

Exploring Design Characteristics in Kindergarten Interior Spaces: A Case Study in Ho Chi Minh City, Vietnam

An Nguyen Thi Tam^{1,*}, Eakachat Joneurairatan², Veerawat Sirivesmas³

¹Faculty of Interior Architecture, University of Architecture, HCMC, Vietnam

^{1,2,3}Faculty of Decorative Arts, Silpakorn University, Thailand

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Abstract

In recent years, the number of young children attending school has been increasing in Ho Chi Minh City, Vietnam (HCMC, VN). This growth has led to a substantial rise in the construction of kindergartens. However, the quality of these schools may vary due to multiple factors. As a result, it is essential to propose standardized design requirements to adapt the fundamentals of children's development and help to enhance children's experience within the kindergarten environment, with a particular focus on interior space where young children spend most of their school day. The primary aims of this paper are to explore key design characteristics in kindergarten interior space; and to understand educators' perspectives on the design requirements for optimizing learning interior space in kindergartens, focusing on the context of HCMC, VN. The methodology includes a literature review, case study analysis, and interviews with educators. As a result, the paper suggests that key design characteristics in kindergarten interior spaces should be prioritized during the design process to enhance the efficiency of learning environments and support children's developmental needs. Four main themes are identified: functional factors, aesthetic factors, psychological factors, and interactional factors. The outcomes of this study have benefits to various user groups and participants, including kindergarten policy makers, educators, architects, and interior designers, as well as the value of returning to the fundamentals of the educational goals through children's perceptual and physical interaction with the interior environment.

Keywords: Kindergarten Interior Space, Design Characteristics, Children's Development, Children's Experiences, Spatial Factors

* Corresponding Author; E-mail: an.nguyenthitam@uah.edu.vn

Introduction

Early childhood plays an important role in human life. The process of shaping how children move into adulthood is strongly impacted by what is learned and experienced in the formative years (Kaup et al., 2013). The environment of kindergarten or preschool, as the role of “third teacher” alongside parents and teachers (Reggio Emilia’s theory), can influence significantly children’s development, specifically physical – cognitive – and socio-emotional development. As a result, the school environment can either enhance or interfere with children’s daily activities through environmental interaction – what could be seen as a learning experience, both indoor and outdoor. Hence, the impact of interior space, as the role of the “father of design” (Caan, 2011), in kindergarten is not underestimated.

There are previous studies that mentioned the relationship between interior school space and children, such as color factors and children’s behavior or children’s preferences (Read, 2003; Read and Upington, 2009); Architecture and furniture design impact on children’s motor development (Scoditti et al., 2011); classroom’s spatial definitions and children’s behavior (Abbas et al., 2016); cultural determinants (Yalçın et al., 2017); material and non-material of the space and children’s learning (Gkloumpou, 2019); spatial form and children’s behavior (An et al., 2023). However, due to of important role of interior school space on children (Hussein et al., 2022). As the place they spend more than 8 hours per day, this topic requires further analysis and research to enhance the value of children’s school spaces and to provide interior designers with clear criteria in their designs. In this context, the key design characteristics of kindergarten interior spaces should have a deeper understanding and emphasized to investigate their impacts on children’s development, highlighting their essential role.

In Vietnam (VN), in recent years, the number of young children attending school has been increasing dramatically, specifically, the number of preschool students increased by 7,923 students in 2023 (Vietnam.vn, 2023). Particularly in HCMC, the increasing number is around 10,000 kindergarten children (TPHCM.chinhphu.vn, 2024). This has resulted in a shortage of kindergartens, leading to an increase in the new construction or renovation of kindergartens or childcare centers to meet the growing demands. However, in VN, there are still happening the condition of “*The investment, construction, renovation, upgrading, and certification of standard compliance for public preschools and general education schools in the area still face many challenges, difficulties, and obstacles, with slow progress that has not yet met development requirements*” (Vietnam News Agency, 2023). (Hanh, 2018) mentioned the poor general situation of play-learning space for kindergarten children in HCMC, including a shortage in the area, facilities, and equipment; rigid educational methods and teaching methods while increasing quantity and standards of children per class. It is highlighted that

only 30% of schools meet the standards for space and facilities without a unified according to regulations of the Ministry of Education and Training. Which, 60% of schools still use old materials and lighting systems. Meanwhile, it is indicated that the learning barriers such as impaired concentration of students can be created by poor quality environments, and students will be distracted by negative attributes in enclosed interior spaces. So, not a well-designed environment of kindergarten school can bring to negative effect on children's development and learning outcomes. In this context, the design quality of these kindergartens in Vietnam should have more studies. The need for well-designed interior spaces in kindergarten has become both urgent and essential.

