THE EDUCATIONAL ROLE OF SPACE IN THE LEARNING AND DEVELOPMENT PROCESS: A SCOPING REVIEW

IL RUOLO EDUCATIVO DELLO SPAZIO NEL PROCESSO DI APPRENDIMENTO E SVILUPPO: UNA REVISIONE DELL'AMBITO

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ABSTRACT

This scoping review explores the role of educational space not only as a physical context but as an active factor shaping learning and development from early childhood. A search across three databases identified 31 studies. Thematic analysis revealed four interconnected areas that foster optimal conditions for learning and development: the learning environment (indoor and outdoor), play, relationships, and the use of technologies.

Questa revisione dell'ambito indaga il ruolo dello spazio educativo non soltanto come contesto fisico, ma come fattore attivo che modella l'apprendimento e lo sviluppo fin dalla prima infanzia. La ricerca condotta su tre database ha portato all'inclusione di 31 studi. L'analisi tematica ha permesso di individuare quattro aree interconnesse che favoriscono condizioni ottimali per l'apprendimento e lo sviluppo: l'ambiente di apprendimento (interno ed esterno), il gioco, le relazioni e l'uso di tecnologie.

KEYWORDS

Learning environment, early childhood education, play, relationship, technologies
Ambiente di apprendimento, educazione della prima infanzia, gioco, relazione, tecnologie

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Introduction

In recent decades, early childhood education has increasingly acknowledged the active and decisive role of both physical and social spaces in the educational process. Research in this domain has expanded considerably, highlighting the extent to which the surrounding environment influences not only learning but also children's overall well-being. This complex and multifaceted understanding of educational spaces is strongly supported by the notion of the "third teacher" introduced by Malaguzzi (2010), according to which the environment functions as a silent yet powerful educator, capable of fostering curiosity, interaction and discovery. Learning spaces are therefore not mere physical structures, they also embody social and cultural meanings, reflecting the values, aspirations and educational policies of the society in which children grow.

The review of the scientific literature proposed by Grimberg & Cortazar (2022) reveals that the configuration of school environments can vary substantially, directly shaping the types of learning and interaction that occur within them. Spaces that encourage interaction—such as open classrooms or flexible learning areas—facilitate more collaborative and less formal forms of education, demonstrating their capacity to stimulate innovation and creativity among young learners. Furthermore, the physical arrangement of classrooms and the availability of accessible, differentiated resources support diverse learning modalities, ranging from traditional lectures to group work and experiential learning, which enables students to acquire knowledge through active engagement.

At the same time, play is widely recognized as a powerful pedagogical tool (Stevens-Smith & Stegelin, 2015). Far from being merely a pause from structured activity, play constitutes an essential means through which children explore the world and cultivate social skills. Both free and guided play environments are crucial to creating a balanced learning context. Outdoor play, in particular, contributes not only to physical development but also to environmental awareness, enabling children to connect with nature and engage in forms of learning that cannot be replicated within the classroom (Speldewinde & Campbell, 2024).

Furthermore, research highlights that emotionally attuned teacher-child interactions, within warm and well-organized classroom environments, enhance children's learning behaviors. Such relationally secure settings foster attention, motivation and self-control, supporting overall development and engagement (An Kim, 2025).

The integration of technology in early childhood education settings, however, presents mixed evidence: while some studies argue that it offers unique opportunities for personalized and engaging learning tailored to individual needs, others express concern that early exposure may contribute to problematic, sedentary, or antisocial behaviors (Fuller et al., 2021).

The design of learning environments requires a careful balance between these elements, taking into account both the individual and collective needs of children. Nevertheless, despite the acknowledged importance of such factors, there remains substantial heterogeneity in design practices at the international level. Accordingly, this scoping review seeks to address the following research questions:

RQ1: What elements related to the educational environment influence children's learning and development?

RQ2: What outcomes have been produced by studies in this field?

RQ3: What future directions should be explored to improve the design of educational spaces?

1. Research methodology

A scoping review was conducted to identify studies examining how educational spaces influence children's learning processes and development. The review process was guided by the methodological frameworks proposed by Peters et al. (2015) and Levac et al. (2010), and was articulated through the following steps: (1) identification of research aims and questions; (2) definition of eligibility criteria; (3) literature search; (4) studies selection and inclusion; (5) data extraction; (6) analysis; and (7) presentation of findings.

To ensure methodological rigor, the review adhered to the PRISMA extension for scoping reviews (Munn et al., 2018; Tricco et al., 2018) which provided guidance for reporting the processes of study identification, selection and inclusion, as well as the presentation of results.

Search strategy

Based on the review objectives and research questions, keywords, databases and eligibility criteria have been defined. The research was not limited by methodological approach, thus including both qualitative and quantitative studies. To address RQ1, broad keywords were adopted to encompass studies on practices, strategies, teaching tools, indoor and outdoor environments, technologies, play

and resources. The literature search, completed in December 2024, was conducted in Scopus, Web of Science (WOS) and ERIC. The final search string, combining the selected terms with Boolean operators, was: *learning OR child development, environment OR space, inclusion OR inclusive education, childhood, school OR education*. The term *childhood* captured studies focusing on children aged 3–10 years, the target group of this review.

Eligibility criteria

To ensure the quality and consistency of the included studies, the authors defined specific inclusion and exclusion criteria aimed at minimizing heterogeneity.

Inclusion Criteria:

- Studies published between 2015 and 2024;
- Research conducted in kindergarten or primary school contexts;
- Publications in English;
- Studies examining variables related to educational space with outcomes on children's learning and development (from kindergarten to primary school);
- Studies employing qualitative, quantitative or mixed-method approaches.

