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School Space as Catalyst for Learning: Insights from Malaysian primary school pupils

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Abstract
Schools are designed for teaching and learning, yet their spatial layouts are often standardized to administrative needs, overlooking user experience and pupils' perspectives. This study examines how Malaysian primary pupils perceive and interpret their school environment through a design charrette conducted across three primary schools in Puncak Alam, Selangor, involving 124 participants. Pupils collaboratively brainstormed, photographed, and redesigned school spaces to express their preferences. Content analysis revealed two main themes: *categories of space* and *affordance of school spaces for learning,* highlighting the need for schools to offer a wider range of affordances to enhance pupils' learning experiences.

Keywords: School Space; Learning; Primary Schools; Pupils

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1.0 Introduction

Schools are formal institutions that nurture learning and foster personal and social growth. They provide structured environments where pupils engage with planned curricula to build foundational knowledge, skills, and values. Beyond academic instruction, schools function as social spaces where children interact, form relationships, and learn norms, behaviours, and responsibilities for participation in society. Through organized teaching, dedicated educators, and purpose-built facilities, schools help shape individuals and communities.

Around the world, initiatives aim to create next-generation schools that align design with current pedagogical shifts. Schools are complex environments that must be carefully designed for effective use. The Government of Malaysia has responded to the need to enhance educational environments across the region. Substantial allocations are provided yearly to upgrade educational infrastructure, particularly in primary and secondary schools (Ministry of Education Malaysia, 2023). There are also proactive measures to construct new schools, especially in densely populated urban areas where rising enrolment continues to strain existing facilities (Ministry of Education Malaysia, 2021). A recent proposal to address land scarcity and increasing student numbers in urban areas was the development of vertical schools, characterized by multi-story institutions ranging from 6 to 17 floors (Malay Mail, 2023; Lim & Tan, 2021). There is an ongoing debate over the effectiveness of the vertical school concept in Malaysia.

As one of the key solutions to address urbanization pressures and land scarcity—particularly in densely populated urban areas (The Star, 2024), it has also raised several commentaries related to emergency evacuation challenges in multi-storey school structures, users' reliance on lifts, and increased building service demands, all of which may significantly influence the long-term viability of vertical school models (Mohamad & Ismail, 2022).

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Schools in the suburban areas are likewise affected by the rapid increase in student enrolment, a trend closely associated with rising property values and escalating living costs that prompt population shifts into more affordable peri-urban and rural areas (Hashim & Rahim, 2020; OECD, 2023). Schools are consequently required to accommodate student numbers that far exceed the spatial capacity for which they were originally designed. Classrooms, in particular, have become significantly overcrowded, with pupil numbers surpassing recommended standards, while access to other shared or specialized learning spaces is increasingly constrained due to highly congested scheduling (Abdullah & Kassim, 2021; UNESCO, 2018). These spatial limitations limit teachers' ability to diversify pedagogical approaches, often compelling them to conduct most instructional activities within the classroom (Ismail, Rahman & Ghani, 2022). In effect, pupils' learning experiences become confined mainly to their respective classrooms, limiting opportunities for varied, experiential, and spatially distributed forms of learning (Barrett et al., 2019).

Drawing on Gibson's Affordance Theory (1979), this study examines how school spaces provide pupils with opportunities for learning. In this approach, affordances are understood as properties that emerge from pupils' interactions with the physical and social features of school spaces. By examining pupils' insights and engagement across different areas of the school, this study aims to understand how spatial, social, and cognitive elements work together to shape learning opportunities. This study first identifies the school spaces beyond the classroom that pupils view as supportive of their learning, and later examines how they interpret and evaluate the affordances of these spaces. The two objectives help to deepen understanding of how pupils experience and make sense of the spatial conditions that influence their everyday learning.