The research question here is how to optimize the design of interior kindergarten space even in different conditions, such as the site of the building or budget. It is essential to know what are the key characteristics of interior design for kindergarten space and what the sub-core to make wise decisions. By prioritizing the integration of these key design characteristics, the kindergarten interior space can be improved to better support children's development and enhance their experiences in that space.

Research Objective

1. To identify the key design characteristics of kindergarten interior spaces.
2. To understand educators' perspectives on the design requirements for optimizing learning interior space in kindergarten interior spaces to support children's development and children's experience.

Research Methodology

Research Design

This study employed a qualitative research design using a case study approach. It combined a literature review, visual site analysis, and in-depth interviews to explore key design characteristics of kindergarten interior spaces and their implications for children's development. The case study focused on Maitri Kindergarten in Ho Chi Minh City, Vietnam.

Population and Sample

The population included stakeholders in kindergarten environments, particularly educators and designers. The sample was purposively selected and consisted of educators from Maitri Kindergarten, including the school's director, who is both an architect and Montessori-trained educator. The kindergarten was chosen due to its distinctive design and implementation of pedagogical principles.

Research Instrument

The research instruments included: (1) A structured interview guide covering aspects of interior space such as spatial function, form, color, material, furniture, and environmental conditions. (2) An observation checklist and photographic documentation tool for visual site analysis.

Data Collection

Data were collected through three main steps: (1) A literature review to identify existing theoretical frameworks and relevant design characteristics. (2) A visual analysis of the case study site, including spatial observation, photography, and mapping of interior features. (3) In-depth interviews with the director of the kindergarten to gain insights into educators' perspectives on the relationship between interior design and children's development.

Data Analysis

The data were analyzed using thematic content analysis. Responses from interviews were categorized based on recurring themes, which were then aligned with observations and findings from the literature. The results were synthesized into four main design characteristic themes: functional, aesthetic, psychological, and interactional factors.

Research Process

The research methodology of this paper includes three steps to address the research objectives, which are literature review; analysis of case study - the Maitri Kindergarten in HCMC, VN through space observation, taking photos, and visual analysis; and in-depth interview with educators.

1st step: Literature review

Previous studies mentioned the relationship between the kindergarten environment and children. Past research such as the kindergarten interior as an important factor for children's academic achievement (Bahauddin, 2011); children's psychological needs (Hassan et al., 2013); children's engagement (Aydoğan et al., 2015); to current research such as the healthy development of preschool children (Iliev and Domljan, 2021); children's creativity with environmental capabilities (Shahryari and Kasmaei, 2023); children's health, language, social, science, and art (Mei and Luen, 2023). The kindergarten environment could impact children's development, physical – cognitive – and socio-emotional development, leading to children's learning and environmental experiences. To develop children's physical skills, kindergarten spaces should be designed to support their movements (McLaren et al., 2023). Both gross motor skills, such as standing, walking, running, jumping, and maintaining balance, which involve large muscles, and fine motor skills that engage small muscles. Meanwhile, to enhance their cognitive skills, children need to have opportunities to discover, explore, interact, and experience their surrounding environment through sensory experiences and interaction (Anugrah and Lukman, 2020). Kindergarten spaces can enhance

children's socio-emotional development by promoting social interactions between children and their peers or between children and teachers through spatial organization, functional design, and furniture arrangement.

All spatial elements in the kindergarten interior can work together to influence the developmental process, either by targeting one developmental skill at a time or by addressing multiple skills simultaneously. It is important to be aware that children's development is holistic (Naeum, 2010). These three domains are interrelated, inseparable, and interdependent. Development in various areas occurs simultaneously, with each area influencing and being influenced by development in the others. This means that a well-designed and enriched space can have positive influences, while a poorly designed and inadequate space can have negative influences on children's development. These environmental and spatial interactions happen daily through 4-5 early years of children, unconsciously shaping young children's personalities.

