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Child-Friendly Mosque Architecture: A Systematic Review of Spatial and Environmental Design Strategies

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Abstract

Mosques serve religious, educational, and community functions, yet their architectural planning does not always fully address children's spatial, developmental, and environmental needs. Research on mosque accessibility and child-friendly built environments has largely developed separately, highlighting the need for an integrated synthesis of design strategies suited to mosque settings. This study aimed to identify spatial and environmental design strategies for child-friendly mosque architecture. A systematic literature review informed by the PRISMA 2020 reporting framework was conducted. Scientific literature published primarily between 2021 and 2025 was examined through qualitative thematic synthesis, with architectural implications interpreted at macro, mezzo, and micro spatial scales. Five interrelated domains emerged: accessibility and movement; spatial zoning and supervision; child-scaled activities and participation; sensory and environmental comfort; and nature-connected spaces and inclusive supporting facilities. Cultural and religious identity emerged as a cross-cutting consideration across these domains. The resulting conceptual framework emphasizes integrated accessibility, supervised autonomy, flexible relationships among worship and learning activities, environmental comfort, and cultural and ecological belonging. The framework provides a conceptual foundation for architectural design and post-occupancy evaluation. However, further mosque-specific empirical research is needed to validate the proposed strategies and establish contextually appropriate evaluation indicators.

Keywords: child-friendly mosque architecture; spatial-environmental design; systematic literature review

Arsitektur Masjid Ramah Anak: Tinjauan Sistematis tentang Strategi Desain Spasial dan Lingkungan

Abstrak

Masjid memiliki fungsi keagamaan, pendidikan, dan kemasyarakatan, tetapi perencanaan arsitekturnya belum sepenuhnya mengintegrasikan kebutuhan spasial, perkembangan, dan lingkungan anak. Penelitian mengenai aksesibilitas masjid dan lingkungan terbangun ramah anak masih cenderung berkembang secara terpisah, sehingga diperlukan sintesis untuk merumuskan strategi desain yang sesuai dengan karakteristik ruang masjid. Penelitian ini bertujuan mengidentifikasi strategi desain spasial dan lingkungan untuk mendukung arsitektur masjid ramah anak. Metode yang digunakan adalah tinjauan literatur sistematis dengan mengacu pada kerangka pelaporan PRISMA 2020. Literatur ilmiah yang diterbitkan terutama pada periode 2021–2025 dianalisis melalui sintesis tematik kualitatif, dengan implikasi desain ditinjau pada skala makro, mezo, dan mikro. Hasil sintesis mengidentifikasi lima domain utama, yaitu aksesibilitas dan pergerakan, zonasi ruang dan pengawasan, aktivitas dan partisipasi sesuai skala anak, kenyamanan sensorik dan lingkungan, serta ruang yang terhubung dengan alam dan fasilitas pendukung inklusif. Identitas budaya dan keagamaan menjadi pertimbangan lintas domain. Temuan ini menghasilkan kerangka konseptual yang menekankan aksesibilitas terintegrasi, kemandirian anak dengan pengawasan, fleksibilitas ruang ibadah dan pembelajaran, kenyamanan lingkungan, serta keterikatan budaya dan ekologis. Kerangka ini dapat menjadi dasar pengembangan desain dan evaluasi pascahuni, tetapi masih memerlukan validasi melalui penelitian empiris khusus pada lingkungan

Kata kunci: *arsitektur masjid ramah anak; desain spasial-lingkungan; tinjauan literatur sistematis*

INTRODUCTION

Mosques serve not only as places of ritual worship but also as centers for religious education, social interaction, and community activities. These multiple functions require architectural environments capable of accommodating users with diverse physical abilities, ages, mobility needs, and patterns of spatial use. Consequently, accessibility and inclusivity have become increasingly important considerations in mosque architecture. Aji et al. (2022) examined mosque accessibility for people with disabilities, identifying architectural barriers and emphasizing the importance of accessible facilities. Similarly, Suhardi et al. (2024) investigated accessibility improvements through universal design principles, highlighting the relationships among circulation, entrances, ramps, ablution facilities, toilets, prayer spaces, and information systems. Anjani and Lestari (2025) further discussed the application of universal design in mosque environments. Collectively, these studies establish accessibility as an important architectural concern; however, their primary emphasis is on general accessibility and universal design rather than the specific spatial, developmental, and environmental needs of children.