2.0 Literature Review

Research on learning environments increasingly demonstrates that school space functions as an active pedagogical agent rather than a passive backdrop to teaching and learning. Scholars have shown that learners' experiences of educational settings are shaped by the interconnected relationship between spatial configurations, environmental qualities, and pedagogical cultures. Woolner and Clark (2021–2023), for example, argue that school environments operate as social-spatial systems in which physical design, institutional routines, and cultural expectations interact to shape learning possibilities. Complementing this, Clark and McPhie's (2021) work highlights the importance of eliciting pupils' perspectives to understand how space is lived, negotiated, and made meaningful in children's geographies. A growing body of research indicates that spatial design and educational practice are mutually constitutive, in which changes made to school layouts inevitably reshape learning cultures (Yates & Gulson, 2021). Spatial affordances can promote new pedagogical modalities only when accompanied by broader cultural and organizational change. Extending this discourse, Cleveland and Fisher (2020–2022) show that the pedagogical potential of innovative learning environments is realized only when their spatial affordances are reinforced by simultaneous shifts in school culture and organizational practice.

In the Malaysian context, emerging studies echo these global insights while foregrounding local spatial and cultural dynamics. Research by Nawawi and Khalid (2021) and Nor et al. (2022) reveals that Malaysian primary schools typically operate within classroom-centric learning cultures shaped by standardized layouts, tightly scheduled routines, and restricted access to varied learning settings. Although formal instructional spaces and resource centers dominate pupils' daily experiences, recent work highlights the pedagogical potential of outdoor and informal environments. Hamzah and Lee (2023), for instance, report that landscaped and social garden spaces support exploration and interaction, though they remain underutilized. Similarly, a study by Salleh and Ahmad (2022) demonstrates that spatial quality influences teachers' capacity to diversify instructional strategies. More recently, Abdullah and Hashim (2024) emphasize the importance of recognizing children's spatial preferences and well-being, reinforcing calls to integrate pupil voice into the evaluation of learning environments. Collectively, these global and Malaysian studies offer a robust theoretical and contextual foundation for examining how school spaces act as catalysts for learning, shaping how pupils perceive, navigate, and utilize their educational environments.

Flexible and responsive school spaces are central to developing 21st-century learning competencies and creating a more conducive physical environment for learning. The Malaysia Education Blueprint (2013–2025) aims to transform the education system in Malaysia, prioritizing efforts to upgrade schools according to infrastructure standards that reflect local suitability and needs across all Ministry of Education schools. The Blueprint advocates for learner-centric environments, emphasizing adaptable, inclusive school spaces that support holistic development, active learning, and student well-being.

3.0 Methodology

Using a multi-case study approach, this study conducted design charrettes as a child-friendly method for engaging school pupils. Due to scheduling constraints, charrettes were held at three of the four primary schools in Puncak Alam, a township in the Kuala Selangor district of Malaysia. Each session lasted approximately three hours, including a thirty-minute break. Design charrettes began with an introductory briefing on the objectives, procedures, and ethical considerations. Pupils were then divided into groups of six to seven, each guided by a trained facilitator. Only Year 6 pupils of mixed gender with various academic achievement levels were included. In total, 124 pupils participated: School 1 (n = 42), School 2 (n = 41), and School 3 (n = 41). The three participating schools were purposively selected to reflect the typical enrolment patterns and demographic profile of Puncak Alam, particularly the predominantly Malay pupil population. Although the fourth school, which shared similar characteristics, was unable to participate within the available data collection period, steps were taken to minimize the impact of its exclusion by ensuring variation in school size and location across the three included sites. Given this alignment, the participating schools offer adequate representation for the study objectives, with the omission acknowledged as a minor limitation that is not expected to affect the validity of the findings.