Previous studies mentioned that some design requirements of kindergarten interior space should be adapted to children's development (Table 1).

Table 1 Requirements in kindergarten interior space. By Author

Authors	Characteristics requirements in kindergarten space	Promote Children's developmental needs
Reggio Emilia's theory	Amiable; Comfortable; Pleasing; Organized; Clean; Inviting; Engaging	Learning process
(Dinchisika, 2004)	The richness of content, Density, and Functionality; Openness and potential for Integration; Dynamics and Variability; Safety; Intimacy, and Credulity; Aesthetics	Personality development
(Naeum, 2010)	Security – a safe environment; Attention – to give and receive it; Sense of Autonomy and Control; Emotional intimacy; Feeling part of a wider community; Privacy; Sense of Status within social groupings; Sense of Competence and Achievement; Meaning and Purpose – which come from being stretched.	Socio-emotional needs
(Stonehouse, 2011)	Healthy and Safe, Engaging Empowering and Respectful Welcoming and Comfortable Encourage collaboration	Behavior and movements, Encouraging active involvement, Emotional development, and social interaction

Table 1 (Continue)

Authors	Characteristics requirements in kindergarten space	Promote Children's developmental needs
(Izadpanah, 2011)	Health; Comfort; Scale; Exploration; Sense of Control; Complexity; Safety; Privacy; Legibility; Flexibility	Stimulate children's exploration, experience, discover
(MENDEZ, 2017)	Flexibility; Comfort; Aesthetics; Learner Centered; Community Involvement; Encourage Independence; Creativeness; Combine digital and physical environment; Indoor-Outdoor contact	Holistic development Learning process
(Maxwell L. E., 2018)	Control; Privacy; Complexity; Exploration; Restoration, Personalization; Legibility	Social and physical skills
(Marta, 2023)	Safety, Ergonomic	Physical development

Table 1 highlights various characteristics in the design requirements of kindergarten interior spaces, from past to present, related to children's development needs. These characteristics often vary and sometimes overlap across different studies but all of them adapt children's needs to physical, psychological, and socio-emotional factors which link to the basic requirement in interior design of human triangle needs (Caan, 2011).

This literature review highlighted critical aspects of kindergarten interior space, including the design and various design characteristics of the physical areas aligned with the promotion of children's developmental needs. Which, results highlight some main factors are unified in space is that safety and health, engagement and stimulation, social interaction and flexibility, and aesthetic elements. It indicates that the crucial role of the kindergarten interior space requires more studies with deeper information focus on key design characteristics to adapt to the rapid changes of society as well as the evolving needs of younger generations.

In the context of kindergarten interior space, the updated research should not only focus on the relationship between kindergarten space and children but also should pay attention also the voices of stakeholders, teachers, and educators – to have a holistic view. Hence, it is essential to conduct research based on kindergarten site analysis and gather inputs from stakeholders. That's why, this paper employs a research method with the next two steps: visual analysis from a site visit to The Maitri kindergarten, located at District 2, HCMC, VN, and data analysis from in-depth interviews with educators at this place. This approach aims to observe how kindergarten interior design impacts children and to understand educators' perspectives on children's spatial experiences.

2nd step: Analysis Case study- The Maitri Kindergarten, District 2, HCMC, VN

The Maitri Kindergarten is located in District 2, HCMC, VN. It accommodates children aged 12 months to 6 years. The Maitri is a private school, following the pedagogy of Montessori which is quite popular in Vietnam. The specific site of Maitri is the total space of the school is closed plan on the ground floor of an apartment building. Maitri Montessori Kindergarten is around 100m² with around 30-35 children in all stages of ages (low density). The 100m² includes an indoor play yard, one kitchen, one restroom, sleeping areas, and two learning areas for 1-3-year-old children and 3-6-year-old children. Because of the limitation of location, Maitri preschool does not have outdoor large play yard compared to the above preschools (Figure 1).

Benefits: Low density (35 children in 100m²); one ground floor, no level, the centered plan so easy for observation, High ceiling for good ventilation, large windows

Limitation: Too high ceiling, the location of the restroom and kitchen is fixed due to the site of the building.