Children represent a distinct group of mosque users whose architectural needs require particular attention. Beyond basic accessibility, children require environments that accommodate agerelated differences in physical dimensions, movement capabilities, sensory experiences, learning activities, and caregiver supervision. Pakpahan (2018) examined the concept of childfriendly mosques and highlighted concerns related to children's treatment, participation, and the availability of supportive mosque facilities. Although this research contributes to understanding the importance of welcoming children into religious environments, the architectural relationships among spatial organization, environmental comfort, safety, and childoriented activities remain insufficiently developed. This limitation suggests that the concept of a childfriendly mosque needs to be examined not only through institutional attitudes and supporting facilities but also through the physical and environmental characteristics of the entire building.

Research on childfriendly built environments provides a broader theoretical foundation for addressing these architectural considerations. Jansson et al. (2022) conceptualized childfriendly environments as sociophysical settings shaped by the opportunities provided to children, the processes through which environments are developed, and the participation of relevant stakeholders. Pia and Bezboruah (2025), through a systematic literature review of childfriendly neighborhoods, identified interconnected characteristics such as play opportunities, active mobility, amenities, natural environments, place attachment, and learning spaces. Similarly, Smith et al. (2023) examined children's opportunities for play in the built environment, emphasizing the importance of spatial conditions that enable children's activities. These studies demonstrate that childfriendliness extends beyond the provision of dedicated facilities and involves relationships among accessibility, participation, social interaction, and environmental quality. Nevertheless, their primary research contexts differ from mosques, where children's activities coexist with congregational worship, religious learning, privacy requirements, and culturally influenced spatial arrangements. Therefore, the direct applicability of these findings to mosque architecture remains uncertain.

Mosquespecific spatial research provides an additional perspective for understanding these contextual differences. Juharida et al. (2023) systematically reviewed genderrelated spatial design in mosques and discussed how architectural arrangements are influenced by Islamic schools of thought and mosque spatial characteristics. Juharida (2023) further examined genderspace organization in Javanese mosques in Surakarta and Yogyakarta through macro, mezzo, and micro architectural scales, addressing site zoning and circulation, prayerspace organization, and architectural partitions. These studies demonstrate the importance of spatial relationships in accommodating privacy, access, and functional organization within religious buildings. However, their principal focus is genderrelated spatial configuration rather than children's accessibility, supervision, learning, play, or environmental experiences. Consequently, the potential application of multiscale mosque spatial organization to childfriendly architectural design has not been sufficiently explored within these studies.

Environmental research introduces further considerations that are relevant to children's experiences of architectural spaces. Rodríguez et al. (2021) and AlmagroLidón et al. (2024) examined thermal comfort in educational environments, highlighting the importance of considering children's experiences rather than relying exclusively on adultoriented assumptions. Mealings (2023) reviewed

the relationship between classroom acoustic treatment and listening, learning, and wellbeing, while Mustapa et al. (2024) examined the relevance of biophilic design in children's learning environments. These studies provide valuable evidence concerning thermal, acoustic, and natureconnected architectural characteristics. Nevertheless, their findings primarily originate from educational settings, and the relationship between these environmental characteristics and children's experiences in mosques remains insufficiently established. In particular, mosque environments introduce distinct requirements concerning prayer activities, speech intelligibility, spatial privacy, and interactions among users of different ages.

Comparison of these research streams reveals a specific knowledge gap. Mosque accessibility studies primarily address universal design and physical barriers, mosque spatialorganization studies emphasize religious and genderrelated arrangements, and childfriendly builtenvironment studies investigate children's participation, movement, play, and environmental experiences in nonreligious settings. Although each research stream contributes relevant architectural knowledge, the reviewed literature does not sufficiently integrate these considerations into a coherent spatialenvironmental framework specifically addressing children as mosque users. The central research problem is therefore how architectural principles derived from childfriendly environments can be systematically interpreted within the functional, spatial, environmental, and cultural requirements of mosque architecture. This problem is particularly relevant because improving individual facilities does not necessarily ensure that circulation, supervision, worship, learning, and children's activities function effectively as an interconnected spatial system.

To address this gap, the present study conducts a structured systematic literature review to synthesize existing evidence on childfriendly architectural environments and mosquespecific spatial organization. The study addresses three research questions: (1) What spatial and environmental characteristics are associated with childfriendly built environments? (2) How can these characteristics inform mosquespecific architectural design strategies? and (3) How can the resulting strategies be organized and considered for evaluation across macro, mezzo, and micro architectural scales?