Exclusion Criteria:

- Grey literature (e.g., theses, conference proceedings, institutional reports);
- Publications in languages other than English;
- Studies not involving kindergarten or primary school children as primary participants or research focus;
- Studies lacking outcomes that relate educational space to children's learning and/or development.

Selection of included studies

During the selection process, duplicates were removed, followed by title and abstract screening to exclude studies irrelevant to the review focus. The remaining documents were assessed in full to extract information pertinent to the review. The overall process is illustrated in **Figure 1** through the PRISMA flowchart.

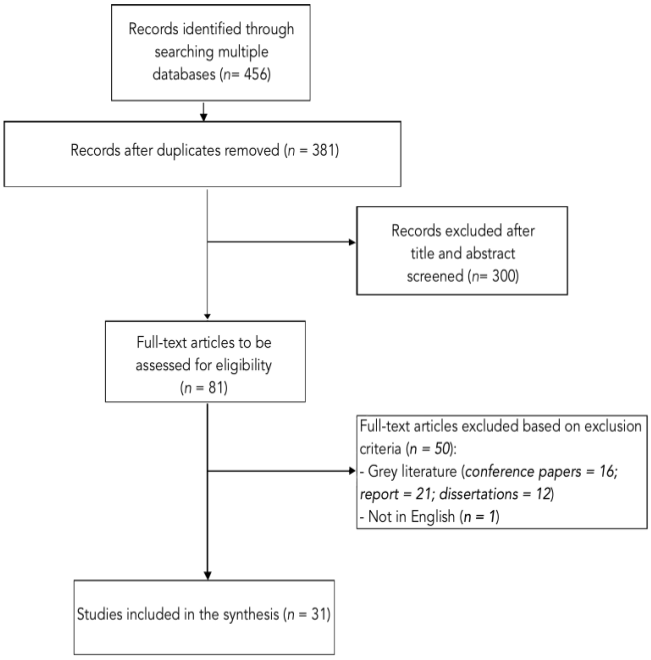

Figure 1: PRISMA extension for scoping reviews (PRISMA-ScR): checklist and explanation (adapted from Ragni et al., 2023).

Specifically:

1. The initial search yielded 456 records (SCOPUS = 151; WOS = 124; ERIC = 181).
2. After removing duplicates, 381 records remained.
3. Title and abstract screening, conducted independently by the authors, resulted in 81 eligible records.
4. Full-text screening excluded grey literature (theses = 12; conferences = 16; institutional reports = 21) and one non-English article, leaving 31 studies included in the review.

The screening process (steps 3 and 4) was performed using Rayyan software (Ouzzani et al., 2016). Discrepancies were resolved through discussion among the authors.

Data extraction

At the end of the selection process, the authors, through cooperative work, determined which data to extract from the selected studies, in particular: (1)

authors, year of publication, country(s); (2) type of study; (3) sample; (4) objectives; (5) variables measured and/or investigated; (6) learning and development outcomes.

2. Results

The overview of the included studies is shown in **Table 1**.

Characteristics of included studies

The studies included in this review reveal substantial heterogeneity in both research design and methodological approach. Specifically, eight case studies adopted a qualitative perspective (Beatty et al., 2021; Brodzeller et al., 2018; Giusti & Bombieri, 2020; Hennessy, 2019; Khalfaoui et al., 2020; Kroll, 2017; León-Jiménez et al., 2020; McGuire & Meadan, 2022; Roberts, 2017), while one quasi-randomized trial also relied on qualitative methods (Bejno et al., 2022). Six systematic reviews were identified: three integrating qualitative, quantitative, and mixed-method research (Buenestado-Fernández et al., 2023; McLean et al., 2022; Zolkipli et al., 2023), one focused on meta-ethnographic qualitative studies (Prins et al., 2022), one combining qualitative and quantitative studies (Roberts et al., 2020), and one limited to quantitative evidence (Tonge et al., 2016). Additional contributions include an action-research study with a qualitative approach (Buli-Holmberg et al., 2022), three literature reviews (Jawad, 2022), among which one exploratory (Teichert & Salman, 2021) and one extensive (Clemente-Suárez et al., 2024), and a scoping review encompassing meta-analyses and systematic reviews (Eadie et al., 2024). The corpus further comprises a small-scale qualitative study (Hanna, 2020), a quantitative content analysis (Martínez-Bello & Martínez-Bello, 2017), two ethnographic studies adopting qualitative approaches (McAnelly & Gaffney, 2019; Shaw, 2019), a conceptual study with a blended approach (Næsby, 2020), a participatory qualitative research (Watson & Newman, 2024), and one study combining action learning with participatory action research (Mahadew, 2023). Finally, three additional contributions (Miranda et al., 2017; Ngololo et al., 2024; Scanlon et al., 2023) specify only the methodological approach—two quantitative and one mixed—without indicating the precise research design.

Table 1: Included studies.

