ICCAUA Proceedings Journal
Proceedings of the international conference of contemporary affairs in architecture and urbanism-ICCAUA
Volume 9 (December 2026), 2610294

Journal homepage: https://journal.iccaua.com/

DOI: https://doi.org/10.38027/ICCAUA2026EN0294

Visualizing Students' Latent Spatial Needs in Campus Planning Through LEGO® Serious Play®

* [1] **Yurika Mori**
[1] Department of Systems Engineering, Faculty of Systems Engineering, Wakayama University, Wakayama City, Japan
[1] E-mail: mori@wakayama-u.ac.jp
[1] ORCID: https://orcid.org/0009-0000-5905-0780

Received: 26.04.2026
Revised: 26.06.2026
Accepted: 01.07.2026
Available online: 10.07.2026

This article has been selected and peer-reviewed for publication in this journal as part of the 9th International Conference of Contemporary Affairs in Architecture and Urbanism, held on 7–8 May 2026 in Istanbul, Türkiye.

Abstract

This study investigates the potential of LEGO® Serious Play® (LSP) as a participatory method for visualizing latent spatial needs in campus planning. A series of workshops was conducted exclusively with university students at Wakayama University, where participants constructed physical models representing their ideal campus environments and articulated the meanings embedded in their models. The resulting models and narratives were qualitatively analysed with a focus on spatial continuity, boundary definition, centrality, and patterns of movement and stay. The findings indicate that LSP enables students to externalize implicit spatial preferences that are difficult to capture through conventional questionnaires or interviews, particularly regarding intermediate spaces, informal gathering areas, and perceived spatial hierarchies. This study positions LEGO® Serious Play® as an effective qualitative tool for integrating students' latent spatial perceptions into early-stage campus planning and design processes.

Keywords: Campus planning; Participatory design; LEGO® Serious Play®; Latent spatial needs; Design workshop participants.

1. Introduction

1.1 Background about Campus Planning and Student Participation

University campuses function not only as spaces for education and research but also as environments that support everyday life, social interaction, and informal learning. In recent years, campus planning has increasingly emphasized user-centered and participatory approaches, reflecting a broader shift in planning and design toward inclusive and collaborative processes. Previous studies have shown that the spatial quality of campus environments is closely related to students' well-being, creativity, and sense of belonging (Soares et al., 2022).

Among various stakeholders, students are the primary and most continuous users of campus spaces. Nevertheless, their perspectives are often underrepresented in campus planning and design processes. Conventional planning practices typically rely on expert-led decision-making supported by questionnaires, interviews, or behavioral observations. While these methods are effective for identifying explicit needs and preferences, they tend to prioritize functional requirements over experiential and relational aspects of space. As a result, student participation is frequently limited to responding to predefined questions, rather than actively contributing to the formation of spatial concepts. Participatory design research has highlighted dialogue as a central mechanism through which stakeholders contribute to shaping design outcomes and shared understanding (Luck, 2003). This gap highlights the need for participatory methods that enable students to express their spatial perceptions more actively and creatively within the planning process (Tewdwr-Jones & Wilson, 2022). This need is particularly relevant in adaptive reuse projects, where the integration of stakeholder perspectives has been identified as a critical factor for successful implementation (Conejos et al., 2016). In adaptive reuse projects, stakeholder engagement is particularly important because social values and user experiences often influence the long-term success of reused buildings (Bullen & Love, 2011). Previous studies have also argued that adaptive reuse should be understood not only as a technical intervention but also as a socially negotiated process involving multiple stakeholders (Bullen & Love, 2010).

1.2 Latent Spatial Needs and Challenges in Visualization

One of the key challenges in participatory campus planning lies in identifying students' *latent spatial needs*—needs that are implicit, experiential, and not easily articulated through language alone. These needs often relate to intermediate spaces, informal gathering areas, and transitions between different functional zones, which play a crucial role in shaping daily campus life but are rarely foregrounded in planning discussions (Seydel & Huning, 2022).

Conventional qualitative methods such as questionnaires and interviews presuppose that participants can clearly verbalize their perceptions and expectations. However, spatial experience is frequently embodied and intuitive, making it difficult to translate into words (Aziz Amen& Ali, 2025). Consequently, important dimensions of students' spatial understanding—such as atmosphere, perceived centrality, or patterns of movement and stay—may remain unrecognized.

Recent research in participatory design has emphasized the importance of alternative forms of expression, including visualization, storytelling, and hands-on activities, to externalize tacit knowledge and support collective reflection (Arcia et al., 2024). In the context of campus planning, such approaches offer the potential to reveal spatial needs that remain hidden when relying solely on verbal communication. These latent spatial perceptions may also be interpreted through the concept of affordances, which Gibson (1979) defined as the action possibilities that environments offer to individuals. Spatial experiences are fundamentally embodied, as individuals perceive and act upon environmental opportunities through their bodily engagement with space (Heft, 1989' Etemadi, 2024). Rather than fixed properties of physical environments, affordances emerge through the dynamic relationship between individuals and their surroundings (Aziz Amen, 2022; Chemero, 2003). From this perspective, affordances emerge from the interaction between individuals and environments rather than from either element alone (Stoffregen, 2003). Consequently, different users may perceive distinct landscapes of affordances based on their experiences, practices, and social contexts (Rietveld & Kiverstein, 2014).