The objective of this study is to develop a conceptual spatialenvironmental framework for childfriendly mosque architecture by integrating five interconnected domains: accessibility and movement, spatial zoning and supervision, childscaled activities and participation, sensory and environmental comfort, and natureconnected spaces and inclusive supporting facilities. Cultural and religious identity is considered a crosscutting dimension influencing the adaptation of these domains to mosque environments. The study contributes to architectural scholarship by connecting previously separated research perspectives and organizing their potential implications across macro, mezzo, and micro spatial scales. Rather than proposing a universal architectural model or claiming empirically validated design standards, the resulting framework provides a structured conceptual basis for mosque design programming, accessibility assessment, environmental evaluation, and future childinclusive postoccupancy research.

METHOD

This study employed a structured systematic literature review (SLR) to synthesize existing evidence on spatial and environmental design strategies relevant to childfriendly mosque architecture. The review was structured with reference to the Preferred Reporting Items for Systematic Reviews and MetaAnalyses (PRISMA 2020) reporting guidelines (Page et al., 2021), which provide a framework for transparently documenting literature identification, screening, eligibility assessment, and evidence synthesis. The review sought to address three questions: (1) What spatial and environmental characteristics are associated with childfriendly built environments? (2) How can these characteristics inform architectural design strategies for childfriendly mosques? and (3) How can the identified strategies be organized across macro, mezzo, and micro architectural scales?

The literature review primarily focused on peerreviewed journal articles published between 2021 and 2025. Relevant mosquespecific literature was also considered to provide contextual understanding of religious spatial organization and accessibility, including Juharida et al. (2023) and Juharida (2023). Literature was identified through scholarly search engines and academic publisher databases using combinations of keywords, including "childfriendly environment," "children and built environment," "children's participation," "play and built environment," "biophilic design and children," "thermal

comfort children," "acoustic comfort children," "inclusive mosque," "mosque accessibility," and "mosque spatial organization." These keywords represented three interconnected areas: childfriendly built environments, spatial and environmental design, and mosque accessibility and spatial organization.

Studies were considered eligible when they addressed architectural, spatial, environmental, or participatory characteristics relevant to children and presented empirical findings, systematic or scoping reviews, or designoriented syntheses. Mosquespecific studies concerning spatial organization, accessibility, or childfriendliness were also considered relevant. Studies were excluded when they focused exclusively on theological interpretation without architectural implications, examined topics unrelated to the built environment, or addressed technical issues without clear relevance to children's spatial and environmental needs. The primary publication period was 2021–2025, while earlier mosquespecific sources were considered when directly relevant to the research objectives.

The literature was examined through qualitative thematic synthesis to identify recurring architectural characteristics, relationships among spatial functions, and potential design implications. The synthesis was organized into five interconnected domains: (1) accessibility and movement; (2) spatial zoning and supervision; (3) childscaled activities and participation; (4) sensory and environmental comfort; and (5) natureconnected spaces and inclusive supporting facilities. Cultural and religious identity was considered a crosscutting dimension influencing the interpretation of these domains within mosque environments.

The thematic findings were subsequently interpreted through three architectural scales. The macro scale addressed site planning, accessibility, zoning, and circulation. The mezzo scale focused on relationships among worship, learning, play, and familysupport spaces. The micro scale examined childscaled architectural details, safety, and sensory and environmental comfort. This multiscale interpretation was informed by mosquespecific spatial research, particularly Juharida (2023) and Juharida et al. (2023).

The resulting synthesis informed the development of a conceptual spatialenvironmental framework for childfriendly mosque architecture. The framework was intended to identify potentially relevant architectural strategies and evaluation indicators rather than establish empirically validated design standards. Because the review relied on published and archival materials without direct involvement of human participants, no additional humansubject ethics approval was required.

RESULTS AND DISCUSSION

1. Evidence Base and Thematic Synthesis

The reviewed literature indicates that childfriendly environments are multidimensional sociophysical settings shaped by relationships among accessibility, safety, environmental comfort, participation, social interaction, and opportunities for learning and play. Jansson et al. (2022) conceptualize childfriendliness through the physical and social opportunities provided by environments, the processes through which these opportunities are developed, and the stakeholders involved in their creation. Similarly, Pia and Bezboruah (2025) identify play opportunities, active mobility, public amenities, natural environments, place attachment, and learning spaces as important components of childfriendly neighborhoods. These findings suggest that the quality of childfriendly environments depends not only on the availability of facilities but also on how spatial characteristics support children's daily experiences.