References, country	Type of study	Sample	Aims	Measured/ Investigated variables	Results in learning and development
1. Beatty et al., 2021 USA	Case study using a qualitative approach	Children aged 4 to 5 years old	Develop inclusive linguistic environments that incorporate ongoing partnerships with families and translanguaging practices	Selection of multilingual children's books; translanguaged morning circle song as a multilingual class book that features photographs of children and their families; create and display multilingual texts; play and recite multilingual songs and poetry; place culturally relevant props (multilingual books, puppets, pretend foods) in play areas	Develop and use of D.'s full linguistic repertoire; equal participation in learning activities; natural acceptance of multiculturalism; partnership with D.'s family
2. Bejno et al., 2022 Sweden	Quasi-randomized using a qualitative approach	19 participants (preschool principals and staff, parents, supervisors)	Improve the preschool program quality using the Swedish version of the Autism Program Environment Rating Scale (APERS) interviewing stakeholders to autistic children receiving Early Intensive Behavioral Intervention	Staff's competence; children's inclusion and participation; collaboration; learning environment	Improvement of competence, self-confidence, engagement and interest for preschool staff; importance of peers as role models and improvement of social, supportive and communicative skills and participation; beneficial from adapting group size and from predictable routines and defined structure in order to feel safe within the environment; importance of visual supports
3. Brodzeller et al., 2018 USA	Case study using a qualitative approach	1 child with ASD in a kindergarten class	Describe how interventions and adaptations can support young children with autism spectrum disorder within inclusive settings	Interventions (activity matrix, peer buddy, videomodeling) and adaptations (CARA's kit – five types of adaptations: environment, materials, activity, instruction, assistance)	Child's engagement in activities and interactions with peers; hand-held schedules and visual timers allow to follow the general flow of the classroom schedule without interruptions or anxiety; classroom as relaxing and safe space to learn and succeed academically and emotionally
4. Buenestado-Fernández et al., 2023 78 countries (54.4% European, 19.1% Asian, 13.2% American, 4.4% African, 2.8% Oceania)	Systematic review (45.5% qualitative; 30.8% quantitative; 24% mixed)	Children and young people in Europe at the Primary and Secondary Education levels (only Early Childhood and Primary level's results are included)	Identify lines of research and intervention to take advantage of the digital connectivity of minors in the educational context	Use of digital technologies	Improvement of motivation, digital competences, problem solving, creativity, collaboration, engagement; empowerment of vulnerable children; reduction of school absenteeism and digital divide
5. Buli-Holmberg et al., 2022 Norway	Action research using a qualitative approach	45 children aged 1-6 years and 12 member staff at a preschool	Investigate how the tool KIDS (Quality in Day Care Institutions) support the improvement of inclusion through observations of how the environment and	Observations, discussions and focus group interviews	Inclusive practices in preschool improve through facilitating conditions of high quality with relationships, play and activities, and physical environment. Rooms' design facilitates children's play and cognitive

	References, country	Type of study	Sample	Aims	Measured/ Investigated variables	Results in learning and development
				staff support children's development		development, interaction and well-being
6.	Clemente-Suárez et al., 2024	Extensive literature search	Childhood (results are included from early years to 10 years old)	Present a narrative overview that explores the complex relationship between digital device usage and cognitive development in childhood	Use of digital devices	Conflicting and relative results on cognitive abilities such as visuospatial skills, cognitive development, memory processes, creativity, social cognition, collaborative learning, attention, executive functions, problem solving skills. The excessive use of devices may lead to maladaptive behaviors and others negative impacts
7.	Eadie et al., 2024 USA, UK, Australia, New Zealand, Canada, Turkey, China, Belgium, others.	Scoping review	ECEC services	Map the extent and consistency of the research literature in each domain of quality (structural, process and system)	Process quality; Structural quality; System quality	Consistent evidences in learning environments and professional development (structural); programmes, interventions and curricula, and pedagogy (process)
8.	Giusti and Bombieri, 2020 Italy	Case study using a qualitative approach	4 children (aged 7-8)	Offer an integrated approach for re-thinking the role of makerspace in a context of inclusion	Use of a makerspace and its impact on inclusion and learning	Solve real-world problems and the technologies available enrich the experiences: children with special needs are welcomed and accepted in their full identity; making allows children to focus on the objects while they are meeting in a social dimension
9.	Hanna, 2020 England	Small scale research using a qualitative approach	6 pupil-researchers from a primary school (age 9-10)	Explore the inclusion of migrant children in education	Combining the use of picturebooks, photography, group discussions and observations, informal drawing and writing activities	Religious Education lessons offer a place where students are the experts and can correct the teacher about their religion and beliefs; sit at the back with an assistant is viewed as a standard differentiation, a potential stigmatization and exclusion. Reading book about immigration helps develop empathy and mutual aid
10.	Hennessy, 2019 Canada	Case study using a qualitative approach	110 primary school student	Present Idea Station, the student portion of a research project to revitalize the school's outdated playground	Interviews among students, and to parents, teachers and the community using the questions "What would you do to improve the playground? What do we need to make it better?"	Children show awareness of the importance of respect for nature and environmental awareness; ample space for informal and out-of--curriculum learning; valorization of children's voices; technologies as resources
11.	Jawad, 2022 Pakistan	Literature review	Junior schools (children aged 5 to 9)	Explore importance of environment and design of the class for students with disability in junior school especially with respect to tables, chairs and cabinets, various	Accessibility of private and public junior schools; reverberation; machines and equipment in practical classrooms; spaces within the classroom; presence of ramps and elevators	A flexible, dynamic classroom provides teachers with greater opportunity to educate to a range of learning styles. Weak points: overly steep ramps; older buildings contain numerous stairs with no alternative choices. Strengths: adequate and

