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# Interaction of In-between spaces in University campuses with informal learning and spatial design: a scoping review

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**ABSTRACT**
The design of learning spaces on 21st-century university campuses significantly contributes to learning and socialization by addressing diverse student needs. Beyond formal, dedicated learning environments, in-between spaces – which support individual study, collaborative discussions, and social interactions – are gaining importance. These spaces foster informal learning and enhance a sense of community among students by facilitating social connections. This scoping review investigates how in-between spaces on university campuses support informal learning and social interaction by examining literature to identify trends, knowledge gaps, and effective spatial design strategies beyond formal education. This scoping review was conducted following Arksey and O'Malley's methodological framework and adhered to PRISMA-ScR reporting guidelines. It synthesized findings from 14 selected studies, analyzing how in-between spaces contributed to informal learning processes and spatial design on university campuses. The review specifically targeted literature published between 2000 and 2025, reflecting significant developments in educational paradigms, digital transformation, and evolving spatial requirements in higher education. This timeframe was deliberately chosen to capture the dynamic context of contemporary learning environments increasingly characterized by informal and adaptable spatial approaches. This review offers theoretical insights and evaluation criteria to guide campus planning by clarifying the functional roles of in-between spaces in informal learning and social interaction.

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In-between space; informal learning; university campuses; data measurements; scoping review

## 1. Introduction

The quality of urban space plays a critical role in directing human actions and establishing social relations (Gehl 2011; Madanipour 2018). University campuses, as integral parts of the urban fabric, play a significant role in city life due to their spatial scale and urban location (Temple 2008). The design of 21st-century learning spaces within university campuses has become a pivotal element in enriching students' educational experiences and aligning with the shifting paradigms of modern pedagogical theory (Oblinger and Lippincott 2006).

A central response to the shifting expectations of 21st-century higher education has been the growing emphasis on the development of student-centered teaching and learning environments (Jamieson 2003; JISC (2006); Keppell and Riddle 2013, Scholl and Gulwadi 2015). Despite substantial global investment in the physical infrastructure of higher education, a conceptual disjunction persists between these developments and contemporary pedagogical models that advocate for flexibility, mobility, and digital modes of learning. This contradiction has played a critical role in the proliferation of informal learning spaces across university campuses (Deed and Alterator 2017).

The design of both formal instructional environments and informal learning settings has increasingly been shaped by pedagogical principles that emphasize student-centeredness and the creation of meaningful learning experiences (Finkelstein et al. 2016). In recent years, spatial design in higher education has been largely influenced by frameworks that promote environments that support particular learning behaviors (Thomas 2010; as cited in; Deed and Alterator 2017). Rather than replacing conventional classroom practices, these newly conceptualized spaces represent alternative possibilities for how learning can occur.

The design and development of contemporary learning spaces are underpinned by core principles, such as flexibility, collaboration, and connectivity. These principles are intrinsically tied to initiatives aimed at evaluating and enhancing the student experience across various campus contexts, both general and discipline-specific (Scholl and Gulwadi 2015). Over time, these foundational principles have been expanded into more comprehensive conceptual frameworks. For instance, Jamieson et al. (2000) emphasize dimensions, such as multipurpose use, adaptability, vertical integration, shared control

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between teachers and students, curricular alignment, and enhanced accessibility. Jamieson (2003) further highlights the importance of comfort, aesthetic quality, technological provision, and spatial configuration. Similarly, Keppell and Riddle (2013) propose a framework incorporating elements, such as comfort, aesthetics, spatial flow, equity, formal and informal learning integration, perceived affordances, and the potential for space reusability.

Specifically, including spatial environments that respond to the varied needs and expectations of students from diverse academic backgrounds contributes significantly to educational engagement and social interaction (Jamieson et al. 2000; Montgomery 2008). Beyond the confines of single-function formal learning spaces, in-between areas function as flexible and dynamic zones that support a range of user needs, enable informal learning practices and cultivate a sense of belonging by facilitating continuous and integrated learning experiences across the campus (Neary and Saunders 2011). By promoting interpersonal encounters, these spaces have the potential to render learning processes more fluid, adaptive, and organically embedded within everyday student life (Dugdale 2009).

Despite its relevance, research on the role of these spaces in facilitating learning and socialisation remains relatively scarce and conceptually fragmented (Temple 2008). Studies addressing the spatial dimensions of learning often categorize informal environments as peripheral, with their comprehensive contributions to learning processes frequently overlooked or underexplored (Beckers, Van der Voordt, and Dewulf 2016).