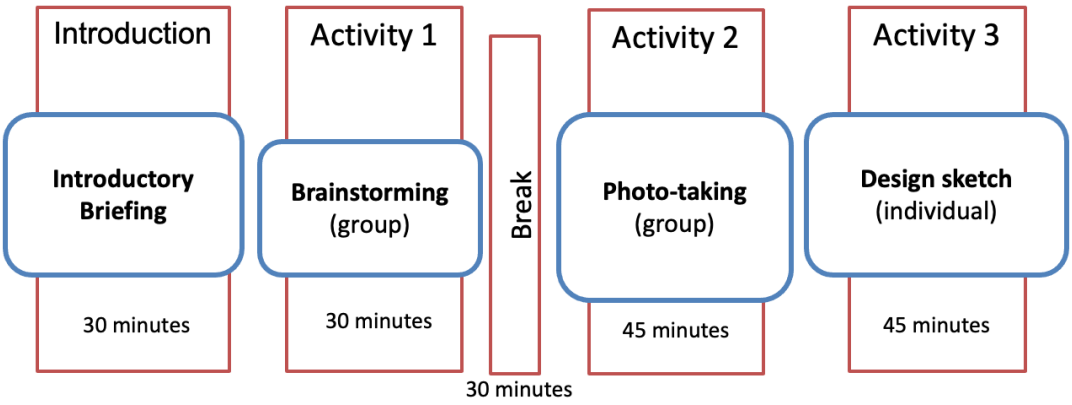

Fig.1. The conceptual outline of the design charrette.
(source: Author, 2025)

In three sequential activities: brainstorming, photo-taking, and design sketching (Fig. 1), the pupils were first informed of an imaginary task, which is to build a full-scale 1:1 sculpture made out of a recycled fuel drum. In the assigned group, the pupils were to outline the sequential steps needed for the imaginary sculpture in the Activity 1 template (Fig. 2a). Secondly, they were required to discuss the most appropriate spaces for conducting the aforementioned steps. Within the school compound, the pupils were to photograph the selected spaces using a provided mobile phone or iPad. With the assistance of the group facilitator, the images were digitally composed in the Activity 2 template (Fig. 2b). Lastly, the pupils were to propose an individual design idea for any of the school spaces identified earlier. Using the provided or personal colouring media, the pupils were to present the redesign proposal on the Activity 3 template (Fig.2c). This paper, however, discusses the findings from the first two activities, which focus on pupils' insights as a group. Several types of datasets, including textual responses, digital photographs, and pupils' sketches, led the study to use Content Analysis, an analysis method that reveals patterns by identifying and counting repeated features. This study specifically used MAXQDA, a CAQDAS software, to organize the datasets and sort coded segments into clear visual displays. Through this approach, codes that appeared repeatedly, overlapped with others, or emerged uniquely across the visual data were identified.

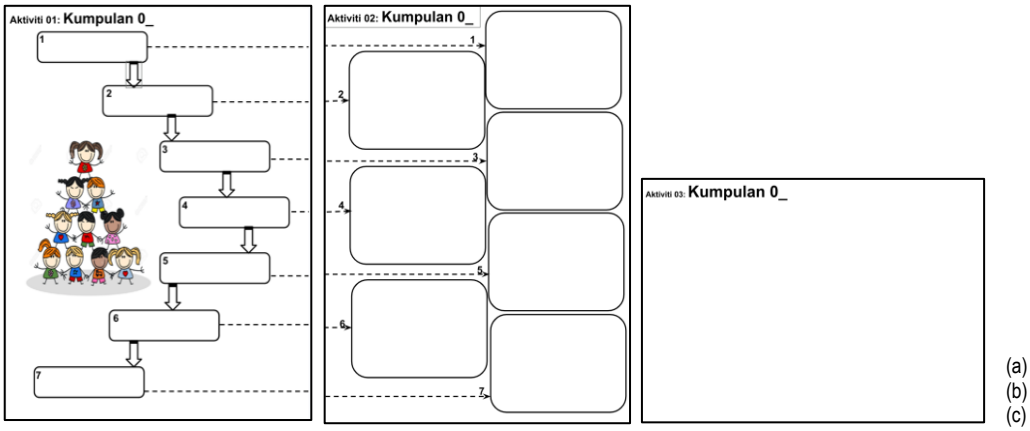

Fig.2. Template for design charrette activities: (a) Activity 1-Brainstorming; (b) Activity 2-Photo-taking; (c) Design sketch.
(Source: Author, 2025)

4.0 Findings

This study presents only the findings from the first two *design charrette* activities: *brainstorming* and *photo-taking*, as the data adequately offer an initial insight into the nature of the school spaces and how pupils engage with them. The analyzed data led the study to two key themes: *categories of space,* and the *affordance of school spaces for learning.*