References, country	Type of study	Sample	Aims	Measured/ Investigated variables	Results in learning and development
			colors and resources, system, lighting, aeration, and music therapy		natural lights, relaxing colors, good acoustics, outside views, adaptable and responsive classroom equipment
12. Khalfaoui et al., 2020 Spain	Case study using a qualitative approach	20 5-year-old children	Explore in depth the type and frequency of positive peer interactions in interactive groups (IGs) in a preschool serving mainly Roma and immigrant children with a very low SES to understand how IGs can create inclusive learning environments	Observation of peer interactions (a total of 797 children's interactions are audible, transcribed and classified into categories)	IG format is an effective classroom organization for fostering solidarity and empathy, promoting help and guidance interactions among peers. It promotes an interactive, dialogic and supportive learning environment that promotes prosocial behavior and collaboration
13. Kroll, 2017 USA	Case study using a qualitative approach	Children ages 2-5 years old, 5 head teachers	Examine the development of self-regulation, socially, cognitively and emotionally through the use of play in the curriculum	Use of play throughout the programme and connections the teachers saw between play and the development of self-regulation	Play based environment provides opportunities for problem solving, language development, for practicing conflict resolution and negotiation, and for regulating emotions. Routines and structures are also important to improve the self-regulation skill
14. León-Jiménez et al., 2020 Spain	Case study using a qualitative approach (communicative methodology)	18 primary school students and 10 teachers	Analyze how SEAs (successful educational actions) generate friendship and empathy and their impact in the environment in a school as a learning community	Semi-structured interviews; observations of different SEAs such as interactive groups, dialogic literary gatherings, dialogic pedagogic gatherings for teacher training and classroom assemblies from the Dialogic Model of Prevention and Resolution of Conflicts	Stronger friendship and empathy; supportive and safe environment; decrease in conflict and violent behaviors; inclusive attitudes; wellbeing and feeling of safety and support
15. Mahadew, 2023 South Africa	Participatory action learning and action research design (PALAR) using a qualitative approach	6 ECCE teachers and 2 teacher trainers	Explore how teachers adopt an inclusive pedagogy which encourages access, participation, achievement and respect for all children	Questionnaire about inclusion and photovoice to capture lived experiences	Active engagement is an essential component of an inclusive learning environment; participatory pedagogy equally encourages children to exercise their autonomy; books from multicultural background facilitate a deeper insight into the own and other cultures; flexibility enables a more child-centred approach and greater democracy and ownership of learning
16. Martínez-Bello and Martínez-Bello, 2017 Spain	Content analysis using a quantitative approach	9 ECE classrooms	Examine the representation of the body taking into account different categories (age, gender, activity level, space, type of character, clothing and disability) in nine different ECE classroom walls in	Children's pictures, drawings, activities and learning activities on classroom walls	Results show equal representation of children's bodies according to gender and activity level with no single predominant role for girls or boys (gender equality) but no contribution to children learning about corporal diversity related to disability

References, country	Type of study	Sample	Aims	Measured/ Investigated variables	Results in learning and development
			Spanish public schools		
17. McAnelly and Gaffney, 2019 New Zealand	Ethnographic using a qualitative approach	5-year-old child with autism in a kindergarten	Present the narrative of an inclusive early childhood education setting	Ethnographic observation and interviews within the community of practice	Support child's identity as a learner; family and child's active participation in the kindergarten programme; empowerment of child's contribution
18. McGuire and Meadan, 2022 USA	Case study using a qualitative approach	6-year-old child and 25 classmates	Identify ways to create a socially inclusive environment for children who engage in persistent challenging behaviors and/or who have social-emotional delays or disabilities	Use of classroom-based supports	Social inclusion and positive relationship
19. McLean et al., 2022 Australia, Canada, UK, France, Italy, Japan, Hong Kong	Systematic review (37.5% qualitative; 25% quantitative; 37.5% mixed)	Children from birth to 5 years of age	Identify the beneficial outcomes of playgroup participation and indicate primary and secondary features of playgroup provision in practice	Primary: playgroup facilitator, safe and welcoming space, play activities, routines and structure. Secondary: service networks, venue, materials	Social and emotional; communication and general knowledge; language and cognition; physical health and wellbeing
20. Miranda et al., 2017 Spain	Quantitative	173 children ranging in age from 3 to 6 years attending 19 preschools and 51 teachers	Examine the relationship between social play and involvement in the outdoor pre-school environment	Quality of the outdoor school environment was assessed using the Preschool Outdoor Environment Measurement Scale (POEMS); Play Observation Scale (Rubin, 2001); Leuven Involvement Scale for Young Children (Laevers, 1994, 2005)	Association between greater social play and better results on scales that measure variables related to the learning and development of preschool children; gender was found to have a moderating effect on the relationship between the type of group play and involvement
21. Næsby, 2020 Denmark	Conceptual analysis using a mixed method approach	88 preschools (children aged 3-5 years)	Investigate quality in Danish preschools	Quality of orientation, structure, process; use of ECERS-3	Preschools maintain inequality based on social, physical and mental inclusion
22. Ngololo et al., 2024 Namibia	Mixed method	32 ECD centres and caregivers	Determine the provision of early learning to children aged between 0-8 years, caregivers' capabilities, and resources availability in the country	Questionnaire to collect data on ECD centres' background information, caregivers' qualifications, teaching strategies, teaching resources; observation checklist about classroom environment (learning materials, curriculum, learning strategies, interactions, classroom climate), interviews and photography	Obstacles in promote the holistic development of the children; lack of necessary teaching and learning materials as inhibiting factors to cognitive, language and gross motor development; lack of necessary skills promotion; lack of indoor and outdoor materials necessary for physical, cognitive and socio-emotional development
23. Prins et al., 2022	Systematic review using a meta ethnography of qualitative research	Participants between the age of 2-8 years	Explore the value of play in nature-based environments compared to non-nature-based environments for developmental	Play in/on a nature based environment	Playing in nature-based environments not only supports young children's healthy physical development (e.g., physical activity and motor development), but might also support their social-