Translating these principles into mosque architecture requires consideration of the distinctive characteristics of religious environments. Unlike educational and recreational buildings, mosques accommodate congregational worship, religious education, social interaction, and community activities within spatial arrangements influenced by religious and cultural practices. Consequently, architectural strategies derived from other building types cannot be transferred without considering the functional requirements of prayer, privacy, supervision, and religious learning. This contextual distinction

highlights the importance of integrating childfriendly principles into the overall architectural organization of mosques rather than introducing isolated children's facilities.

Children's participation constitutes another recurring consideration in the literature. Ensarioğlu and Özsoy (2021) demonstrate the relevance of involving children in builtenvironment design, while Smith et al. (2023) emphasize children's opportunities to engage with and experience their surroundings as active users. These perspectives suggest that architectural assessments should consider children's perceptions alongside adultdefined expectations. Within mosque environments, potential participatory approaches include childfriendly consultations, spatial mapping activities, behavioral observations, and postoccupancy feedback. Such approaches may help identify differences between adult assumptions regarding appropriate mosque behavior and children's actual spatial experiences.

The literature on play further demonstrates that children's opportunities for movement and exploration are influenced by the physical characteristics and connectivity of surrounding environments. Zhao et al. (2023) examine relationships between neighborhood characteristics and children's outdoor play, while Lu and van Ameijde (2025) synthesize evidence concerning urban density and playspace connectivity. These findings suggest that playsupportive environments need not be limited to designated playgrounds. In mosque architecture, carefully organized courtyards, shaded circulation areas, flexible activity rooms, and informal learning spaces may offer opportunities for interaction and exploration. Nevertheless, these proposed applications require consideration of caregiver supervision, acoustic compatibility, and the functional requirements of worship.

The reviewed evidence was organized conceptually into five interconnected domains: accessibility and movement, spatial zoning and supervision, childscaled activities and participation, sensory and environmental comfort, and natureconnected spaces and inclusive supporting facilities. Cultural and religious identity was treated as a crosscutting consideration because it influences the interpretation of these domains within mosque architecture. Table 1 presents the thematic relationships between the reviewed literature and potential architectural implications.

Table 1. Thematic Synthesis of ChildFriendly Spatial and Environmental Strategies

Thematic domain	Evidence from literature	Proposed mosque design implications
Accessibility and movement	Universal design and accessible circulation support the usability and inclusiveness of mosque environments (Aji et al., 2022; Suhardi et al., 2024).	Continuous accessible circulation, identifiable entrances, childreadable signage, safe pedestrian routes, and accessible ablution and toilet facilities.
Spatial zoning and supervision	Connected amenities, safe mobility, and opportunities for social interaction contribute to childfriendly environments (Jansson et al., 2022; Pia & Bezboruah, 2025).	Spatial relationships supporting caregiver proximity, visibility, functional zoning, and appropriate separation between active and quiet activities.
Childscaled activities and participation	Children's opportunities for play and participation are relevant to inclusive builtenvironment design (Ensarioğlu & Özsoy, 2021; Smith et al., 2023).	Flexible learning and activity areas, childscaled facilities, participatory programming, and postoccupancy feedback.
Sensory and environmental comfort	Children's thermal experiences and acoustic requirements may differ from adultoriented assumptions (Rodríguez et al., 2021; AlmagroLidón et al., 2024; Mealings, 2023).	Passive cooling, shading, ventilation, acoustic treatment, daylight control, and appropriate spatial buffering.

Natureconnected spaces and inclusive supporting facilities	Biophilic design and outdoor environmental characteristics are relevant to children's comfort and wellbeing (Mustapa et al., 2024; Guo et al., 2024; Zhang et al., 2025).	Shaded courtyards, landscaped areas, vegetation, nature views, and accessible supporting facilities integrated with the mosque's spatial organization.

Source: Authors' conceptual synthesis based on the reviewed literature.
Note: Cultural and religious identity is considered a crosscutting dimension. The proposed design implications represent architectural interpretations of the literature rather than empirically validated mosquespecific outcomes.

