)	(-)	(+)	(-)	(-)	(-)	(-)	(-)	(-)
	Functional and visual connection between interior and exterior	(+)	(+)	(+)	(+)	(+)	(+)	(+)	(+)	(-)	(+)
EQUIPMENT	Multi-functional equipment	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)
	Equipment supporting motor development	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)
	Presence of soft elements	(-)	(-)	(-)	(-)	(-)	(+)	(+)	(-)	(+)	(-)
	Presence of wooden elements	(-)	(-)	(-)	(-)	(-)	(+)	(-)	(-)	(-)	(-)

Parameters / building data sheet	Criterion requirements	BT01	BT02	BT03	BT04	BT05	BT06	BT07	BT08	BT09	BT10
INTERIOR DESIGN	Access to greenery	3.25 (+)	3.5 (+)	3 (+)	1.5 (-)	2 (-)	3 (+)	3 (+)	3 (+)	2.5 (+)	2.5 (+)
	Layout flexibility	3.75 (+)	4 (+)	3 (+)	2.5 (+)	2.5 (+)	2.75 (+)	2.75 (+)	2.5 (+)	2.5 (+)	2.5 (+)
	Spatial definition	1.75 (-)	2 (-)	2 (-)	3 (+)	1.5 (-)	3 (+)	2.5 (+)	1.5 (-)	1.5 (-)	1.5 (-)
	Attractiveness, cosiness and "home-like" atmosphere	1.5 (-)	2.5 (+)	1.5 (-)	3 (+)	1.5 (-)	3.25 (+)	2.25 (-)	1.5 (-)	2 (-)	1.5 (-)
	Balanced colour palette	4.5 (+)	3.25 (+)	3.75 (+)	3.25 (+)	3 (+)	4.25 (+)	2.75 (+)	3.5 (+)	2.25 (+)	3.5 (+)
Number of criteria met		5/15	5/15	5/15	10/15	3/15	10/15	7/15	4/15	3/15	5/15

In some facilities, they are entirely absent (BT01, BT06, BT08, BT10) or present as a single plant (BT05).

Layout flexibility – Likert scale scores fall within the range of 2.5–4 points, indicating fulfilment of the flexibility criterion in all analysed classrooms. Some teachers declare periodic modifications to the functional layout in order to optimise and diversify the conduct of classes. It is worth noting, however, that changes to the functional layout are introduced exclusively by staff, whereas the literature holds that active participation by children in adapting the space should be possible.

Spatial definition – in the analysed classrooms, spatial zoning is based primarily on the arrangement of furniture and a carpet, with the infrequent use of typical dividing elements such as curtains, shelving, or mobile partitions – as recommended, inter alia, in the "Szkoła dobrze zaprojektowana" guide (Zarządzenie... 2021). Zones are also not delineated by changes in colour or finish. Only three kindergarten classrooms exceed the threshold value of 2.5 points on the Likert scale (BT04, BT06, BT07).

Attractiveness, cosiness and "home-like" atmosphere – the adopted criterion was met in only three of the ten analysed classrooms (BT02, BT04, BT06). The maximum score achieved (3.25 points) indicates a generally low level of realisation. In many cases, the interiors give the impression of office-like spaces, an effect reinforced by the presence of suspended exposed grid ceilings with fluorescent lighting. Elements that build a domestic atmosphere, such as potted plants or decorations, appear sporadically.

Balanced colour palette – the colour schemes of the analysed kindergarten classrooms are generally muted, kept in greys or pastels. Vivid colour accents appear typically on one – at most two – surfaces and are balanced by a neutral background; for example, the intensity of the floor colour is softened by a grey carpet, light-coloured walls, ceiling, and furniture in wood tones. An exception is classroom BT09, which showed a lack of colour coherence between the furniture, the carpet, and the wall decorations. In the remaining kindergartens, parameter scores fall within the range of 2.25 to 4.5 points, indicating a moderately high level of criterion fulfilment.

Identification of gaps and good practices

In the analysis of fulfilment of individual criteria, the poorest performance relates to the equipping of the spaces. The absence of multi-functional elements and equipment supporting motor development may be a consequence of the traditional model of preschool education, in which such activity is confined to designated spaces such as gymnasiums. In day-to-day practice, staff therefore do not perceive a need for these elements to be present directly in the kindergarten classrooms. Analysis of the materials used, on the other hand, reveals a marked deficit in natural elements – particularly conspicuous is the absence of wooden flooring or furniture. Surfaces made of synthetic materials predominate – and this applies to both hard elements and soft elements such as pouffes, which are frequently covered in impermeable, synthetic fabrics with an unpleasant texture.