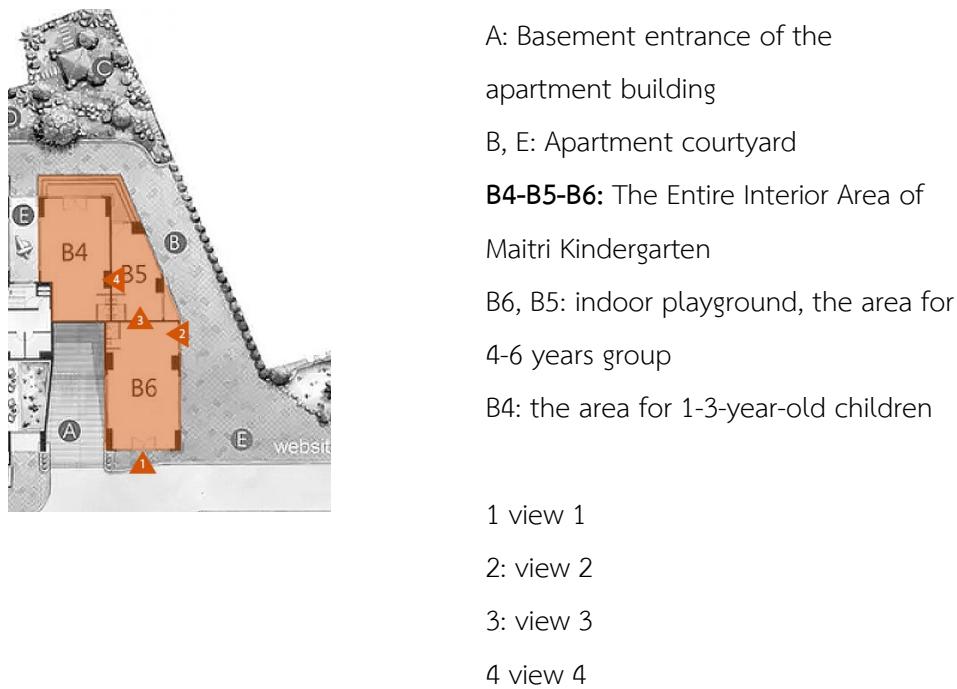


Figure 1 The Entire Interior Area of Maitri Kindergarten, Including B4, B5, and B6

In terms of spatial organization, there is an indoor playground in the interior space at the entrance, which creates a sense of welcoming and pleasantness. Functional areas are arranged by the content of Montessori with five different areas: Sensory perception, Language, Mathematics, Practical life, and Fifth field of other sciences. The Maitri interior space emphasizes openness, with few doors and minimal solid boundaries. Just two solid walls with strong colors divide three different

areas, space for welcoming with an indoor playground and learning space, space for a 1-3 years group, and a space for a 4-6 years group (Figure 1). It creates a sense of community involvement, promoting children's engagement and children's social interaction and collaboration between children and peers, children and teachers.

The Maitri interior space does not have a designated sleep area; instead, children can choose their sleeping spots. This creates a sense of spatial control for children, allowing them to feel confident in their spatial experiences and promoting curiosity in exploration.

The numerous large windows also foster a connection between indoor and outdoor environments for the children, not only with the natural environment to get natural lighting but also with the social environment. *“It is believed that large glass windows do not cause concern regarding children's concentration, as they are likely to focus on activities they are engaged in and enjoy”* (as educators share).

In terms of interior spatial form and order, the design applies geometric elements, such as straight lines on the walls and curved shapes on the floor and furniture. The shapes are not overly stimulating or elaborate; instead, they are simple and harmonious with the overall space. The design avoids excessive use of solid and mass forms, incorporating many voids to create a sense of airy. (Figure 2-3-4)



Figure 2 The indoor playground, View 1, in the B6 Area



Figure 3 The area for 4-6-year-old children in the B5 Area



Figure 4 Interior design of the area for 1-3-year-old children, View 4, in the B4 Area

The color theme of the interior space is created by the paint's color and the material's color. In general, the color theme features a light color palette, including a light-grey tile floor, light wood flooring, white walls, a white ceiling, light yellow curtains, and light natural shelves (Figure 3-4). This neutral background emphasizes the accent wall, which serves to divide the space into different functional areas. The use of green-blue as an accent color is intended to capture children's attention and make the space more memorable, acting as a visual cue that contributes to the sense of place (Figure 2). The chosen hue is strong and applied to one of the main walls to create a focal point for the entire space. *"It is believed that the color choice is to enhance children's emotional connection with the environment"* (as educators share), and enhance children's spatial experience through color.