1.3 LEGO® Serious Play® as a Participatory Method

LEGO® Serious Play® (LSP) is a facilitated, hands-on methodology originally developed for organizational learning and strategic thinking. Grounded in theories of constructivism and constructionism, LSP encourages participants to build physical models as metaphors for their ideas and experiences, followed by storytelling and reflection. Through this process, participants are able to express complex thoughts and perceptions that may be difficult to articulate through words alone (Zierock & Angar, 2025). Previous studies have suggested that LEGO® Serious Play® enables participants to externalize tacit knowledge through metaphorical and three-dimensional model construction (James, 2013). Similar to design games, hands-on participatory activities can support creativity, communication, and collaborative exploration among participants (Vaajakallio & Mattelmäki, 2014). In recent years, LSP has been applied in various fields, including education, management, and community engagement, to foster creativity, dialogue, and shared understanding. Its application in urban and spatial planning has also gained attention as a means of facilitating collaboration and participation among diverse stakeholders (Tewdwr-Jones & Wilson, 2022). However, empirical studies examining the use of LSP in architectural and campus planning contexts remain limited. Play-based methods have been shown to stimulate reflection, creativity, and alternative forms of knowledge generation in collaborative settings (Statler et al., 2009).

In particular, there is a lack of research focusing on how LSP can be used to visualize users' latent spatial needs and translate them into planning-relevant knowledge. This study addresses this gap by positioning LSP as a qualitative tool capable of capturing students' implicit spatial perceptions through model-making and narrative interpretation.

Participatory design has evolved from a traditional expert-driven approach toward a co-creative paradigm in which users and stakeholders are positioned as active agents in knowledge production and design generation. Sanders and Stappers (2008) describe this shift as "co-creation," in which designers and non-designers jointly produce meanings, ideas, and solutions, transforming design into a shared exploratory process. This shift also requires designers to adopt new roles as facilitators and mediators within collaborative design processes (Lee, 2008). This perspective is consistent with the notion of "design things," where collaborative activities function as arenas for collective meaning-making and negotiation among stakeholders (Björgvinsson et al., 2012). This perspective aligns with Steen's (2013) conceptualization of co-design as a process of joint inquiry and imagination, where design is understood not merely as problem-solving but as a collaborative construction of alternative futures. Achieving shared understanding among participants is considered one of the key challenges and outcomes of co-design processes (Kleinsmann & Valkenburg, 2008). Within this framework, Nonaka's (1994) theory of knowledge creation provides a foundational lens, particularly in emphasizing the externalization of tacit knowledge into explicit, shareable forms through interaction and reflection. Material-based approaches involving making, telling, and enacting have been recognized as effective tools for facilitating collaborative exploration and knowledge generation (Brandt et al., 2013). Narrative and game-based design activities can provide a shared space in which participants collaboratively explore and negotiate future possibilities (Dindler & Iversen, 2007). This theoretical grounding is closely related to tactile and material-based methods of design thinking, in which "thinking through making" enables the articulation of otherwise unspoken spatial and experiential knowledge.

Moreover, spatial understanding is not only analytical but also narrative in nature. Throgmorton (2003) conceptualizes planning as a form of persuasive storytelling, where spatial futures are constructed through competing narratives and interpretive frameworks. Taken together, these perspectives suggest that spatial design operates as a multi-layered process in which participatory co-creation, embodied and material cognition, experiential evaluation, and narrative construction intersect. In the case of historic building reuse, this integrated framework is particularly relevant, as it positions architectural reinterpretation as an active process of knowledge transformation rather than a static design outcome.

1.4 Research Objectives and Structure of the Paper

The aim of this study is to investigate the potential of LEGO® Serious Play® as a participatory method for visualizing students' latent spatial needs in campus planning. Through a series of workshops conducted with university students at Wakayama University, the study explores how physical models and accompanying narratives can reveal spatial preferences that are difficult to capture using conventional qualitative methods.

Specifically, this study addresses the following research questions:

1. What types of spatial needs and perceptions are expressed by students through LEGO® Serious Play® workshops?
2. How can these needs be interpreted in terms of spatial continuity, boundary definition, centrality, and patterns of movement and stay?
3. In what ways does LEGO® Serious Play® contribute to participatory campus planning compared to traditional qualitative methods?

The remainder of this paper is organized as follows. Section 2 describes the research design, workshop setting, and analytical framework. Section 3 presents the results of the qualitative analysis of the LEGO® models and narratives. Section 4 discusses the implications of the findings for campus planning and participatory design methodologies. Finally, Section 5 concludes the paper by summarizing the main contributions and outlining directions for future research.

2. Materials and Methods

2.1 Research Design

This study is positioned as qualitative research aimed at exploring students' latent spatial needs. Given the focus on spatial perceptions and experiential knowledge that are difficult to articulate verbally, the study adopts an approach that emphasizes participants' subjective interpretations and narratives. A participatory workshop format was employed as the primary research method. Conventional tools such as questionnaires and interviews are limited in their ability to capture tacit spatial perceptions.

Therefore, this study adopts LEGO® Serious Play® (LSP) as a hands-on, participatory method that enables participants to actively and creatively express their spatial ideas. Through the process of model construction and storytelling, the study seeks to externalize participants' implicit spatial images.