Historically, university campuses have been primarily designed to support traditional instructional methods and formal educational settings. Nonetheless, there is an increasing movement within higher education institutions to integrate informal learning spaces – such as communal areas, lounges, courtyards, and outdoor environments – into campus designs. Although these spaces are not explicitly intended for educational purposes, students frequently utilize them for studying, collaboration, and social interaction (Mačiulienė, Gulevičiūtė, and Skaržauskienė 2024). Moreover, Wang (2020) highlights that informal learning is poised to gain comparable pedagogical significance to formal instruction in the near future.

To more accurately capture the variety of learning settings, the learning environment concept has undergone significant development. Originally formulated within the context of schools and colleges, the learning landscapes framework has since been adapted to higher education institutions to reflect ongoing educational transformations (Chiddick 2006; Harrison 2006). Although the term lacks a universally agreed-upon definition (Thody 2008), it facilitates a multidimensional perspective on university campus design (Neary and Thody 2009).

According to DEGW, the emergence of these contemporary learning landscapes is driven by factors, including technological progress, an increasing emphasis on collaborative learning experiences, and the interdisciplinary nature of academic activities (Wu 2018). This evolution has prompted the creation of adaptable, student-centered environments that seamlessly integrate formal and informal learning spaces with advanced information networks (Dugdale 2009). Scholars, such as Fraser (1998) and Zandvliet (Zandvliet and Straker 2001), have made significant contributions by exploring the intersections of environmental psychology and learning space design, underscoring the critical roles of spatial configuration, student engagement, and environmental comfort.

Temple and Fillippakou (2007) highlight the significance of informal spaces adjacent to university buildings, which foster peer interaction and cultivate a sense of community. Expanding on this, Dugdale and Long (2007) conceptualize learning environments as encompassing all physical and virtual spaces where learning occurs. These perspectives collectively emphasize the crucial role of incorporating informal learning spaces into the overall educational experience (Jamieson et al. 2000; Oblinger and Lippincott 2006).

The influence of formal learning environments, including lecture halls and laboratories, is well-established in the literature (Johnson and Lomas 2005; Brown and Lippincott 2003). In contrast, informal learning spaces, such as corridors, courtyards, residence halls, and dining areas, have only recently gained recognition for their role in facilitating relaxation, collaboration, and impromptu study activities (Boddington and Boys 2011). As pedagogical approaches increasingly prioritize collaborative learning and social interaction, the significance of these informal spaces has correspondingly grown (Wright 2017).

This study seeks to to make a significant contribution to the evolving field by conducting a comprehensive scoping review that systematically synthesizes existing literature on the influence of in-between spaces on informal learning within university campuses. While previous research has primarily focused either on the physical design aspects of learning environments (Scott-Webber 2004) or on students' individual experiences (Temple 2008), this review fills a critical gap by offering an integrated and holistic framework that connects spatial design with informal learning processes (Beckers, Van der Voordt, and Dewulf 2016).

Design-focused categories provide valuable direction during the planning phase; however, additional research is required to connect spatial design with actual student behaviors and learning outcomes effectively. By adopting data-driven approaches, scholars can develop a more sophisticated educational discourse that integrating insights from learning theories and ecological design frameworks (Keppell and Riddle 2013).

Accordingly, this scoping review serves as a rigorous and systematic approach to map and synthesize the fragmented body of knowledge concerning the interplay between in-between spaces, informal learning, and spatial design within university campuses. By providing a broad overview of existing research, it aims to clarify key concepts, highlight research gaps, and establish a foundational framework to guide future studies and inform effective design strategies in higher education environments.

In-between spaces – frequently denoted by varied terminologies, such as third places, informal learning spaces, and transitional zones – remain conceptually ambiguous due to the absence of a unified definitional framework within extant scholarship. To systematically address this conceptual fragmentation, the present study adopts a scoping review methodology aimed at rigorously mapping and synthesizing the body of literature on the influence of in-between spaces on informal learning within university campuses from 2000 to 2025. This methodological approach can facilitate the identification of critical research gaps and the formulation of informed recommendations for future campus design. This scoping review is underpinned by two principal research inquiries:

RQ1: What are the prevailing research trends concerning the relationship between in-between spaces and informal learning processes on university campuses from 2000 to 2025?