Due to of finishing material and texture in the interior space, a majority of the material is natural wood on the floor and shelves with a light oak color. However, compared to another spatial factor, the material and texture in the space look more complex and varied. Such as wood for shelves, plastic or bamboo for study material, bamboo or rattan for chairs, linen or fabric for pillows, plants or flowers, and various textures and finishing materials set in the interior space to bring various sensory experiences for children through daily activities. Not only that, they can learn these materials through real objects and feeling familiar. The color of the materials plays an important role in creating the overall color of the space, particularly with the use of light colors. (Figure 3-4)



Figure 5 The area for the 4-6 years group, view 2, in the B6 Area



Figure 6 The design of material shelves in the B6 Area

Complexity is also expressed in furniture's design – in child's scale, with various colors and materials. There are two main groups of furniture, for children on a children's scale (1-3 years old; 4-6 years old), and also for adults help to encourage collaboration between different stages of ages, with different shapes and colors, texture. Not only that, furniture can become physical boundaries as partitions help to divide different functional areas. With this design, *"children can move furniture*

and arrange space follow teacher's guides by themselves" (as educator's sharing). These activities, children got the sense of sense of control and enhance their independence.



Figure 7 Interior Design in the B5 Area



Figure 8 A Study Corner in the B5 Area

One specific feature of this space is the absence of digital devices. The space to create the sense of nature with full of natural lights and open space. The strong point of Maitri Kindergarten is its openness, both visual and physical space, is filled with natural light. The interior design maximizes this natural light through large floor-to-ceiling windows, benefiting children's physical development and enhancing their social connections. Additionally, this design fosters a strong indoor-outdoor connection, further enriching the learning environment. (Figure 6-7).

3rd step: In-depth interview

After observing the space and taking photos, the author conducted an in-depth interview with the director of the kindergarten. As the school's founder and main teacher, she is both an architect and trained in Montessori pedagogy, giving her a deep understanding of the relationship between the design of the space and its connection to children's development, and educational principles. The pedagogy of Maitri kindergarten is the application of Montessori, which firstly allows the child to freely explore his world, with a certainty that there is an impulse that is pushing him towards learning. It is important to bring out a child's curiosity and the desire to discover, as the discovery makes the child develop the maximum of their capabilities and conquer the world with the power of his intelligence. Montessori highlights that the children's psychological embryo development must absorb nutrition from the surrounding environment (Li et al., 2023) through some principles such as designing with child's level; child-sized environment; valuing art more for its process than for the product; allowing visible and physical access to the natural environment; simplicity in designing build environment (Scott, 2010). According to Močinić and Feresin (2017) is that "*The space must be conceived and created with furniture and materials at hand. The environment must stimulate and offer opportunities to actualize and express the potentials of the*

child, to ease their movements, to propose a limited number of activities, but in an organized way, to gradually follow the cognitive development, to stimulate the aesthetics and love towards the environment". These principles underline the connection between interior design and children's cognitive, social, and physical development, making Montessori education a relevant framework for analyzing kindergarten spaces.

Hence, educators' perspectives of the Maitri kindergarten on the interior design space are to stimulate children's experiences, discovery, and exploration, supporting both physical and cognitive development through spatial components. Interior design aims to create a safe and comfortable environment for children toward child-centered design. To get full and in-depth feedback from the educator, the list of questions mentions the order of key layers in the interior space (NguyenThiTam et al., 2024) including spatial function, order, form, color, material and texture, furniture., and environmental factors (Table 2)

Table 2 The list of in-depth interviews and key answers. by author

List of questions	Key Answers
1. what are the key elements of interior that ace impact children's physical development?	Acreage, low-density Safe movement Lights Ventilation
2. what are the key elements of interior space that impact children's cognitive development?	Complexity in aesthetic elements in good proportion Not much stimulation Promote exploration Sense of familiarity Toward natural connection and interaction
3. What are the key elements of interior space that impact children's socio-emotional development?	Safety Sense of Control Encourage Independence Personalization and Social interaction (social engagement) Learning to share space