References, country	Type of study	Sample	Aims	Measured/ Investigated variables	Results in learning and development
			outcomes of young children		emotional, motor, and cognitive development
24. Roberts A. et al., 2020 UK, Israel, Canada, New Zealand, US, Austria	Systematic review (8 qualitative; 6 quantitative)	Children of preschool age and primary school	Direct interaction with nature amongst children and young people and impact on wellbeing	Forms of outdoor experiences that include contact with nature and report their impacts on wellbeing	Self-esteem and confidence; positive and some negative affects; stress reduction and restoration; resilience; social benefits.
25. Roberts W., 2017 Australia	Case study using a qualitative approach	30 families and their children, and 33 qualified ECEPs	Identify some key enablers and barriers in early childhood education and care environments	Enablers and barriers around social inclusion, access, participation and engagement; use of Interpretative Phenomenological Analysis (IPA) to analyse semi-structured interview	Enablers: empathy, trust, time, communication and relationship are key elements of effective engagement; Barriers: lack of time, access the information needed by vulnerable families, lack of professional development, isolation
26. Scanlon et al., 2023 Bulgaria	Quantitative	40 kindergarten (children aged 3-7 years)	Offer insights into how ECEC settings in Bulgaria can enhance quality to develop conditions that support children with SEND	ECERS-3	Low-quality settings are less likely to offer positive learning experiences and enriching environments for all children, especially children with special educational needs or disabilities
27. Shaw, 2019 UK	Ethnographic using a qualitative approach	3 teachers and 2 nursery nurse, 1 teaching assistant	Extend the knowledge and understanding of how engaging with young children's voices in a meaningful way can alter practitioners' pedagogical practice and create inclusive learning environments	Observation of whole-class activities, group work, physical development, use of outdoor environment, creative resources	Face the greater diversity of children's needs; flexible organization and structure allows children to feel included; listening to children's voices makes teaching effective
28. Teichert and Salman, 2021	Exploratory literature review	Children aged 0-6 years	Examine research to date on age-appropriate and play-based uses of digital technology that could more naturally fit in preschool and kindergarten classrooms while also highlighting the potential benefits of using tablets in early learning classrooms	Inclusion of digital technology in early learning classrooms; digital devices that align with play-based learning environments	Tablets can motivate children because they are engaging, interactive, and provide immediate feedback; they provide young children with opportunities to scaffold their peers' learning and help build independence; child-centred affordances of tablets; they support the development of bilingual children
29. Tonge et al., 2016 USA, Canada, Sweden, Netherlands, Belgium, Denmark, Australia	Systematic review (quantitative)	Children from birth to 5 years of age	To systematically review the correlates of physical activity and sedentary behavior among children in Early Childhood Education and Care (ECEC) services	Child domain; educators domain; presence of an outdoor environment and larger play spaces	Higher levels of physical activity and conversely outdoor environments were positively associated with reduced sedentary behaviors. No association with sedentary items, indoor environment, weather conditions. It appears to be the quality, rather than the quantity of the play time that is significant

References, country	Type of study	Sample	Aims	Measured/ Investigated variables	Results in learning and development
30. Watson and Newman, 2024 Australia	Participatory research using a qualitative approach	Children aged 3-5 years	This research sought children's ideas about their early childhood setting, with the view to informing the design of a new inclusive centre	Child-led photo-taking tours; photo elicited interviews; and interview elicited drawing	Preference for outdoor spaces, places for relationship, places that are safe and clean, for movement and privacy, for real objects
31. Zolkipli et al., 2023 China, Malaysia, Finland, Morocco, Germany, Italy, Indonesia, Netherlands	Systematic review (6 qualitative; 4 quantitative; 4 mixed)	Preschool children with learning disabilities	Aanalyze research conducted on Game-Based Learning (GBL) courseware to support the education of children with learning disabilities	Game-Based Learning courseware and impacts in learning environments and in education	Combining namely text, video, audio and images provide the best interactive learning outcomes for children; GBL has a significant impact on the development of cognitive skills and assists children who have difficulty in reading, writing and arithmetic

Among the included studies, several focus on children aged 3 to 6 years (Beatty et al., 2021; Bejno et al., 2022; Brodzeller et al., 2018; Khalfaoui et al., 2020; Kroll, 2017; Martínez-Bello & Martínez-Bello, 2017; McAnelly & Gaffney, 2019; McGuire & Meadan, 2022; Miranda et al., 2017; Watson & Newman, 2024; Zolkipli et al., 2023), while others are directed toward children between 6 and 10 years of age (Giusti & Bombieri, 2020; Hanna, 2020; Hennessy, 2019; Jawad, 2022; León-Jiménez et al., 2020). A number of studies address broader samples spanning 2 to 10 years (Buenestado-Fernández et al., 2023; Prins et al., 2022; Roberts et al., 2020), whereas others target the 0–6 age range (Buli-Holmberg et al., 2022; McLean et al., 2022; Teichert & Salman, 2021; Tonge et al., 2016). The review conducted by Clemente-Suárez et al. (2024) adopts the term "childhood" to describe its sample, encompassing studies that range from early years to adolescence. Similarly, the works of Eadie et al. (2024), Næsby (2020), Ngololo et al. (2024) and Scanlon et al. (2023) broadly refer to early childhood education (ECE) or kindergarten contexts without specifying narrower age groups.

Synthesis of the results

For the analysis and synthesis of results, MAXQDA24 software was employed to code and classify data from the included studies. This process enabled the identification of variables relevant to RQ1 and their organization into thematic codes. The variables emerging within the overarching theme of educational environments and their impact on children's learning and development were grouped into four main domains: in/outdoor space, play, relationship, and technologies.