Figure 1. View of the campus from Symbol Road (Photo by the Author, February 7, 2026).

2.2 Workshop Setting up and Participants

The workshops were conducted at Wakayama University. Figure 1 shows that View of the campus from Symbol Road. Wakayama University is a national university in Japan, established in 1949. It is located in the Kansai region, in Wakayama City, approximately 60 km south of Osaka. Situated in the northwestern part of the Kii Peninsula, the university lies on the periphery of the Kansai metropolitan area, offering accessibility to both urban and natural environments.

The campus is adjacent to the urban area and is surrounded by residential neighborhoods, commercial facilities, and hilly terrain, reflecting a context where built and natural environments coexist.

Furthermore, as a comprehensive university comprising multiple faculties, Wakayama University accommodates students from diverse academic disciplines within a shared campus. This results in the coexistence of varied spatial needs and patterns of use. For these reasons, the university provides an appropriate context for capturing students' latent spatial perceptions from multiple perspectives.

Participants were recruited through an open call to students and faculty members of the university. The workshops were conducted in two sessions: the first session took place on March 16, 2026 (13:00–15:00) with five participants, and the second session was held on March 23, 2026 (16:00–18:00) with nine participants. The participants varied in academic year and disciplinary background, allowing for a diversity of spatial perspectives. Figure 2 shows a scene from the presentation of models created. Figure 3 shows that scene of LEGO Model creation.

The workshops were organized as a combination of individual model-making and group discussion. Each participant constructed a physical model representing their ideal campus environment using LEGO® bricks and subsequently explained the meaning of their model. This process enabled the collection of both visual and narrative data.

Ethical considerations were carefully addressed. Prior to participation, the purpose of the study, research procedures, and data usage were explained both orally and in written form, and informed consent was obtained from all participants. Participation was voluntary, and participants were informed of their right to withdraw at any time. All collected data were anonymized to ensure that individuals could not be identified in the analysis or reporting.

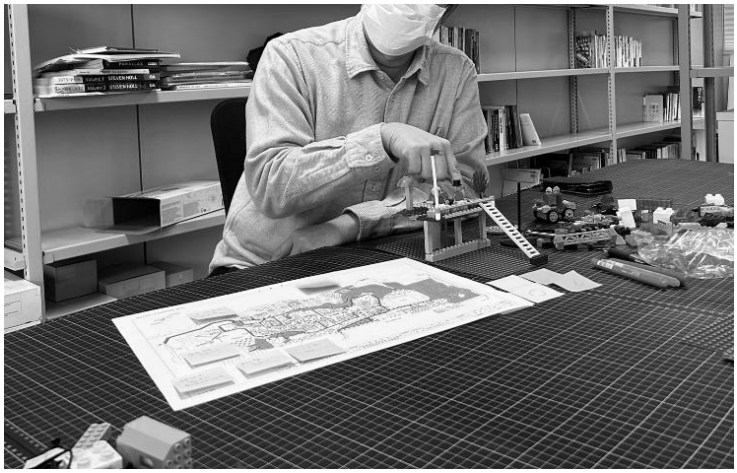

Figure 2. A scene from the presentation of models created (Photo by the Author, March 16, 2026).

Figure 3. A scene of LEGO Model creation (Photo by the Author, March 16, 2026).

2.3 LEGO® Serious Play® Workshop Procedure

The workshop was designed based on the LEGO® Serious Play® (LSP) methodology to facilitate the step-by-step externalization of participants' latent spatial perceptions. The session lasted approximately 120 minutes and was structured to capture the relationship between existing experiences ("Before") and ideal spatial conditions ("After").

At the beginning of the workshop, each participant was provided with an individual LEGO® Serious Play® starter kit. A short warm-up session (10–20 minutes) was conducted to familiarize participants with "thinking through their hands." For example, participants were asked to build a space that represents "passing through." This exercise encouraged participants to engage in making as a form of thinking, rather than planning in advance. It also implicitly introduced key spatial concepts such as movement, boundary, and continuity without explicit instruction. The workshop consisted of four phases:

Phase A (0–30 min): Visualization of Current Experience (POE)

Participants identified comfortable, uncomfortable, and noteworthy places on a campus map using color-coded sticky notes and briefly described the reasons for their choices. These were then shared within small groups, forming an initial layer of narrative data related to existing campus experiences.

Phase B (30–85 min): Externalization of Ideal Space (LSP)

Participants individually constructed LEGO® models representing an ideal campus condition in which previously identified issues were resolved. The task emphasized the qualities of space rather than precise locations. Each participant then presented their model, explaining which issues it addressed, what kinds of activities would occur, and how movement and stay were structured within the space.

Phase C (85–110 min): Re-articulation and Self-evaluation
Participants reflected on their models and evaluated how they corresponded to previously identified themes, as well as to analytical categories such as spatial continuity, boundary, centrality, and movement/stay. This process connected participant interpretation with the analytical framework of the study.

Phase D (110–120 min): Reflection and Closing
Finally, participants reflected on whether and how their perception of the campus had changed through the workshop, and the session was concluded.