This question entails a comprehensive examination of publication patterns, encompassing research topics, methodological orientations, theoretical frameworks, and spatial analysis techniques. Particular emphasis is placed on the ramifications of digital technological advancements and emergent pedagogical paradigms on learning environments, alongside transformations in architectural configurations and social interaction spaces since the early 21st century. A comparative analytical lens can elucidate disciplinary emphases and emergent conceptual trends in the discourse surrounding in-between spaces.

RQ2: How are the spatial design attributes of in-between spaces characterized, and what impact do these attributes exert on informal learning and student social interactions?

This inquiry investigates architectural design rationales, patterns of student engagement, interrelations with environmental factors, and spatial organization within in-between spaces. It evaluates how such spatial configurations shape informal learning dynamics and foster social connectivity on university campuses-anchored in Siemens's (2005) Connectivism theory – which suggests that learning is no longer merely an individual cognitive process but emerges through digital tools and social networks – the study frames learning as a networked activity dependent on access, interaction, and connectivity. From this perspective, open, flexible, and socially supportive in-between spaces are viewed as spatial reflections of these networked learning environments.

Through this methodologically rigorous scoping review, the study endeavors to consolidate and integrate disparate strands of knowledge, thereby providing a coherent foundation to inform the planning and design of future university campuses. It aims to delineate spatial strategies that respond to evolving educational demands since the 2000s and to articulate design principles conducive to facilitating informal learning within higher education contexts, especially those that promote continuity of learning across both physical and digital realms.

## 2. Background literature

### 2.1. Concept of In-between space

The concept of in-between represents a connecting space or a relationship between two different points in time and space. Collins (2003) defines such spaces as "spaces between one thing and another." The spaces in between can be seen as a connection, transition, boundary, differentiation, threshold or line of tension. He defines these spaces as the third kind of spaces that are "neither inside nor outside" and explains that these spaces represent a transition between inside and outside (Brookes 2012).

A literature review reveals that studies on the concept of in-between spaces are limited and do not sufficiently focus on the common features that make these spaces functional and meaningful. The concept of "in-between space" has been interpreted differently and analysed from different perspectives in many disciplines dealing with the relationship between the concepts of space and in-between. The origins of this concept include meanings based on both the physical structure of space and the social relationships between individuals.

According to the terminological analysis, Smithson's (1974) term "in-between space" encompasses spaces between buildings, connections between different spaces and mobility infrastructures (Santos-Garcia and Braga 2025). Deleuze (1992) considers the concept of the "in-between space" as a transitional space between the inside and the outside. According to him, the interior space is created by folding the exterior space, and this folding is defined by the surfaces that determine the boundaries of the interior space. In Baroque architecture, in particular, such folds emphasise the permeability between the interior and exterior of the room (Deleuze 1992; as cited in; Erdem and Er 2019).

Grosz (2001) explains that the concept of "in-between space" in architecture has the potential to create new relationships and question the existing order. Inspired by Henri Bergson's idea of the in-between, he sees intermediate spaces as areas that develop outside static structures and carry within them the desire for change. According to Grosz, these spaces offer a potential for mobility and change that is characteristic of the character of the time in which they exist (Grosz 2001).

Zsuzsanna defines "in-between spaces" on an urban scale as naturally occurring spaces that are not designed by urban planning and that contradict traditional urbanist norms. It shows that these spaces were created spontaneously and without human intervention (Gahse 1997).

Zizek (2006) notes that the spaces in between are conceived as multifunctional open spaces, but access is restricted by an invisible filter. This filter makes the spaces in between safer and more protected, while at the same time providing a space of uncertainty in which temporary purposes and new functions can emerge (Zizek 2006).

Aldo Van Eyck considers in-between spaces as areas in which the transitions between inside and outside are clearly defined in the spatial organisation and in which opposites come together in a balanced way. In his opinion, contemporary architecture must overcome its tendency to emphasise spatial continuity and eliminate all structuring elements. In this context, Van Eyck (1991) proposed the creation of intermediate spaces with a transitional character, defined by clear boundaries. These spaces thus gain significance as areas in which the contrasts between interior and exterior space are integrated and complementary binary structures interact (Eyck 1991; as cited in Uluğ 1996).

Herman Hertzberger's definition of in-between space provides a meaningful framework for drawing attention to the design deficiencies of in-between space on campuses. According to Hertzberger (2008), in-between spaces are not only physical spaces, but also spaces that promote human interaction and serve communication and connection. These spaces are not limited to a single function, but are conceived as elements in which different social and sensory experiences coexist and deepen the meaning of space (Hertzberger 2008). However, the fact that in-between spaces on university campuses are usually limited to a specific and narrow function shows that the potential of these spaces is not fully exploited. As Hertzberger suggests, designing transitional and multifunctional in-between spaces that expand the boundaries between inside and outside is an approach that will make social interaction and informal learning on campus more efficient.