In/Outdoor Space

Six studies examined outdoor learning environments (Hennessy, 2019; McAnelly & Gaffney, 2019; Miranda et al., 2017; Prins et al., 2022; Roberts et al., 2020; Tonge et al., 2016). Prins et al. (2022) and Tonge et al. (2016) showed that natural outdoor settings promote higher levels of physical activity and higher-quality play, particularly when designed to ensure safety and autonomy, encouraging exploration and cognitive engagement. McAnelly and Gaffney (2019) and Roberts et al. (2020) highlighted the role of natural environments in fostering resilience, self-regulation and emotional well-being by reducing anxiety and aggressive behaviors. Miranda et al. (2017) found that outdoor play enhances concentration, imagination and creativity through social participation, while Hennessy (2019) emphasized that experiences such as school gardens strengthen environmental awareness and respect for nature.

Indoor environments were also widely investigated. Hanna (2020) reported that classroom layout can reinforce exclusion, particularly for migrant children placed at the back with assistants, which creates spatial and social divisions. Conversely, McAnelly and Gaffney (2019) noted that "privacy zones" equipped with soft furnishings provide spaces for relaxation and self-regulation, especially beneficial for children with special needs, while Kroll (2017) observed that organizing group areas fosters turn-taking, negotiation and collaborative learning.

Several studies stressed the importance of culturally responsive spaces. Beatty et al. (2021), Hanna (2020), and Mahadew (2023) emphasized the value of integrating multilingual and multicultural resources—such as books, games, songs and images—to celebrate diversity and support families. Martínez-Bello and Martínez-Bello (2017) warned that classroom displays often perpetuate gender stereotypes and called for materials that promote equality, diversity and positive representations of disability and body variability.

Flexibility and adaptability emerged as key features of effective learning environments. Buli-Holmberg et al. (2022), Eadie et al. (2024), and Jawad (2022) underscored the importance of age-appropriate and accessible materials, natural lighting, calm colors, good acoustics, safe flooring and spatial differentiation to accommodate varied learning styles and needs. Brodzeller et al. (2018) highlighted the usefulness of visual supports—such as schedules, labels and directional signs—in facilitating transitions, especially for children with autism. Similarly, Kroll (2017) and McAnelly and Gaffney (2019) emphasized the value of routines and positively framed classroom rules in supporting self-regulation and social expectations.

Two studies employing ECERS-3 (Næsby, 2020; Scanlon et al., 2023) revealed shortcomings in kindergarten environments, ranging from inequities in inclusion to inadequate teacher–child interactions, accessibility and learning resources. Finally, Ngololo et al. (2024) demonstrated that a lack of safe, stimulating and developmentally appropriate spaces and materials hinders children's psychological, physical and socio-emotional growth.

Play

Compared with indoor spaces, outdoor environments appear to foster greater social and socio-dramatic play. Miranda et al. (2017) and Prins et al. (2022) found out that outdoor free play offers engaging and stimulating experiences that enhance emotional well-being and support socio-emotional and cognitive development, making it a key indicator of early educational quality. Watson and Newman (2024) further emphasized that risky play—such as climbing, jumping and balancing—provides challenges that help children test limits, develop resilience and acquire new skills. Play is described as a fundamental mode of learning in early childhood. Kroll (2017) observed that between ages 2 and 5, play supports creativity, problem-solving, negotiation and social interaction, contributing significantly to language development and perspective-taking. Hanna (2020) and Miranda et al. (2017) highlighted its role in fostering inclusion, as play creates spaces where children from diverse cultural and linguistic backgrounds can explore and share identities in non-judgmental contexts.

Several studies (Buli-Holmberg et al., 2022; Eadie et al., 2024; Hennessy, 2019) identified both structured and unstructured play as central to cognitive, linguistic and social progress. Structured play helps achieve targeted learning goals, while unstructured play nurtures holistic development through exploration and experimentation. Miranda et al. (2017) also reported gender-related differences, with boys more likely to form larger, independent groups and girls tending to engage in smaller groups closer to adults, often through more interactive conversation.

Finally, a systematic review by McLean et al. (2022) on playgroup participation (ages 0–5) identified four main developmental benefits: socio-emotional growth, language and cognition, communication and general knowledge, and physical health and well-being. Effective playgroups were characterized by key features such as the role of facilitators, the design of activities, safe and welcoming environments,

and predictable routines, supported by networks of services, materials and accessible locations.

Relationship

Although all of the studies highlight the centrality of relationships and socio-emotional development in childhood, several provide specific insights and outcomes. Giusti and Bombieri (2020), through a case study in a primary school makerspace, show how spaces designed to support collaboration, empathy and idea-sharing foster learning through hands-on projects. Such configurations are particularly inclusive for pupils with special needs, as the focus on shared goals enables participation within a social dimension that values diverse abilities.

Khalfaoui et al. (2020) examined a kindergarten with immigrant children from socio-economically disadvantaged backgrounds, showing that poor early interactions can compromise developmental trajectories, increasing the risk of school dropout and failure. Their use of Interactive Groups (IGs), based on dialogic learning, promoted peer guidance and mutual support, reinforcing empathy and solidarity in contexts where these qualities are most needed. Similarly, León-Jiménez et al. (2020), analyzing Successful Educational Actions (SEAs) in primary schools, found that inclusive and supportive environments foster self-esteem, academic achievement and emotional well-being. Among SEAs, the authors highlight IGs, Dialogic Gatherings (DGs) that encourage prosocial dialogue, and the Dialogic Model of Conflict Prevention and Resolution which establishes shared rules to build school spaces free from violence and discrimination.