The result is a general lack of material and tactile diversity. The limited number of clearly defined relaxation areas may be directly related to the low ratings of qualities such as attractiveness, cosiness, and a homelike atmosphere. Despite the presence of new furniture and a coherent, balanced colour scheme, the overall aesthetic effect is sometimes reminiscent of office spaces. This impression is heightened by the presence of fluorescent lighting and standard suspended exposed grid ceilings, which further weaken the sense of cosiness and individual character of the interior.

In spatial terms, the analysed classrooms display a high degree of similarity. They have been designed according to a repeating scheme: rectangular in plan, with an equal ceiling height and a similar functional layout. The space has not been clearly divided into zones – beyond what results from the arrangement of furniture – and this limits the possibilities for varied perception and use of the interior. There is also a lack of more subtle means of organising space, such as changes in colour scheme, materials, or sectional ceiling lowering.

Significant deficiencies were also noted in the design of natural daylighting, despite its important direct effect on the wellbeing of users and its indirect effect on many other assessed parameters – from the perception of spaciousness, through the shaping of the functional layout, to the perception of the interior's colour scheme and the relationship with nature outdoors. Some of the studied kindergarten classrooms, though designed in compliance with applicable law², do not provide optimal lighting conditions for children. The provision for a minimum window-to-room area ratio of 1:8 seems insufficient for kindergarten classroom space. There is also a lack of standards addressing uniform, multidirectional daylighting and the appropriate orientation of windows in relation to the cardinal directions.

Although the analysis conducted reveals primarily significant deficiencies, examples of good practice are also discernible, as are areas to which designers and decision-makers have paid appropriate attention. One positive aspect is the provision of visual and functional contact with the surrounding greenery, achieved through the use of low-set windows and direct access to a patio – a solution found in almost all studied classrooms located on the ground floor. Although actual use of these exits depends on the internal regulations of individual facilities, the very possibility of their use represents a valuable potential. Another favourably assessed aspect is the flexibility of the spatial layout. Thanks to their dimensions, the classrooms enable a variety of organisational arrangements, affording the possibility of adaptation to changing needs. Although the current number of children – most commonly the maximum of 25 – may be considered high, in the context of the ongoing demographic decline, it is anticipated that these spaces will in future be better suited to smaller groups, which will translate into more comfortable conditions for use. Also worthy of note is the selection of interior colour schemes. The use of subdued tones creates a calm, neutral background that does

not compete with children's activity, while at the same time promoting concentration and a sense of aesthetic order.

Conclusions

On the basis of the research conducted, it may be stated that newly built kindergartens in Warsaw are characterised by a similar, though relatively low, level of fulfilment of the selected spatial parameters. Kindergarten classrooms display a high degree of homogeneity – they have comparable potential but also recurring limitations, which result from the design, material, and layout solutions adopted.

The few differences between individual classrooms emerge primarily in the manner of their spatial configuration. Geometry and daylighting have a considerable effect on the comfort of use and the atmosphere inside. The more varied the shape of the classroom, the greater its potential for creating distinct and functional zones. In the few cases where the rectangular floor plan was abandoned, the space was more clearly defined, which facilitated the organisation of children's activities. The niches that arise are naturally adapted as relaxation zones or reading corners. Differences in ceiling height play a similar role. This subtle architectural intervention supports the intuitive allocation of functions to specific areas within the interior. The location of windows and the positioning of adjacent terraces are also of significance – they affect not only access to daylight but also the manner of arranging the walls on the interior side, and thus the flexibility of classroom use.

The economic factor has a primary influence on decisions regarding the finishing and equipping of kindergarten classrooms, and is clearly discernible in many of the studied projects. Within a constrained budget, there is little room for unconventional solutions, and practical considerations tend to take precedence over how a material is perceived by children. A case in point is the widespread use of linoleum, which is characterised by its low cost and lack of maintenance requirements. Wooden flooring is no longer used, although experience from kindergartens of the 1960s – in which parquet flooring was commonly used – shows that despite the passage of time and intensive use, this material retains its durability and unique character. Moreover, it contributes to the creation of a warm, domestic atmosphere in the interior. A similar significance may be attributed to the use of high-quality wooden and upholstered furniture, which would additionally serve to organise and zone the space. The incorporation of even one prominent finishing feature made from natural materials, such as built-in furniture, wall cladding, or timber flooring, can enhance the visual character of an interior while substantially improving the quality of the user experience.