2.4 Data Collection
Three types of data were collected during the workshops. First, the LEGO® models constructed by participants were treated as primary visual representations of spatial perception. Second, participants' verbal explanations and narratives accompanying the models were recorded as key data reflecting meanings and intentions. Third, photographs and documentation were collected, including images of the models and their relationships to the campus map. These datasets were used complementarily to enable an integrated interpretation of spatial perception from both visual and narrative perspectives.

2.5 Analytical Framework
This study employed qualitative analysis to interpret both the LEGO® models and the associated narratives. A set of spatial analytical perspectives was established to enable cross-case comparison.
The analysis focused on the following four dimensions:

- Spatial continuity: how spaces are connected and how flows of movement and perception are structured
- Boundary: how spatial divisions and territories are defined, including the use of clear and ambiguous boundaries
- Centrality: how focal points of activity and gathering are formed within the spatial configuration
- Movement and stay how movement and stationary activities are organized and how transitions between them occur

These analytical perspectives were also linked to participants' self-evaluations, allowing for a multi-layered interpretation of the models.

3. Results
3.1 Overview of POE
Through the Post-Occupancy Evaluation (POE), students' perceptions of the campus were captured across three categories: "positive spaces," "negative spaces," and "spaces of interest." The analysis revealed that students' evaluations are primarily based on spatial qualities such as visual experience, satiability, activity, environmental conditions, accessibility, and maintenance.

(1) Characteristics of Positively Evaluated Spaces
Spaces evaluated positively shared several common characteristics. First, visual quality and views were highly valued. The symbolic axis, views from elevated buildings, and vistas toward the city were frequently mentioned. The clarity of spatial alignment and visual openness contributed to positive perceptions. Temporal aspects such as evening scenery and lighting were also appreciated. Second, spaces that support staying were positively evaluated. Examples include libraries, lounge areas, shaded seating, and terraces. These spaces were described as "comfortable," "relaxing," and suitable for being alone, indicating the importance of environments that allow legitimate and comfortable staying. Third, spaces that accommodate activities and social interaction were also appreciated. Open plazas and step spaces used for events and club activities were associated with liveliness and positive atmosphere. In addition, natural elements such as trees, greenery, shade, and seasonal changes contributed significantly to spatial attractiveness and comfort.

(2) Characteristics of Negatively Evaluated Spaces
Negatively evaluated spaces were associated with several recurring issues.
First, environmental discomfort was frequently mentioned, including strong winds, extreme temperatures, and insufficient lighting. In particular, wind conditions between buildings were repeatedly identified as problematic. Second, accessibility and physical burden were major concerns. Long stairways, steep slopes, and distances between facilities (e.g., from bicycle parking areas) were described as physically demanding. Third, lack of maintenance was a significant issue. Non-functioning fountains, overgrown vegetation, and aging facilities contributed to negative perceptions. Finally, safety and visibility concerns were noted, particularly in areas with poor visibility or insufficient lighting, which caused a sense of insecurity.

(3) Characteristics of Spaces of Interest
Spaces identified as "of interest" revealed another layer of spatial perception. First, many of these spaces were underused or unfamiliar, with participants noting that they had never visited or were unaware of certain facilities such as sports grounds or pools. Second, some spaces were perceived as having latent potential, with comments suggesting they could be better utilized or were worth exploring due to views or spatial qualities. Third, psychological barriers to access were observed, as some spaces were described as difficult to enter or lacking clear purpose.

(4) Summary

Overall, students' evaluations of campus spaces extend beyond functional considerations and reflect a complex interplay of visual quality, satiability, environmental comfort, accessibility, and maintenance. Furthermore, the presence of underused and unrecognized spaces suggests latent spatial potential within the campus environment.

Table 1: Evaluation Scores of Spatial Characteristics for Each LEGO® Model (Developed by the Authors).

	A. Spatial continuity			B. Boundary / Threshold			C. Stay / Place-making			D. Social interaction			E. Centrality			F. Multiplicity / Temporal use		
No	A1	A2	A. Total	B1	B2	B. Total	C1	C2	C. Total	D1	D2	D. Total	E1	E2	E. Total	F1	F2	F. Total
1	2	2	4	3	5	8	5	5	10	4	3	7	2	4	6	3	2	5
2	2	4	6	4	3	7	5	5	10	5	5	10	4	5	9	4	4	8
3	5	5	10	3	5	8	4	4	8	5	5	10	2	5	7	5	5	10
4	2	2	4	3	4	7	4	4	8	4	4	8	4	5	9	4	4	8
5	4	2	6	3	1	4	4	4	8	4	2	6	5	4	9	4	2	6
6	5	5	10	2	5	7	2	1	3	2	5	7	3	4	7	1	3	4
7	2	1	3	5	5	10	5	5	10	3	5	8	5	5	10	1	5	6
8	4	5	9	2	5	7	5	5	10	5	4	9	4	4	8	2	4	6
9	1		1	4	4	8	5	4	9	5	5	10	3	4	7	1	1	2
10		4	4	3	4	7	5	4	9	4	3	7	1	3	4	2	2	4
11	3	5	8	1	5	6	5	3	8	5	3	8	5	2	7	2	2	4
12	5	4	9	2	5	7	4	3	7	4	3	7	5	4	9	2	3	5
13	5	5	10	3	4	7	5	5	10	5	5	10	5	5	10	1	5	6
14	4	4	8	2	3	5	5	5	10	5	5	10	5	4	9	5	5	10