The thematic synthesis indicates that the identified domains should be understood as interconnected architectural considerations rather than independent design components. Accessibility influences children's ability to reach worship and learning spaces, while spatial zoning affects supervision, safety, and activity compatibility. Environmental comfort and natureconnected spaces may also influence how children experience and use mosque environments. Therefore, the central implication of the synthesis is that childfriendliness should be addressed through coordinated spatial relationships across the mosque environment.

2. Macro Scale: Site, Zoning, Access, and Circulation

At the macro scale, child friendly mosque architecture concerns the relationship between the building and its surrounding environment, including site access, entrances, parking and dropoff areas, landscape, and circulation networks. Mosque accessibility research identifies entrances, ramps, circulation routes, ablution facilities, toilets, prayer areas, and information systems as interconnected components of architectural accessibility (Aji et al., 2022; Suhardi et al., 2024). These findings indicate that accessibility should be considered as a continuous spatial system rather than a collection of individual building features.

When interpreted from children's perspectives, this principle suggests that routes connecting entrances, prayer areas, learning spaces, ablution facilities, toilets, and outdoor environments should be continuous, understandable, and reasonably safe. Clear wayfinding and identifiable transitions may support children's spatial orientation, while the separation of pedestrian and vehicular movement may reduce potential circulation hazards. Nevertheless, children's ability to navigate independently varies according to age, developmental characteristics, and caregiver expectations. Accordingly, macroscale planning should facilitate ageappropriate autonomy while maintaining opportunities for supervision.

Juharida (2023) provides a relevant mosquespecific perspective by examining relationships among site organization, circulation, prayerspace configuration, and architectural partitions. Although the study primarily addresses genderrelated spatial arrangements in Javanese mosques, its macro, mezzo, and microscale organization provides an analytical basis for examining broader mosque spatial relationships. The organization of access, ablution facilities, and prayer areas illustrates how circulation and zoning can respond to privacy and functional requirements. In childfriendly mosque design, these relationships may be reinterpreted to support safe movement and caregiver proximity without disregarding established worship practices.

Arrival and transitional spaces also require attention. Sheltered dropoff areas, shaded pedestrian routes, recognizable entrances, and clearly defined circulation zones may improve accessibility and reduce movement conflicts. Courtyards and semiopen spaces may function as transitional environments where children and families can gather before and after religious activities. However, their suitability depends on site conditions, congregation size, climatic characteristics, and the organization of surrounding functions.

The main architectural challenge at the macro scale is balancing accessibility, autonomy, supervision, and the spatial requirements of worship. Excessively isolated children's spaces may limit

interaction with caregivers, while unrestricted connections between active and quiet areas may create functional conflicts. Therefore, macroscale strategies should emphasize connected circulation, legible zoning, and supervised movement. Their effectiveness should ultimately be examined through accessibility audits, spatial observation, and feedback from children and caregivers.

3. Mezzo Scale: Prayer, Learning, Play, and FamilySupport Spaces

At the mezzo scale, childfriendly mosque architecture concerns the spatial relationships among worship, religious learning, children's activities, and family interaction. The reviewed literature emphasizes that childfriendly environments benefit from connections among amenities, opportunities for play, social spaces, and learning environments (Jansson et al., 2022; Pia & Bezboruah, 2025). These findings suggest that the effectiveness of childoriented architectural facilities depends partly on their accessibility, adjacency, and compatibility with surrounding activities.

The relationship between children's activity areas and prayer spaces represents a particular design challenge. Learning and play areas located far from family spaces may complicate supervision, whereas active spaces placed immediately adjacent to quiet prayer areas may create acoustic and movementrelated disturbances. Consequently, mosque design may benefit from a spatial arrangement that establishes appropriate transitions among entrances, courtyards, familyoriented prayer spaces, learning areas, ablution facilities, and outdoor environments. This arrangement represents a possible architectural strategy rather than a universal configuration.

Spatial flexibility is another relevant consideration. Multipurpose rooms may accommodate Qur'anic learning, storytelling, reading, family gatherings, and supervised activities at different times. Such arrangements may be particularly useful in mosques with limited building areas. However, spatial flexibility requires adequate consideration of furniture arrangement, storage, scheduling, acoustic separation, and operational management. Therefore, flexible design should be evaluated not only through architectural configuration but also through its capacity to accommodate different activities without substantial functional conflicts.