Table 2 (Continue)

List of questions	Key Answers
4. How does educational pedagogy influence the interior design process for learning spaces, specifically classroom interior space? What specific elements or principles of educational pedagogy do you believe should be prioritized or considered when developing interior design strategies for such spaces?	Influence on design Children's scale
5. According to you, what is a good interior space for children to discover, experience, and explore?	Complexity in layout, material, furniture
6. What factors of spatial function (density, boundaries, organization, architectural factors) should be considered in design? How should they be considered?	Indoor – Outdoor Connection Comfortable movement Clear – Clean organization Easy movement
7. Which spatial factors of spatial order (balance, harmony, unity and variety, emphasis, rhythm) do you think should be applied in preschool learning spaces?	Connection and Rhythm
8. What types of spatial forms should be used for preschool learning spaces?	Sense of familiarity
9. Which spatial colors should be used for preschool learning spaces? Do you think bright colors should be preferred over dark colors, and why?	Sense of comfort, not much stimulation
10. Which spatial materials should be considered in preschool learning space design, and how?	Various, complexity Not using plastic
11. In preschool learning space design, which characteristics of furniture should designers consider, and how should they be considered?	Follow function
12. What are your thoughts on other environmental factors ?	Lighting, ventilation Place belongs Enhance Children's Personality in space
13. Can you suggest some applications of the interior layers in interior design strategies for preschool learning spaces?	Maximizing one of them depends on a specific real condition.
14. In your opinion, which layer do you think is the most important?	Function

The results of the in-depth interviews revealed educators' perspectives on the design of kindergarten interior spaces to support children's development, consistent with Montessori principles. In terms of children's physical development, low density, ventilation, and light are the most important factors. In which, well-organized spatial arrangement for safe movement. In terms of children's cognitive development, complexity in aesthetics with good proportion, minimal stimulation, a sense of familiarity, and natural connections are important factors. Behalf of children's social development, safety in both physical and mental, a sense of control, independence, personalization, and social interaction are crucial factors. In which, pedagogy influences on interior design of kindergarten. It is highlighted that complexity in layout, material, and furniture should create a good interior space for children to discover, experience, and explore. Moving deeper into layers in space, it is claimed that spatial function should create clear and clean space organization for easy and comfortable movement, specifically, having a connection between indoors and outdoors. Spatial order to create the connection between different zones to create rhythm in space. Forms in space should be designed to create a sense of familiarity. Color creates a sense of comfort and minimal stimulation.

Through site and visual analysis of the case study and results after in-depth interview, it is pointed out that the key design that educators created in the interior space, are safe environment is an important factor, that aligns with the literature review, open and well-organized space-based on the philosophy of pedagogy, richness of aesthetic focus on sensory experience.

Findings

Data from a literature review, an analysis of case studies, and an in-depth interview with kindergarten educators reveal that design elements in kindergarten interior spaces often vary and sometimes overlap across different studies. However, key design characteristics are consistently emphasized over others. Within the scope of this paper, they can be categorized under key themes that enhance children's developmental needs in physical through muscle movement, cognitive development through sensory experience, and socio-emotional development through socio-emotional interaction in space. They include 4 main design characteristics, that align with the literature review, followed by keywords (Figure 8).

- *Functional factors*: safety, ergonomics, scale, sense of control, organization, flexibility, legibility, privacy; density, which could be associated with physical development and children's movements. The functional factors should be designed to follow children's ergonomics.

- *Aesthetic factors*: amiable, richness of content, complexity, dynamics and variety, and cleanliness; which could be associated with children's cognitive development, children's emotions,

and children's learning process. These factors should be designed by researching children's philosophy and children's preferences in aesthetic spatial components, such as color, form, lighting, material, and texture.

- *Psychological factors*: inviting, encouraging independence, welcoming and comfortable, empowering and respectful, collaboration, emotional intimacy, sense of community, sense of competence and achievement, attention, sense of status. The psychological factors could be created by the combination of aesthetic and functional factors to create effects on children. That's why these factors could be associated with children's cognitive, and socio-emotional development, children's emotions, or children's behavior.