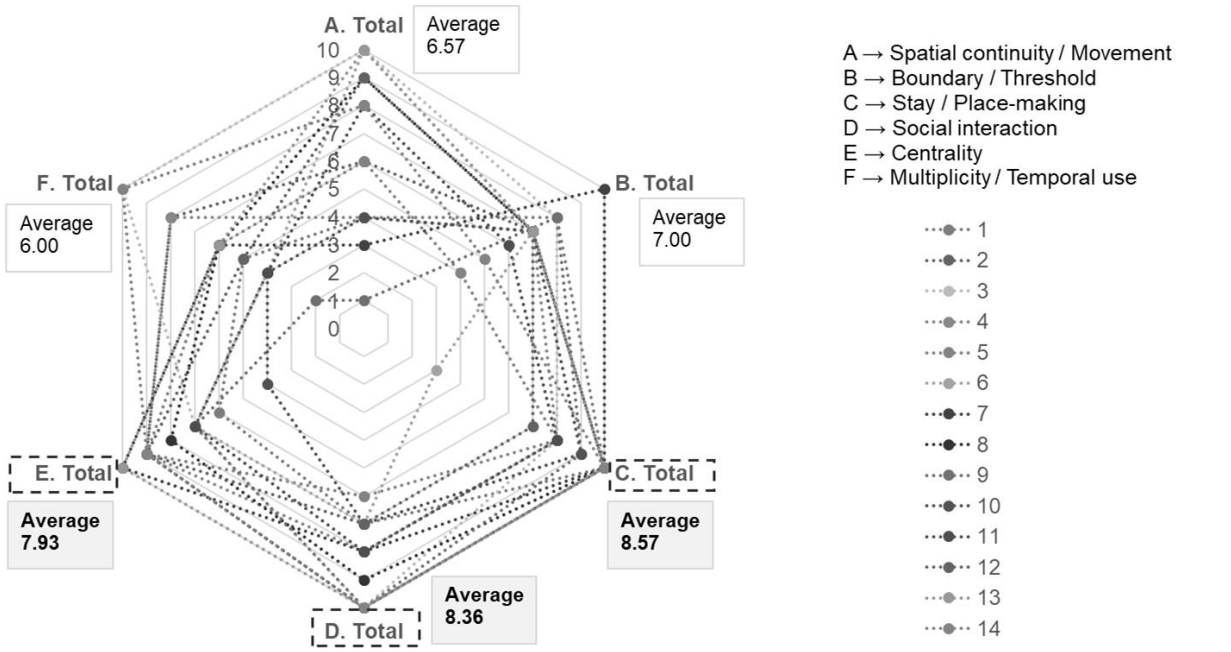

Figure 4. Average Scores of Spatial Characteristics in LEGO® Models (Developed by the Authors).

3.2 Spatial Configurations Revealed through LEGO® Serious Play®

The LEGO® models constructed by participants were analyzed to identify the spatial characteristics of their envisioned campus environments. Based on the evaluation scores and qualitative interpretations, six spatial dimensions were examined: spatial continuity and movement (A), boundary and threshold (B), stay and place-making (C), social interaction (D), centrality (E), and multiplicity and temporal use (F). Table 1 shows that Evaluation Scores of Spatial Characteristics for Each LEGO® Model. And Figure 4 shows that Average Scores of Spatial Characteristics in LEGO® Models.

Overall, the results indicate that participants consistently emphasized spaces that support staying and place-making (C), which showed the highest scores across the dataset. Many models incorporated elements that enable users to stop, remain, and feel comfortable, suggesting a strong preference for environments that legitimize staying rather than merely facilitating movement. These findings correspond with the frequent appearance of semi-enclosed areas, seating-like structures, and spatial configurations that imply a sense of psychological comfort.

Similarly, social interaction (D) was also highly represented. A large number of models included spaces where people could gather, encounter others, or engage in informal communication. These were often expressed through open yet structured spaces, such as plazas, stepped areas, or nodes along circulation routes, indicating an intention to support both planned and spontaneous social activities.

In contrast, spatial continuity and movement (A) exhibited moderate to high variation among participants. While some models clearly articulated continuous movement through linear or networked spatial arrangements, others placed less emphasis on circulation, prioritizing localized spatial qualities instead. This suggests that movement is considered important, but not uniformly central to all participants' spatial preferences. The dimension of boundary and threshold (B) revealed diverse interpretations. Some participants introduced strong boundaries through enclosed or clearly defined zones, while others emphasized transitional or intermediate spaces that blur the distinction between inside and outside. This variation indicates differing attitudes toward spatial separation and openness but also highlights the importance of threshold conditions in shaping spatial experience. Centrality (E) was present in many models but varied in its degree of emphasis. Some participants created clearly defined focal points or symbolic centers, while others distributed activities more evenly across space. This suggests that while the idea of a "center" is meaningful, it is not universally required and may depend on individual spatial strategies.