Participatory design may further strengthen the suitability of mosque spaces for children. Ensarioğlu and Özsoy (2021) highlight children's potential involvement in builtenvironment design, suggesting that users' experiences can inform architectural decisions. In mosque settings, participatory evaluation could help identify whether children perceive learning and activity areas as accessible, welcoming, and comfortable. Such feedback may complement architectural assessments based on spatial dimensions and functional zoning.

Religious and cultural practices must also be considered. Juharida et al. (2023) demonstrate that genderrelated mosque spatial arrangements vary according to religious interpretations and architectural characteristics. This finding suggests that childfriendly mosque planning should avoid assuming a single universal organization of worship and family spaces. Instead, architectural arrangements should accommodate local practices while seeking equitable access to learning facilities, ablution areas, toilets, and other supporting spaces.

Overall, the mezzoscale synthesis indicates that architectural quality depends on the coordination of spatial adjacency, functional flexibility, supervision, and activity compatibility. Childfriendly design should therefore support the coexistence of worship, learning, and social activities without treating children as users who must be physically separated from the broader mosque environment.

4. Micro Scale: Child Scale, Safety, Sensory Comfort, and Details

At the micro scale, childfriendly mosque architecture is expressed through the physical and environmental characteristics of spaces directly experienced by children. These characteristics include

furniture dimensions, handrails, door hardware, floor transitions, surface materials, sanitary facilities, lighting, ventilation, and signage. Mosque accessibility studies emphasize that building usability depends on detailed architectural components, including ramps, stairs, circulation facilities, handrails, ablution areas, and information systems (Aji et al., 2022; Suhardi et al., 2024). Although these studies primarily address disability accessibility, their findings provide relevant considerations for assessing mosque facilities from children's physical perspectives.

Childscaled architectural design requires attention to variations in body dimensions, reachability, movement capabilities, and spatial perception. Facilities designed primarily for adults may not provide equivalent usability for younger children. Accordingly, mosque design may incorporate appropriately positioned handrails, reachable fixtures, understandable signage, safe floor transitions, and surfaces that reduce avoidable slipping or collision hazards. Such adaptations should respond to the anticipated age groups and applicable building safety and accessibility requirements rather than assume a single child dimension.

Thermal comfort represents another important component of microscale environmental quality. Rodríguez et al. (2021) examine factors affecting thermal comfort in educational buildings, while AlmagroLidón et al. (2024) question the adequacy of conventional adultoriented thermal comfort models for schoolchildren. These findings indicate that children's thermal experiences should receive specific consideration in architectural evaluation. Guo et al. (2024) further demonstrate the relevance of outdoor environmental conditions and design strategies in educational settings located in hot and humid climates.

For mosques in Indonesia, these findings support examining passive ventilation, shading, building orientation, roof and wall thermal performance, and vegetation as potential environmental strategies. Shaded courtyards, semiopen transitional spaces, and appropriate solar control may contribute to more comfortable conditions. Nevertheless, the effectiveness of these interventions depends on local climate, building configuration, occupancy patterns, and ventilation or cooling systems. Their performance should therefore be assessed through environmental measurements rather than inferred solely from educationalbuilding research.

Acoustic comfort is equally relevant. Mealings (2023) and Liu et al. (2023) discuss relationships between acoustic environments and listening or learning conditions. Mosque environments introduce additional acoustic requirements because sermons, recitation, congregational prayer, religious education, and children's activities may occur within interconnected spaces. These functions can create competing demands for speech intelligibility, quietness, and opportunities for interaction.

Potential architectural responses include acoustic separation between active and quiet spaces, soundabsorptive finishes in learning areas, spatial buffers, and consideration of reverberation characteristics. However, the effectiveness of acoustic interventions depends on room dimensions, surface materials, occupancy, and the intended functions of each space. Consequently, the acoustic requirements of childfriendly mosque architecture should be investigated through buildingspecific assessments.

Natureconnected design provides another consideration for children's environmental experiences. Mustapa et al. (2024) examine the relevance of biophilic design in primaryschool learning environments, while Zhang et al. (2025) investigate relationships between biophilic design and children's wellbeing in kindergarten settings. These studies suggest that natural elements can contribute to the environmental quality experienced by children, although their findings cannot automatically be generalized to religious buildings.

Potential mosque applications include daylight access, shaded gardens, courtyard vegetation, natural textures, and views toward landscaped areas. These elements may support environmental

comfort and provide opportunities for informal interaction. Nevertheless, natureconnected architectural strategies should incorporate safety and maintenance considerations, including slippery surfaces, water hazards, and accessibility barriers.