4.1. Categories of Space

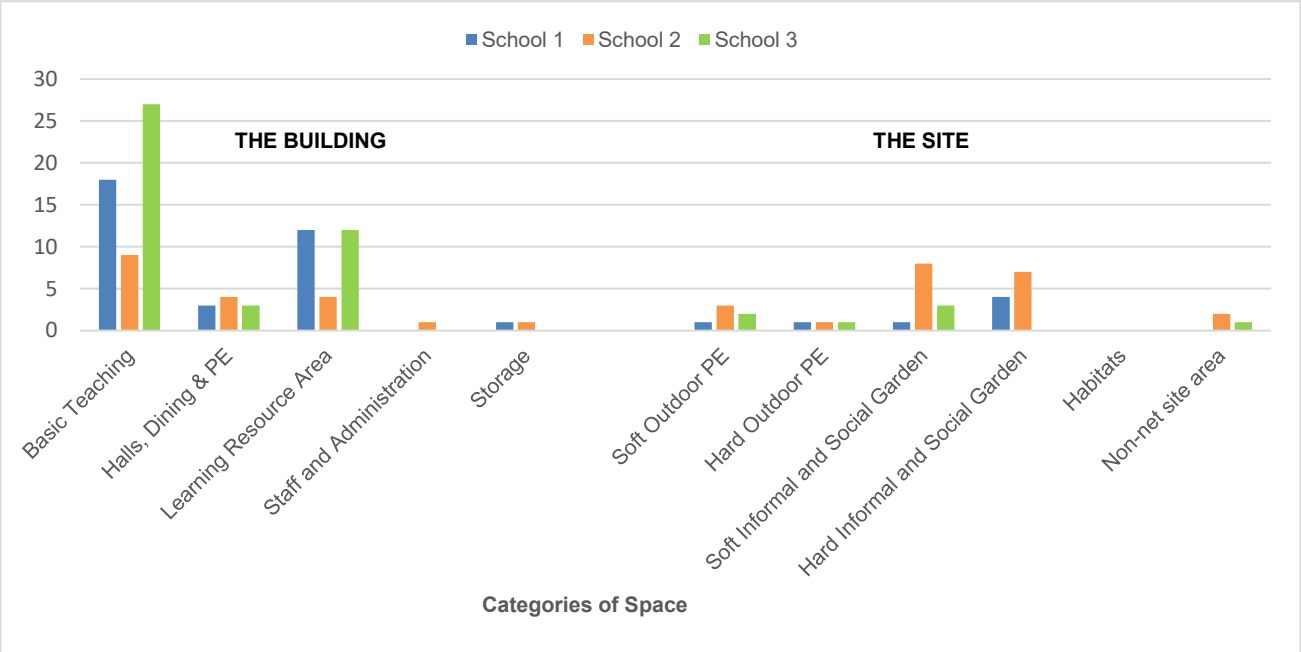

Fig.3. Categories of spaces in the school building and the school site that afford learning from the pupils' insights.
(Source: Author, 2025)

Fig.3 reveals distinct patterns in how pupils across the three schools perceived and utilised different categories of school spaces. *Basic teaching spaces* emerged as the most frequently referenced category overall, with School 3 showing the highest reliance on classroom environments, indicating that learning in this school is predominantly classroom-centred. School 1 also demonstrated strong engagement with *basic teaching areas*, while School 2 showed comparatively lower dependence on these indoor spaces. Differences between schools were most notable in the *site-based outdoor categories.* Fig.4 (a-h) shows photographs taken by the students on several categories of space in the school site that afford learning. School 2 consistently recorded the highest frequencies for outdoor social and garden spaces as well as for soft and hard informal areas, suggesting that pupils in this school are more exposed to, or more frequently engage with, outdoor learning and social environments. In contrast, Schools 1 and 3 made limited references to these spaces, suggesting more restricted use or less prominent roles for outdoor areas in their daily school experience. In learning resource areas, Schools 1 and 3 showed higher engagement than School 2, suggesting that library or resource-centre spaces may be more accessible, emphasised, or better integrated in these schools. Across all schools, *administrative areas, storage,* and *habitat zones* recorded minimal references, reflecting pupils' limited interaction with or perceived relevance of these spaces to their learning activities. The findings generally point to two key patterns. Firstly, Schools 1 and 3 exhibit a predominantly indoor-oriented learning environment, with pupils relying heavily on classroom-based spaces. Secondly, School 2 reflects a more outdoor-focused spatial experience, where pupils engage more frequently with landscaped areas and social garden spaces. These variations suggest that differences in spatial provision, accessibility, and school culture significantly shape how pupils perceive and value their learning environments.