Finally, multiplicity and temporal use (F) showed the greatest variation and generally lower scores compared to other dimensions. While some models suggested flexible use or multiple activities within a single space, this aspect was less consistently developed. This may indicate that temporal adaptability is not immediately foregrounded in participants' spatial imagination, or that it is more difficult to express through physical modeling. Figure 5 shows LEGO Model creations sample 1. Figure 6 shows LEGO Model creations sample 2. Taken together, these results reveal a clear tendency for participants to prioritize spaces that support staying, comfort, and social interaction, often mediated through nuanced boundary conditions and localized spatial configurations. In contrast, aspects related to temporal flexibility and multi-functionality were less explicitly articulated. These findings suggest that LEGO® Serious Play® effectively captures participants' implicit spatial priorities, particularly in relation to everyday experiential qualities of campus space.

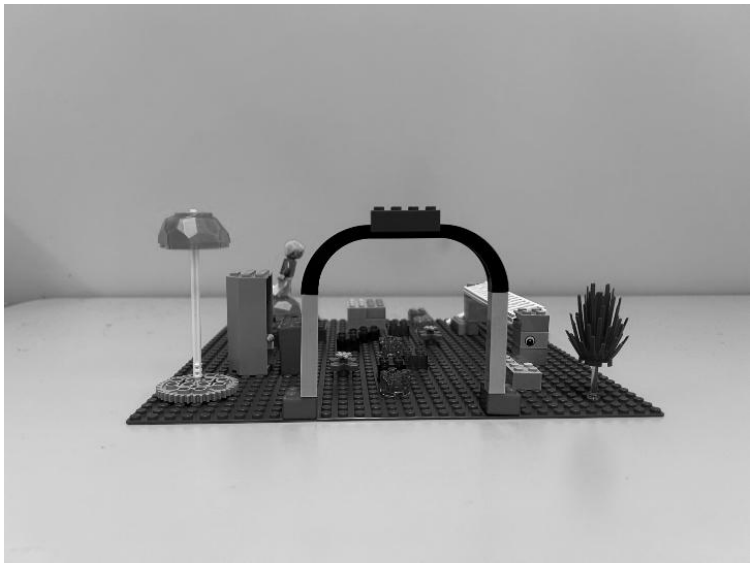

Figure 5. LEGO Model sample 1 (Photo by the Author, March 16, 2026).

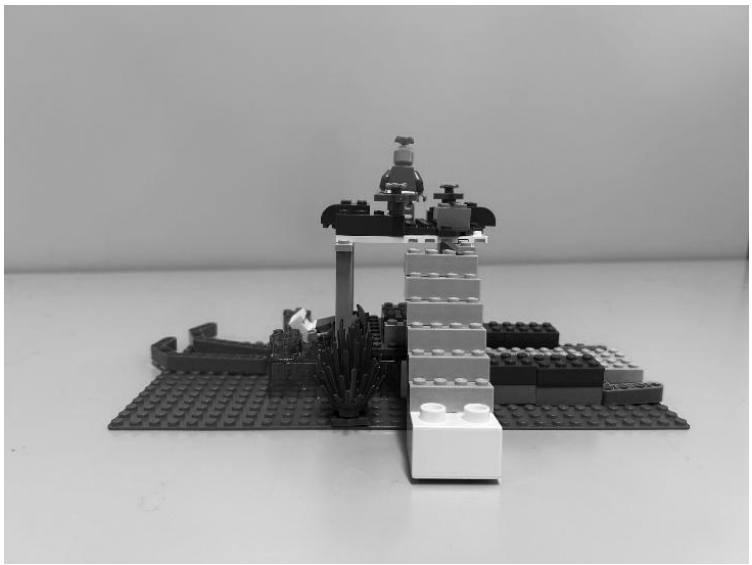

Figure 6. LEGO Model sample 2 (Photo by the Author, March 16, 2026).

4. Discussion

4.1 Interpretation of Students' Latent Spatial Needs

The findings from both the POE and LEGO® Serious Play® workshops reveal a consistent pattern in students' spatial perceptions, allowing for an integrated interpretation of their latent spatial needs. First, the results indicate a strong emphasis on spaces that support staying and psychological comfort. While the POE responses identified preferred locations such as libraries, shaded seating areas, and terraces as "comfortable" or "relaxing," the LEGO models further translated these preferences into spatial configurations characterized by semi-enclosure, seating-like structures, and localized spatial definition. This suggests that students' need for staying is not merely functional but is closely tied to the legitimization of presence, where individuals feel socially and spatially permitted to remain. Second, a recurrent theme across both datasets is the importance of controlling visibility and social exposure.

In the POE responses, discomfort was often associated with wind exposure, openness, or lack of shelter, whereas in the LEGO models, participants introduced boundaries and intermediate spaces that mediate between openness and enclosure. This indicates a latent need for adjustable spatial conditions, rather than strictly open or closed environments. Third, the findings highlight the significance of social interaction embedded within spatial structures. Spaces such as plazas and stepped areas were positively evaluated in the POE and were frequently reinterpreted in the LEGO models as nodes of interaction.

However, these were rarely designed as fully open gathering spaces; instead, they often incorporated spatial differentiation, suggesting that students prefer structured opportunities for interaction rather than undifferentiated openness. Finally, a notable gap emerges in relation to temporal flexibility and multiplicity of use. While some POE responses hinted at time-dependent qualities (e.g., evening atmosphere, seasonal changes), this aspect was less explicitly developed in the LEGO models. This suggests that temporal use may remain a more implicit dimension of spatial experience, or that it is more difficult to externalize through physical modeling.