Watson and Newman (2024) also emphasized that educational spaces from the earliest years shape children's identities by offering relational contexts that provide multiple ways of understanding self and others. Other studies (Bejno et al., 2022; McAnelly & Gaffney, 2019; McGuire & Meadan, 2022) underline the role of peers in promoting inclusive environments, particularly for children with autism or behavioral difficulties, when supported by guided interactions that ensure equitable participation. Miranda et al. (2017) similarly found that engagement in social play correlates with improved learning and developmental outcomes.

Teachers also emerge as crucial mediators of relationships. Several studies (Giusti & Bombieri, 2020; Hanna, 2020; Mahadew, 2023; Prins et al., 2022) describe their role in fostering collaboration and mutual respect by adjusting support to children's needs. Finally, multiple studies (Beatty et al., 2021; McAnelly & Gaffney, 2019; McGuire & Meadan, 2022; Roberts, 2017; Scanlon et al., 2023; Shaw, 2019) stress

the value of co-designing educational environments with children and families. Roberts (2017) identified five elements—trust, empathy, time, communication and relationships—as key to engaging families, strengthening interactions, and building inclusive spaces that support psychological, developmental and health outcomes.

Technologies

Several studies (Buenestado-Fernández et al., 2023; Clemente-Suárez et al., 2024; Teichert & Salman, 2021; Zolkipli et al., 2023) specifically examined the role of technology in early childhood education. Buenestado-Fernández et al. (2023) analyzed digital connectivity in kindergarten and primary school, showing that internet access can help reduce digital exclusion, particularly for disadvantaged students, by enabling participation through social media. Activities such as designing video games and apps were found to reduce both the digital divide and gender disparities while fostering creativity, critical thinking, collaboration and self-regulation.

Clemente-Suárez et al. (2024) argued that digital environments shape neuronal plasticity through rapid and complex stimuli, which, if well-structured, can enhance cognitive skills but risk overloading children's abilities if exposure is excessive. Video games requiring visual-spatial reasoning, coordination and multitasking—such as *Minecraft* or *SimCity*—were associated with problem-solving and planning skills, while immersive technologies like augmented reality (AR) and virtual reality (VR) provided interactive learning experiences that stimulate engagement.

Zolkipli et al. (2023) reported that game-based learning (GBL) supports cognitive, motor, creative and socio-emotional development by integrating multimedia resources such as text, audio, video and images. GBL was linked to improvements in cognition, language, social skills and school readiness, with serious games particularly effective in maintaining motivation and supporting children with Specific Learning Disorders through tailored, engaging materials.

Similarly, Teichert and Salman (2021), focusing on children aged 0–6, emphasized that technology is essential for full literacy in contemporary society. They showed that tools such as tablets enhance expressive and cognitive skills through interactivity and immediate feedback, promote social interaction and collaboration, foster autonomy and support bilingual learners with apps for language acquisition.

In contrast, Tonge et al. (2016) highlighted potential risks, reporting that technology use in early childhood settings is associated with sedentary behaviors, whereas

reduced exposure correlates with increased physical activity and better health outcomes.

3. Discussion

This review examines how educational spaces influence children's learning and development, focusing on studies involving kindergarten and primary school pupils. **Table 2** links the four identified domains to key outcomes, using selected variables to address RQ1 and outcomes to address RQ2.

Across both kindergarten and primary contexts, outdoor spaces emerge as essential for children's overall development and well-being. Learning in nature is associated with motor development, enhanced creativity and problem-solving, reduced aggression and increased environmental awareness. Furthermore, outdoor settings stimulate curiosity and support autonomous exploration, strengthening agency and independence. Bortolotti et al. (2020) further note that outdoor education enhances content acquisition, attention and behavioral regulation, while fostering community belonging. Additional research (Gascon et al., 2015; Haluza et al., 2014) indicates that outdoor activities alleviate ADHD symptoms, reduce anxiety and depression, and promote children's overall well-being. Two design priorities are highlighted: ensuring safety, which enables secure exploration, and providing differentiated zones that support both large-group motor activities and quieter small-group tasks.

Indoor environments present distinct requirements. Studies (Beatty et al., 2021; Hanna, 2020; Mahadew, 2023; Martínez-Bello & Martínez-Bello, 2023) emphasize careful selection of classroom materials—books, games, wall displays, puppets, natural elements and furnishings—to foster diversity and address varied learning needs. Findings suggest that effective indoor learning environments should: be healthy, sustainable and flexible, supporting multiple activities simultaneously; include age-appropriate resources that consolidate existing skills and foster new ones; integrate culturally responsive materials that encourage participation in diverse, global contexts; be accessible and child-centered, supported by visual aids to promote autonomy and curiosity; provide clear, predictable routines that aid self-regulation, particularly for children requiring additional support.

Table 2: Emerging features of the four main domains and their respective learning and development outcomes.