(a)

(b)

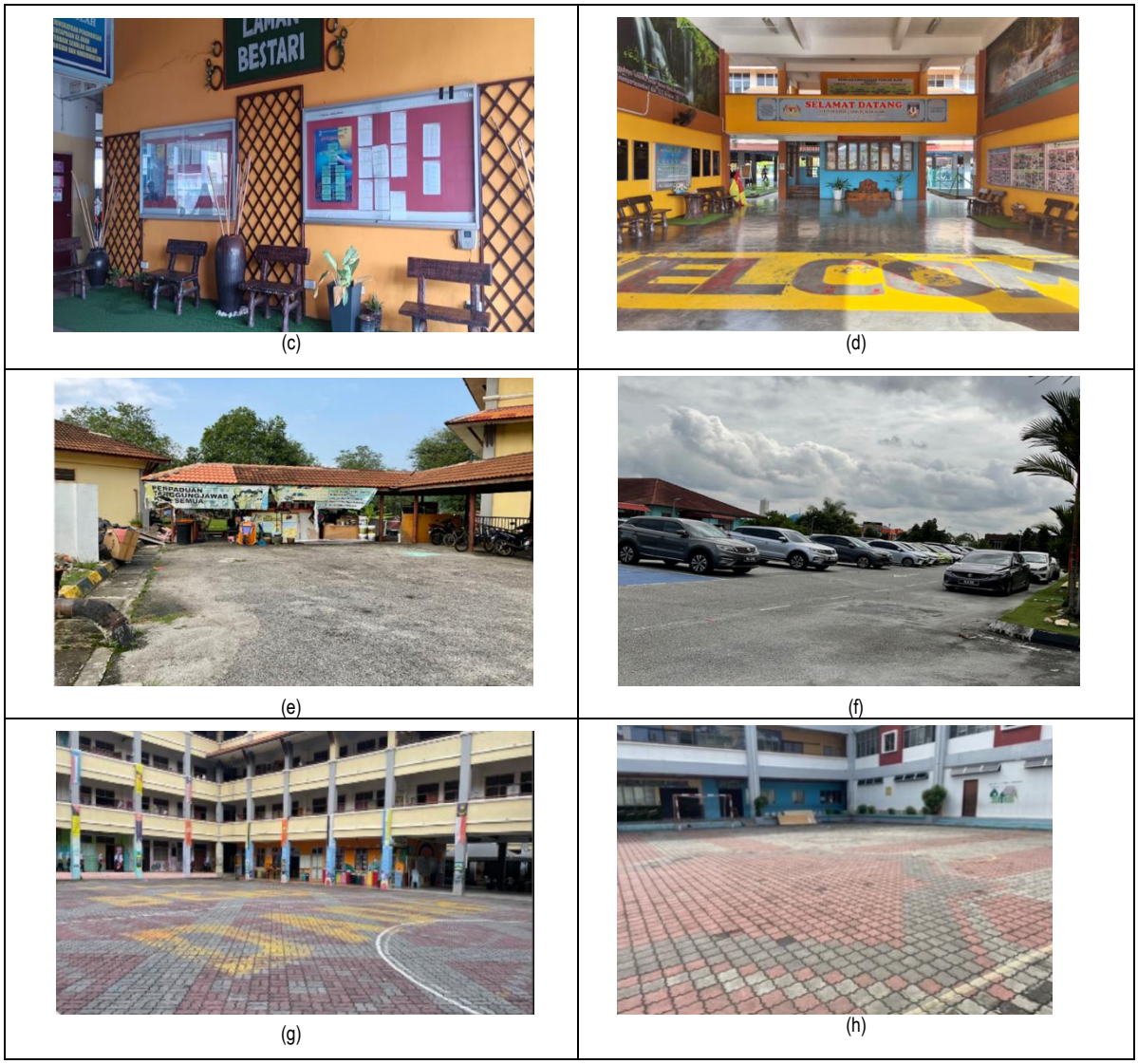

Fig.4. Photographs taken by the pupils depicting some categories of space in the school site that afford learning. (a) Garden in School 3; (b) Garden in School 3; (c) Lobby in School 2; (d) Lobby in School 1; (e) Parking space in School 2; (f) Parking space in School 3; (g) Plaza in School 2; (h) Plaza in School 3.
(Source: Author, 2025)

4.2. Affordance of School Spaces for Learning

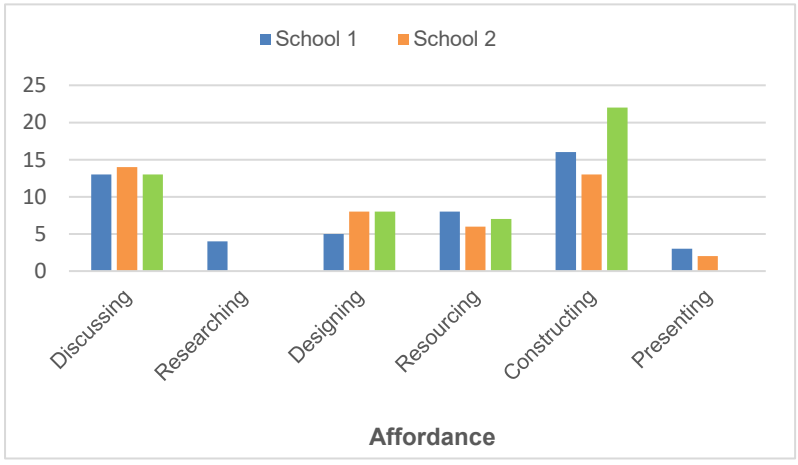

Fig.5. Six key Affordances of School Spaces as perceived by the pupils.
(Source: Author, 2025)

Across the three schools, pupils perceived the school spaces as having approximately 142 affordances for learning. Several cycles of process coding guided the study to six key affordances, namely: discussing, researching, designing, resourcing, constructing, and presenting, which are generally the basic sequential steps in making the imaginary sculpture from the pupils' viewpoints. Constructing emerged as the most dominant affordance, particularly in School 3, suggesting a strong emphasis on developing two-dimensional ideas into three-dimensional ones involving cutting, painting, drying, and decorating. Discussing was also consistently high across all schools, indicating that the idea of opinion sharing between two or more individuals forms a core component of pupils' learning experiences-the pupils associated with discussing generating ideas, assessing quality, evaluating site options, and costing. In contrast, designing and resourcing showed moderate and relatively even, reflecting their supportive but secondary role in the overall learning. Notably, researching and presenting recorded the lowest frequencies, with minimal to no engagement in Schools 2 and 3, suggesting limited opportunities for independent inquiry or for structured communication of ideas. Collectively, these patterns highlight a learning culture that privileges practical, collaborative, and action-based engagements while providing fewer affordances for research-driven or presentation-based activities.