The quality of designed natural daylighting in kindergarten classrooms appears to be an urgent concern. In many existing projects, these solutions give rise to serious misgivings, clearly indicating the need for more ambitious legal regulations guaranteeing children appropriate conditions for daily functioning and development. These regulations should above all specify a greater minimum share of glazed surfaces relative to floor area (e.g., in a ratio of 1:4) and require even distribution of windows so that natural

² Current regulations specify a minimum window-to-room area ratio of 1:8 and a required insolation period of at least 3 hours on equinox days, between 08:00 and 16:00 (§ 57 i § 60, Rozporządzenie... 2002).

light can reach the entire classroom³. These requirements would also need to be supplemented by an obligation to use effective solar shading systems and to design appropriate – ideally intelligent – artificial lighting that would work in harmony with daylight. Similar regulations are needed regarding room height. The minimum value specified by current regulations – 2.5 m – seems insufficient in relation to the typical area of kindergarten classrooms. Fortunately, in practice, designers and investors often demonstrate greater spatial sensitivity and appropriately adjust interior height to their scale and function.

Summary and recommendations

The kindergarten classroom is a spatial unit of unusual scale and character. Although formally classified as a single room, its size – up to 80 m² – and multi-functionality indicate the need for a more complex design approach than it is the case for other rooms of simpler function. The analysis conducted once again underlines the need for a more conscious and careful creation of kindergarten spaces by designers, investors, and kindergarten management. It is

worth noting, however, that most of the identified issues are systemic in nature and could be mitigated through amendments to, or greater specification of, building regulations. Key actions appear to be needed in three areas: more varied spatial configuration, conscious selection of materials, and ensuring high-quality environmental conditions, particularly with respect to natural daylighting.

In the face of the challenges of contemporary early childhood education and the developmental needs of the youngest users, an approach is advocated that integrates functional, aesthetic, and emotional aspects in the design as inseparable elements of a well-planned space. Broader research encompassing a greater number of projects is necessary, enriched by a qualitative component and the involvement of a larger and more varied group of experts. A valuable continuation of the current research would be an analysis of more recently built kindergartens designed using the objectives from the “Szkola dobrze zaprojektowana” guide (Zarządzenie... 2021). The conclusions drawn from a comparison of the influence of such publications on the quality of kindergarten spaces could contribute to the formulation of specific guidelines for systemic changes.

³ Interestingly, highly precise and high-quality guidelines similar to those proposed here appeared in a pre-war document on the arrangement of kindergartens (Mączyński 1935).

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Streszczenie

Standardy architektoniczne przedszkoli publicznych w Warszawie a projektowanie wspierające rozwój dzieci

Środowisko i przestrzeń, w których dzieci spędzają większość czasu, odgrywają kluczową rolę w ich rozwoju emocjonalnym, społecznym i poznawczym. Chociaż autorzy licznych opracowań teoretycznych podkreślają znaczenie przestrzeni w edukacji wczesnoszkolnej, nadal brakuje dogłębnych badań dotyczących rzeczywistej jakości architektury współczesnych przedszkoli w Polsce.

Celem autorek artykułu była ocena jakości przestrzeni współczesnych sal przedszkolnych w Warszawie w oparciu o parametry uznane przez badaczy za sprzyjające rozwojowi i dobremu samopoczuciu dzieci. W pierwszym etapie pracy przeprowadziły one szczegółowy przegląd literatury przedmiotu w celu zidentyfikowania piętnastu cech jakościowych przestrzeni. Drugi etap to badania dziesięciu sal przedszkolnych w nowo wybudowanych przedszkolach publicznych w Warszawie. Rezultatem opisanych prac była ocena stopnia implementacji założeń teoretycznych w badanych obiektach, gdzie średnio zostało spełnionych 5,7 na 15 parametrów. Przeprowadzone badania można traktować jako pierwszy krok w kierunku identyfikacji luk projektowych oraz zarysowania kierunków potencjalnych zmian systemowych, które mogą mieć znaczenie dla praktyki projektowej w skali całego kraju.

Słowa kluczowe: architektura przedszkolna, projektowanie dla dzieci, środowisko edukacyjne, edukacja wczesnoszkolna