- *Interactional factors*: These factors can happen during children's spatial interaction, between children with space, and children with peers: exploration, privacy, legibility, restoration, personalization, indoor-outdoor contact, engagement, creativeness, and combined digital and physical environment. These factors could be associated with social and physical skills, and socio-emotion, and stimulate children's exploration.

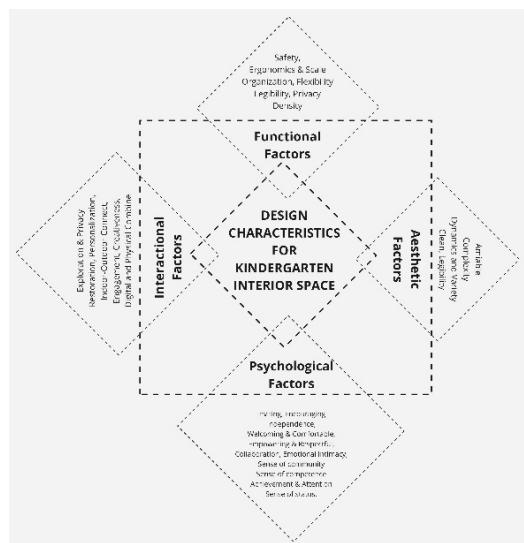


Figure 8 Diagram of key design characteristics in kindergarten interior space

Interestingly, through the in-depth interview process, it is highlighted the role of the educator's voice and the teacher's role in designing and maintaining the design of interior space. Educators' perspectives on the design requirements for optimizing learning interior space in kindergartens are essential for supporting children's development, including:

- Unified approach that combines interior design with pedagogical philosophy;
- Highlighting the complexity of providing children with various choices in their environment—such as layout, materials, and furniture – which is highlighted through an in-depth interview process;
- To maximize specific spatial factors based on real conditions while focusing on functional aspects to create a safe environment;
- To focus on the function factor of space to create a safe environment (both physical factor, mental factor, and social factors) for children's movement and children's interaction.

Discussion

The design of the interior kindergarten space will be analyzed following the four main themes, including functional factors, aesthetic factors, psychological factors, and interactional factors, with detailed characteristics. Hence, suggestion for interior designers is to apply these four themes in the design or site analysis process with the selected detail keywords in the process of designing interior kindergarten space. The details can be selected based on the concept of design, the vision of educators, the goals of pedagogy, and other elements such as culture, location, environment, and budget. In particular, it is remembered that creating an optimal kindergarten interior space is the designer's responsibility, but maintaining its quality for a long time belongs to the end-user responsibility. Which, it is not underestimated the voice and the role of teachers. Teachers should specifically understand the significance of the quality of the perceptual environment on children's learning and development. By understanding key design characteristics of kindergarten interior space, they can maintain the quality of the space or know how to make it more effective in learning and teaching activities.

There is some limitation in this paper that these design characteristics can be easily adapted at The Maitri Kindergarten due to the school's strengths, such as low student density, high ceilings, and open spaces. Therefore, incorporating these key design features requires careful site analysis for each specific space, considering its unique conditions. The limitation of this paper is the lack of analysis of multiple case studies. Future research should include more experiments across various settings to achieve more comprehensive and holistic results. After that, the results can be applied to the interior design process and evaluate the effectiveness of tests directly with kindergarten children. Not only that, ethics in children's research should be taken into account throughout the research process.

Recommendations

1. Recommendations for Research Utilization

- 1.1 Integrate the Four Key Design Themes (functional, aesthetic, psychological, and interactional) into interior design strategies to enhance children's overall development.
- 1.2 Empower educators to actively participate in maintaining and adapting interior spaces based on pedagogical goals and children's needs.
- 1.3 Inform policy and standard development for kindergarten design, especially in rapidly growing urban areas like Ho Chi Minh City.

2. Recommendations for Future Research

- 2.1 Conduct comparative studies across multiple kindergartens with different spatial and cultural contexts to validate and generalize findings.
- 2.2 Include direct assessment of children's behavior and development in response to specific design elements through observational or experimental methods.
- 2.3 Expand stakeholder perspectives by incorporating insights from parents, psychologists, and education administrators for a holistic view.

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