5.0 Discussion

The findings from the brainstorming and photo-taking activities collectively reveal how pupils' experiences of school spaces are shaped not only by spatial provision but also by the prevailing learning culture within each school. Prior research demonstrates that school environments are not neutral containers but social-spatial systems that reflect institutional routines, pedagogical expectations, and cultural norms (Woolner et al., 2021; Barrett et al., 2019). The categorization of spaces in this study indicates a pronounced contrast between indoor-dominant and outdoor-engaged learning environments. Schools 1 and 3 showed a firm reliance on basic teaching spaces, suggesting a more traditional, classroom-centered model of learning established a pattern in many Malaysian schools where instructional practices remain tightly bound to indoor, timetable-driven teaching (Nawawi & Khalid, 2021; Nor et al., 2022). In comparison, the pupils of School 2 demonstrated more frequent engagement with outdoor social and landscaped areas, reflecting a broader spatial experience that supports movement, exploration, and informal interaction, consistent with studies highlighting the educational, social, and well-being benefits of outdoor learning environments (Clark & McPhie, 2020; Cheshmehzangi, 2021). These cross-school differences imply that pupils' spatial behavior is closely tied to the accessibility, visibility, and cultural importance afforded to different environments within each school. A well-documented pattern in environmental behaviour research shows that spatial affordances and institutional cues strongly shape how children use their surroundings (Gibson, 1979; Heft, 2020).