Collectively, the microscale synthesis indicates that childfriendly mosque architecture requires an integrated consideration of physical usability, environmental comfort, safety, and positive spatial experiences. Future assessments should combine architectural observation, environmental measurement, accessibility evaluation, and feedback from children and caregivers to determine the effectiveness of these design strategies.

5. Proposed ChildFriendly Mosque Framework

The synthesis suggests that childfriendly mosque architecture should be approached as an integrated spatialenvironmental system rather than a collection of specialized children's facilities. Five interrelated architectural principles are proposed: (1) connected accessibility; (2) supervised autonomy; (3) worship–learning–play flexibility; (4) sensory and environmental comfort; and (5) cultural and ecological belonging.

Connected accessibility emphasizes continuous and understandable circulation connecting worship spaces, learning areas, ablution facilities, toilets, and outdoor environments. Supervised autonomy addresses the balance between children's opportunities for independent movement and caregiver proximity. Worship–learning–play flexibility concerns the spatial compatibility of religious, educational, and developmental activities. Sensory and environmental comfort emphasizes physical usability and appropriate thermal, acoustic, and visual conditions. Cultural and ecological belonging addresses the integration of local architectural identity, inclusive participation, and relationships with natural environments.

These principles operate across macro, mezzo, and micro architectural scales. At the macro scale, attention is directed toward access, zoning, and circulation. At the mezzo scale, the framework emphasizes spatial adjacency, supervision, and functional compatibility. At the micro scale, attention is directed toward architectural details, physical safety, and environmental performance. Participation and cultural identity operate across these scales and influence how architectural strategies may be adapted to particular mosque communities.

Table 2. Proposed SpatialEnvironmental Framework for ChildFriendly Mosques

Spatial scale	Primary design question	Proposed design strategies	Potential evaluation indicators
Macro	Can children access, understand, and navigate the mosque environment safely?	Separated pedestrian and vehicle circulation; identifiable entrances; shaded routes; continuous accessible circulation; legible spatial zoning.	Route continuity; entrance visibility; potential pedestrian–vehicle conflicts; wayfinding clarity; accessibility barriers.
Mezzo	Can worship, learning, play, and family interaction coexist without substantial functional conflicts?	Flexible multipurpose rooms; familyoriented prayer spaces; appropriately adjacent learning and activity areas; courtyards; acoustic and transitional buffer spaces.	Spatial adjacency; functional flexibility; caregiver visibility; supervision distance; activity compatibility.
Micro	Do architectural details and environmental conditions accommodate children's	Childscaled facilities; safe floor surfaces; reachable fixtures; acoustic treatment;	Fixture reachability; observed hazards; acoustic conditions;

	physical and sensory requirements?	daylight control; ventilation; understandable signage.	thermal comfort; visual comfort; user feedback.
Crosscutting	Does the mosque support children's participation, inclusion, and cultural belonging?	Participatory design processes; equitable facility access; culturally meaningful architecture; nature integration; postoccupancy evaluation.	Child and caregiver feedback; participation opportunities; accessibility audit findings; observed behavior; perceived belonging.

Source: Authors' proposed conceptual framework derived from the thematic synthesis.
Note: The proposed indicators are intended to guide future evaluation. Their operational definitions, measurement procedures, and performance thresholds require further empirical development.

The proposed framework contributes to the integration of childfriendly builtenvironment principles with mosquespecific architectural considerations. Its primary contribution is the organization of design relationships that connect accessibility, spatial configuration, supervision, environmental quality, and cultural belonging. This perspective expands the discussion beyond the availability of dedicated children's facilities and toward the performance of the mosque environment as an interconnected system.

Nevertheless, the framework remains conceptual. The proposed strategies and indicators are derived from the interpretation of existing literature, including studies conducted in educational, neighborhood, and religious settings. Their effectiveness in mosque environments has not been directly established through the present review. Therefore, the framework should be treated as a basis for future architectural assessment rather than a validated design standard.

6. Design Implications and Research Gap

The proposed framework suggests that childfriendly mosque architecture should move beyond the question of whether a mosque provides a dedicated children's room toward examining how the entire environment accommodates children. This broader perspective recognizes that children's experiences are influenced by relationships among accessibility, spatial organization, environmental comfort, safety, and opportunities for participation. Architectural interventions should therefore address the mosque as an interconnected system rather than introduce isolated facilities without considering their relationships to worship and community functions.