	Four main domains	Emerging characteristics	Main learning and development outcomes
Spaces	Indoor	- Flexible and accessible classrooms - Diversity-enhancing cultural and linguistic materials - Predictable routines and differentiated spaces - Age-appropriate and visually stimulating resources - structural elements (*adequate and natural light, relaxing colors, good acoustic, outside and green views, adaptable and responsive classroom equipment)*	- Enhanced language and cognitive development - Active and equal participation and autonomy - Acceptance of diversity and social inclusion - Development of negotiation and self-regulation skills - Improved psychological and relational well-being - Educational success for multiple learning style - Support child's identity
	Outdoor	- Natural and safe spaces - Differentiated zones for motor and calm activities - Encourages autonomy and exploration - Free and risky play opportunities - Equipment for physical activity	- Improvement of motor development, creativity and resilience - Enhanced creativity and problem-solving skills - Reduced stress, aggression, anxiety and ADHD symptoms - Healthy cognitive, motor and social-emotional development - Promotion of agency and sense of community - Respect for nature and environmental awareness
	Play	- Structured and unstructured play - Social and socio-dramatic play - Play in nature-based environment (*jump, keep balance, climb*) - Opportunities for exploration and negotiation - Cooperative and inclusive activities	- Development of social skills, empathy and solidarity, and negotiation skills - Improved problem-solving and creativity - Promotion of emotional regulation and self-control - Inclusion of children with disabilities and diverse cultural backgrounds - Improvement of communication and general knowledge
	Relationship	- Teachers as active mediators - Peers as role models - Collaboration with families - Educational spaces fostering interaction and dialogue - Interactive groups (IGs); Dialogic Gatherings (DGs); Dialogic model of prevention and resolution of conflicts - Morning circle - Classroom-based support	- Increased self-esteem and self-efficacy - Enhanced emotional and social well-being - Encourages active participation and inclusion - Supports development of prosocial values such as empathy and solidarity - Help and guidance interaction among peers - Prosocial behaviors and collaboration - Decrease in conflict and violent behaviors
	Technologies	- Integration of digital games, tablets, AR, VR, educational apps - Activities for creating digital content - Moderate use, in social or game-based contexts	- Increased motivation, engagement and collaboration - Development of cognitive, linguistic and creative skills - Reduction of the digital divide and support for students with special needs - Digital competences - Support in reading, writing and arithmetic abilities - Risk of cognitive overload, maladaptive or sedentary behaviors if not properly regulated

Consistent with recent studies (Genis Vinyals et al., 2024; Gupta & Nagasawa, 2024; Macagno et al., 2024), such designs enhance language development, active participation, appreciation of diversity, psychological well-being and negotiation skills within shared spaces. Accessibility, in particular, fosters equal participation, trust and improved community interactions. Furthermore, involving children in designing educational spaces through storytelling, dialogue and collaborative

drawing, encourages ownership, care and respect. This approach supports self-esteem, self-efficacy and positive adult–child relationships.

The other three domains—play, relationship and technologies—interact dynamically, shaping educational outcomes. Optimal learning conditions, especially in early childhood, arise when play and relationships are central. Play, as noted by Stevens-Smith and Stegelin (2015), enables exploration, social skill development and problem solving, while promoting health and well-being. Social and socio-dramatic play are particularly important, supporting inclusion of children from diverse cultural, linguistic and ability backgrounds. Through play, children learn self-regulation, emotional expression and solidarity (Duque et al., 2021), offering protection in marginalized or disadvantaged contexts. Importantly, outdoor environments appear to enhance these benefits: nature-based settings stimulate curiosity, creativity and resilience, while offering opportunities for physical activity, risk-taking and cooperation. Outdoor education helps reduce aggressive behaviors promoting a sense of community.

Studies further show that when play and relationships are integrated, outcomes include active participation, communication and problem-solving skills, empathy, patience, behavioral inhibition and emotional well-being. These results highlight the importance of intentional teacher planning. Teachers are encouraged to act as mediators and observers, dedicating time to dialogue and communication to foster understanding, positive classroom climates and peer learning.

Evidence regarding digital environments in early childhood remains mixed. Some studies (Buenestado-Fernández et al., 2023; Clemente-Suárez et al., 2024; Teichert & Salman, 2021; Zolkipli et al., 2023) report benefits including engagement, motivation, reduced digital divides, support for special needs, collaboration and creativity, especially when technologies are integrated into social and play-based contexts. Conversely, other studies (Mustafaoğlu et al., 2018; Slutsky et al., 2021; Tonge et al., 2016) highlight teachers' preference for traditional activities and concerns over technology's potential negative social and behavioral impacts in early childhood. Overall, while technology offers rich interactive opportunities, it can simultaneously enrich and overload children's cognitive capacities. Siskind et al. (2020) emphasize that combining technology with nature-based learning can enhance young children's attention, motivation and cognitive skills. Thoughtful use of digital tools in outdoor settings supports engagement and learning, while excessive screen time may negatively affect self-regulation, physical activity, and

well-being. The authors also highlight the need for further research to better understand these interactions.

Conclusion

This review examined the relationship between educational spaces and children's learning and development, with a focus on kindergarten and primary school. The use of a scoping review proved effective in identifying the key features and drivers shaping this relationship. Four main domains emerged—in/outdoor spaces, play, relationship and technologies—which, depending on their configuration (Table 2), appear to foster or hinder high-quality learning contexts that optimize children's development and educational outcomes.

The findings underscore the importance of designing child-friendly spaces that are safe, stimulating and accessible, thereby supporting autonomy and independence from the earliest years. Accessibility ensures equitable participation, allowing all children to benefit from available learning opportunities. Equally crucial is the creation of environments that value and promote diversity, affirming every child's right to an education that is respectful, inclusive, and responsive to individual needs.

In relation to RQ3, the review highlights the need for further investigation into the role of technology in early education. While digital tools can enrich learning and exploration, the current evidence—particularly in kindergarten settings—is limited and often contradictory. Further research is therefore required to establish pedagogical practices that integrate technology in ways consistent with principles of child development.

The review aims to guide the design of educational spaces that meet children's needs in a changing world. Such spaces support development, personal growth, and meaningful learning. Findings can inform future research on preschool environments, helping educators adapt strategies to promote well-being, engagement, and holistic development.

Author contributions

This contribution is the result of the joint work of all authors. In particular, AR prepared the introduction and the conclusion. FMS and AR collaboratively conducted the study selection and data extraction. FMS is responsible for writing paragraphs 1, 2, and 3. MM provided scientific supervision throughout the project.

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