The affordance analysis further deepens understanding of how pupils perceive learning in these environments. The six identified affordances align with a sequential experiential learning process, yet reveal their distribution with an emphasis on hands-on and collaborative modes of engagement. Constructing emerged as the most dominant affordance, particularly in School 3, suggesting that pupils associate learning strongly with tangible, practical, and maker-oriented tasks, mirroring contemporary research on design-based and maker pedagogies that foreground active doing as a driver of learning (Kijima & Yoshida, 2020). Discussing was also consistently high across all three schools, underscoring the central role of verbal collaboration and peer interaction, which aligns with sociocultural theories emphasizing talk and shared meaning-making as critical tools for learning (Littleton & Howe, 2023). Conversely, the relatively few references to Researching and Presenting point to gaps in opportunities for inquiry-driven learning and in structured communication of ideas—skills emphasized in twenty-first-century learning frameworks that advocate critical thinking, independent research, and communicative competence (OECD, 2019; Voogt & Roblin, 2019).

Taken together, the findings highlight how spatial configuration and school culture interact to shape pupils' learning experiences. Indoor-oriented schools appear to reinforce more conventional patterns of learning, centred on classroom-based, task-focused activities, a trend widely observed in environments where rigid timetabling and limited spatial diversity constrain pedagogical flexibility (Woolner & Thomas, 2012; Cleveland, 2023). Meanwhile, schools with accessible and inviting outdoor environments enable pupils to experience learning as more spatially distributed, socially interactive, and exploratory, supporting research that shows outdoor and informal spaces afford richer opportunities for autonomy, creativity, and collaborative engagement (Nair & Fielding, 2020). The affordance patterns also reveal that pupils' interpretations of learning are grounded in doing and communicating rather than researching or presenting. These insights emphasize the need for school designs that broaden the repertoire of available affordances that support hands-on, collaborative, inquiry-based, and communicative learning equally, and ensure that both indoor and outdoor spaces contribute meaningfully to pupils' overall educational experience.

6.0 Conclusion & Recommendations

This study shows that school spatial layouts and learning cultures strongly shape pupils' experiences, with indoor-oriented schools reinforcing traditional, classroom-based activities, and outdoor-engaged schools enabling more exploratory and collaborative learning. Pupils most often associate learning with hands-on, interactive tasks, while fewer references to researching and presenting suggest limited opportunities for inquiry and communication. The study's scope, three schools in one region, limits generalizability, and the time-bound charrette format may have constrained pupils' expression. As affordance data reflects perceptions rather than observed behaviour, future research should incorporate longitudinal or ethnographic methods, more varied school samples, and multimodal tools such as behavioural mapping. Further work should explore how schools can strengthen underrepresented affordances, particularly inquiry and communication, and how outdoor learning can be more deliberately embedded. Examining links between spatial experience, well-being, and learning outcomes remains an important direction for future research.

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Paper Contribution to the Related Field of Study

This study offers valuable insights into learning environments, environmental behaviour, and child-centred school design by showing how spatial layouts and learning cultures shape pupils' experiences. The findings highlight the need for school environments that support a wider range of learning affordances—particularly inquiry, communication, and outdoor engagement—thereby informing both architectural design and pedagogical practice. Methodologically, the use of participatory, child-friendly tools demonstrates the value of eliciting pupils' spatial perspectives and points toward the potential of longitudinal and multimodal approaches for deeper insight. More broadly, the study provides evidence relevant to school improvement, wellbeing research, and education policy by emphasizing how spatial experience influences pupils' engagement and learning outcomes.

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