Overall, the results demonstrate that students' latent spatial needs are not simply about specific functions or facilities, but rather about relational spatial qualities, including the balance between openness and enclosure, movement and staying, and individual and collective use. Importantly, these needs are often difficult to articulate verbally but become visible through model-based expression.

4.2 Effectiveness of LEGO® Serious Play® in Campus Planning

This study demonstrates that LEGO® Serious Play® (LSP) is an effective participatory method for capturing and visualizing students' latent spatial needs in campus planning. Compared to conventional methods such as questionnaires and interviews, LSP enables participants to express tacit and experiential knowledge that is difficult to verbalize. In the POE phase, students were able to describe specific locations and experiences; however, these descriptions often remained fragmented and focused on individual impressions.

In contrast, the LSP workshops facilitated the transformation of these experiences into spatially structured representations, where relationships between elements such as movement, boundary, and centrality could be explicitly articulated. Furthermore, LSP supports a process of externalization and reflection. By constructing models and explaining them through narratives, participants were able to iteratively refine their ideas, leading to a deeper level of spatial awareness. The requirement to connect models to previously identified issues (i.e., POE results) also strengthened the analytical link between existing problems and proposed spatial conditions. Another key advantage of LSP is its applicability to the early stages of design and planning. At this stage, spatial concepts are often abstract and underdefined, making it difficult for non-experts to participate meaningfully. The use of physical modeling lowers this barrier, allowing participants to engage in spatial thinking without requiring technical drawing skills. As demonstrated in this study, LSP can generate rich qualitative data that informs the conceptual development of spatial strategies.

4.3 Methodological Limitations and Future Research

Despite its contributions, this study has several limitations. First, the sample size was relatively small and limited to students from a single university. While the findings provide valuable insights into student perceptions, they cannot be generalized without further validation. Second, the study focused exclusively on student participants, who represent only one group of campus users. Future research should extend this approach to include other stakeholders, such as faculty members, administrative staff, and local community members, in order to capture a more comprehensive range of spatial needs.

Third, while LSP proved effective in visualizing spatial relationships, certain aspects—particularly temporal use and long-term adaptability—were less explicitly represented. This suggests the need for complementary methods, such as scenario-based discussions or longitudinal observations, to capture these dimensions more fully.

Finally, the application of this method to other contexts, including different universities or urban environments, remains to be explored. Comparative studies would help to clarify the extent to which the findings are context-specific or universally applicable.

5. Conclusions

This study investigated the potential of LEGO® Serious Play® as a participatory method for visualizing students' latent spatial needs in campus planning. Through a combination of POE and LSP workshops conducted with university students, the study revealed how spatial experiences and perceptions can be transformed into structured spatial representations.

The results demonstrate that students place strong emphasis on spaces that support staying, comfort, and social interaction, often mediated through nuanced boundary conditions and localized spatial configurations. At the same time, aspects such as temporal flexibility were less explicitly articulated, highlighting both the strengths and limitations of model-based expression.

Importantly, this study shows that LSP enables the externalization of tacit spatial knowledge that is difficult to capture through conventional methods. By integrating physical modeling and narrative interpretation, the method provides a valuable tool for incorporating user perspectives into the early stages of campus planning and design.
Future research should expand the scope of participants and contexts, as well as explore the integration of LSP with other participatory and analytical methods. Through such developments, LSP has the potential to contribute to more inclusive and responsive approaches to spatial planning.

Acknowledgements
The author would like to thank the participants who took part in the workshops for their valuable time and insights.

Funding
This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Conflicts of Interest
The author declare that there are no conflicts of interest regarding the publication of this paper.

Data Availability Statement
The data generated and analyzed during this study are not publicly available due to ethical considerations and the protection of participants' privacy but are available from the corresponding author upon reasonable request.

Institutional Review Board Statement
Ethical review and approval were not required for this study in accordance with local legislation and institutional requirements. All participants were informed about the purpose of the study, and informed consent was obtained.

Credit Author Statement
Yurika Mori: Conceptualization, Methodology, Investigation, Data Curation, Writing – original draft, Writing – review & editing. All authors have read and approved the final manuscript.

Reference List
Arcia, A., Stonbraker, S., Mangal, S., & Lor, M. (2024). A practical guide to participatory design sessions for the development of information visualizations: Tutorial. *Journal of Participatory Medicine, 16*, e64508. https://doi.org/10.2196/64508

Björgvinsson, E., Ehn, P., & Hillgren, P.-A. (2012). Design things and design thinking: Contemporary participatory design challenges. Design Issues, 28(3), 101–116. https://doi.org/10.1162/DESI_a_00165

Brandt, E., Binder, T., & Sanders, E. B.-N. (2012). Tools and techniques: Ways to engage telling, making and enacting. In J. Simonsen & T. Robertson (Eds.), *Routledge international handbook of participatory design* (pp. 145–181). Routledge. https://doi.org/10.4324/9780203108543-14