An important implication concerns the relationship between childfriendly architecture and universal design. Improvements in circulation continuity, accessibility, wayfinding, and environmental comfort may benefit children, caregivers, older adults, and people with disabilities. However, these user groups have different physical capabilities, supervision requirements, and spatial preferences. Consequently, inclusive mosque design should acknowledge shared accessibility needs while responding to differences among users.

Another implication concerns the balance between architectural flexibility and religious functionality. Mosques accommodate activities with different requirements for movement, sound, privacy, and spatial organization. Children's learning and play activities may require spatial flexibility, whereas congregational worship often requires acoustic clarity and relatively controlled movement. These potentially competing requirements suggest that successful childfriendly design depends on coordinated spatial planning and operational management rather than unrestricted multifunctionality.

The Indonesian context introduces additional architectural considerations. Climatic conditions, local traditions, site characteristics, congregation sizes, and religious practices influence the suitability of particular design strategies. Shaded courtyards, semiopen spaces, and passive ventilation may offer relevant environmental opportunities, but their performance depends on local conditions. Similarly, the

organization of familyoriented and genderrelated spaces should respond to community practices rather than assume a universally applicable spatial configuration.

Despite these potential applications, the reviewed literature reveals limitations in the available evidence. Much of the research on childfriendly built environments focuses on neighborhoods, schools, parks, and healthcare facilities. Mosquespecific studies more frequently examine accessibility, genderrelated spatial organization, and religious functions. Consequently, direct empirical evidence concerning children's spatial behavior, environmental preferences, and experiences within mosques remains insufficiently developed in the literature examined.

This limitation affects the interpretation of the proposed framework. Findings from educational and recreational environments can inform potential architectural strategies, but they do not establish that equivalent outcomes will occur in mosques. Differences in religious activities, behavioral expectations, occupancy conditions, cultural practices, and building management may influence the effectiveness of childfriendly interventions.

Future research should therefore investigate children's actual experiences in mosque environments using childinclusive and contextsensitive evaluation procedures. Postoccupancy evaluation, behavioral mapping, accessibility audits, environmental measurements, and participatory spatial assessments may help examine the proposed design principles. Comparative investigations across mosque typologies, climatic regions, and cultural settings could further clarify which strategies are transferable and which require local adaptation.

The principal contribution of this review is a conceptual spatialenvironmental framework that integrates childfriendly builtenvironment considerations with mosque architecture through macro, mezzo, and microscale analysis. The framework provides a structured foundation for future design assessment and empirical investigation. However, additional mosquespecific evidence is required to validate its indicators, establish measurable performance criteria, and determine whether the proposed strategies improve children's accessibility, comfort, participation, and sense of belonging.

CONCLUSION

This systematic literature review identifies five interconnected principles for child-friendly mosque architecture: connected accessibility, supervised autonomy, worship–learning–play flexibility, sensory and environmental comfort, and cultural and ecological belonging. The findings suggest that child-friendliness should be integrated into the overall architectural organization of mosques rather than addressed solely through dedicated children's facilities. The proposed spatial-environmental framework organizes these principles across three architectural scales: macro, emphasizing safe access, circulation, and zoning; mezzo, focusing on spatial relationships among worship, learning, play, and family activities; and micro, addressing child-scaled facilities, safety, and environmental comfort. Cultural and religious considerations are incorporated as cross-cutting dimensions to support inclusive design while respecting local worship practices and community requirements.

The principal contribution of this study is a conceptual framework connecting child-friendly built-environment principles with mosque-specific spatial organization. However, because much of the available evidence originates from educational, neighborhood, and other nonreligious settings, the framework requires further empirical validation. Future research should examine its applicability through child-inclusive post-occupancy evaluations, behavioral observations, accessibility assessments, and environmental measurements in Indonesian mosques.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AI USE STATEMENT

AIassisted tools were used to support literature discovery, language editing, and manuscript organization. The author remains responsible for the accuracy, interpretation, citation, and final content of the manuscript.

AUTHOR CONTRIBUTIONS

Author 1: conceptualization, literature search, thematic synthesis, analysis, framework development, and manuscript preparation. Author 2: literature search, thematic synthesis, analysis, and framework development. Author 3: thematic synthesis and analysis.

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