Bullen, P. A., & Love, P. E. D. (2010). The rhetoric of adaptive reuse or reality of demolition: Views from the field. *Cities, 27*(4), 215–224. https://doi.org/10.1016/j.cities.2009.09.005

Bullen, P. A., & Love, P. E. D. (2011). Adaptive reuse of heritage buildings. *Structural Survey, 29*(5), 411–421. https://doi.org/10.1108/02630801111182439

Chemero, A. (2003). An outline of a theory of affordances. Ecological Psychology, 15(2), 181–195. https://doi.org/10.1207/S15326969ECO1502_5

Conejos, S., Langston, C., & Smith, J. (2016). Improving the implementation of adaptive reuse strategies for historic buildings. *Built Environment Project and Asset Management, 6*(4), 362–376. https://doi.org/10.1108/BEPAM-01-2015-0002

Dindler, C., & Iversen, O. S. (2007). Fictional inquiry—Design collaboration in a shared narrative space. CoDesign, 3(4), 213–234. https://doi.org/10.1080/15710880701500187

Etemadi, E. (2024). Sani' ol-Molk's The Thousand and One Nights: A study of image content and visual adaptation. Springer. https://doi.org/10.1007/978-981-97-0733-1

Amen, M. A., & Ali, F. A. (2025). Analyzing the impact of spatial centrality and courtyard diversity on tourist attractions in the walled city of Lefkoşa. PLOS One, 20(8), e0330956. https://doi.org/10.1371/journal.pone.0330956

Aziz Amen, M. (2022). The effects of buildings' physical characteristics on urban network centrality. Ain Shams Engineering Journal, 13(6), 101765. https://doi.org/10.1016/j.asej.2022.101765

Gibson, J. J. (1979). The Ecological Approach to Visual Perception.

Heft, H. (1989). Affordances and the body: An intentional analysis of Gibson's ecological approach to visual perception. Journal for the Theory of Social Behaviour, 19(1), 1–30. https://doi.org/10.1111/j.1468-5914.1989.tb00133.x

James, A. (2013). Lego Serious Play: A three-dimensional approach to learning development. *Journal of Learning Development in Higher Education*, (6). https://doi.org/10.47408/jldhe.v0i6.208

Kleinsmann, M., & Valkenburg, R. (2008). Barriers and enablers for creating shared understanding in co-design projects. *Design Studies, 29*(4), 369–386. https://doi.org/10.1016/j.destud.2008.03.003

Lee, Y. (2008). Design participation tactics: The challenges and new roles for designers in the co-design process. *CoDesign, 4*(1), 31–50. https://doi.org/10.1080/15710880701875613

Luck, R. (2003). Dialogue in participatory design. *Design Studies, 24*(6), 523–535. https://doi.org/10.1016/S0142-694X(03)00040-1

Nonaka, I. (1994). A dynamic theory of organizational knowledge creation. *Organization Science, 5*(1), 14–37. https://doi.org/10.1287/orsc.5.1.14

Rietveld, E., & Kiverstein, J. (2014). A rich landscape of affordances. *Ecological Psychology, 26*(4), 325–352. https://doi.org/10.1080/10407413.2014.958035

Sanders, E. B.-N., & Stappers, P. J. (2008). Co-creation and the new landscapes of design. *CoDesign, 4*(1), 5–18. https://doi.org/10.1080/15710880701875068

Seydel, H., & Huning, S. (2022). Mobilising situated local knowledge for participatory urban planning through storytelling. *Urban Planning, 7*(3). https://doi.org/10.17645/up.v7i3.5378

Soares, I., Van Quoc, T. N., Yamu, C., & Weitkamp, G. (2022). Socio-spatial aspects of creativity and their role in the planning and design of university campuses' public spaces: A practitioners' perspective. *Data & Policy, 4*, e35. https://doi.org/10.1017/dap.2022.27

Statler, M., Roos, J., & Victor, B. (2009). Ain't misbehavin': Taking play seriously in organizations. *Journal of Change Management, 9*(1), 87–107. https://doi.org/10.1080/14697010902727165

Steen, M. (2013). Co-design as a process of joint inquiry and imagination. *Design Issues, 29*(2), 16–28. https://doi.org/10.1162/DESI_a_00207

Stoffregen, T. A. (2003). Affordances as properties of the animal-environment system. *Ecological Psychology, 15*(2), 115–134. https://doi.org/10.1207/S15326969ECO1502_2

Tewdwr-Jones, M., & Wilson, A. (2022). Co-designing urban planning engagement and innovation: Using LEGO® to facilitate collaboration, participation and ideas. *Urban Planning, 7*(2). https://doi.org/10.17645/up.v7i2.4960

Throgmorton, J. A. (2003). Planning as persuasive storytelling in a global scale. *Journal of Planning Education and Research, 22*(2), 125–137. https://doi.org/10.1177/0739456X03255461

Vaajakallio, K., & Mattelmäki, T. (2014). Design games in codesign: As a tool, a mindset and a structure. *CoDesign, 10*(1), 63–77. https://doi.org/10.1080/15710882.2014.881886

Zierock, B., & Angar, S. (2025). Leveraging LEGO® SERIOUS PLAY® for rapid prototyping in design thinking. *EAI Endorsed Transactions on Creative Technologies, 10*(1), Article 6249. https://doi.org/10.4108/eetct.6249