Stevens (2007) reinforces the notion that thresholds facilitate a gradual transition between inside and outside, which softens social distinctions and encourages social "in-betweenness." These zones are not just intersections of thoughts and emotions but also of collective presence – spaces where individuals come together as members of a community.

Stavrides (2018) links this communal dynamic to broader social structures, suggesting that threshold spaces emerge as frameworks of expanding communal life. As a result, every in-between space becomes a social product – a spatial crystallization of relational dynamics.

The conceptual diversity observed across disciplines underscores both the complexity and richness inherent to in-between spaces as spatial and social constructs. Architectural interpretations primarily emphasize formal boundaries, transitions, and permeability, while sociological and philosophical perspectives enrich the discourse with dimensions of transformation, ambiguity, community formation, and resistance to structural rigidity. This duality becomes particularly pronounced within university campuses. On one level, in-between spaces function as transitional connectors, seamlessly linking classrooms, libraries, dormitories, and other designated programmatic areas. Concurrently, they serve as social condensers, facilitating spontaneous interactions, fostering informal learning opportunities, and enhancing a collective sense of belonging.

However, many such spaces remain underutilized, often due to reductive, functionally-oriented design approaches and a lack of deliberate spatial programming. The literature reveals a productive tension between planned and emergent spatial forms. Advocates, such as Van Eyck and Hertzberger, argue for the intentional design of in-between zones to augment social engagement, whereas scholars like Zsuzsanna and Grosz highlight the generative potential inherent in organically evolving spatial forms, shaped by lived experience and active appropriation. Additionally, as Zizek critically notes, spatial openness can obscure subtle exclusionary mechanisms, necessitating a rigorous examination of the underlying power dynamics influencing accessibility and usage.

Consequently, in-between spaces must not be perceived merely as residual voids or pragmatic transitional elements; rather, they are active spatial agents that profoundly influence social behaviors, facilitate knowledge exchange, and mediate both individual and collective identities. Comprehensively understanding and strategically leveraging their multilayered spatial and social characteristics is essential for their meaningful integration into contemporary campus designs. As a spatial strategy, effectively designed in-between spaces possess substantial potential not only to enhance mobility and

**Table 1.** Concepts and definitions of "in-between spaces" from scholars (created by the authors, 2025).

| References | Concepts | Definition |
|---|---|---|
| Deleuze (1992) | Transition, Folding, Inside-Outside Boundary | Transitional area between inside and outside; areas in which the inside is formed by the folding of the outside, whereby the folding determines the boundaries of the inside |
| Van Eyck (2008) | Transition, Interior-Exterior, Contrasts, Contemporary Space | The defined structure of contemporary space, where the transitions between inside and outside are defined and binary oppositions come together. |
| Gahse (1997) | Natural Areas, Leftover | In urban planning, naturally occurring, undesigned intermediate areas that stand in contrast to traditional urban planning. |
| Zizek (2006) | Multifunctionality, Filter, Uncertainty, New Functions | Multifunctional, access to which is restricted by an invisible filter; a space where new functions can be born in uncertainty. |
| Grosz (2001) | In between, change, movement, new relationships | The in-between can create new relationships and questions of order; spaces that offer the possibility of movement and change outside of static structures |
| Stevens (2007) | Thresholds In-betweenness | Threshold spaces enable a gradual transition between interior and exterior, softening rigid spatial or social boundaries and fostering social "in-betweenness. |
| Hertzberger (2008) | Communication, Link building | In-between spaces are not only physical spaces, but also spaces that promote human interaction and fulfil the function of communication and connection. |
| Stavrides (2018) | In between space, commons | In contrast to static and enclosed spaces, in-between spaces are defined as fluid, permeable, and collectively shaped environments that enable communal interaction and the continual reproduction of social relations. |

connectivity but also to cultivate inclusive, pluralistic, and dynamic learning environments. Furthermore, the varied definitions and conceptualizations identified across disciplines highlight important convergences and divergences, enriching the broader understanding of in-between spaces (see Table 1). Recognizing these nuanced conceptual relationships is vital for a holistic grasp of the roles and impacts of such spaces within university contexts.

The concept of in-between space represents a physical transition area and a multidimensional structure where social, cultural and experiential interactions intersect. In the literature, this concept is discussed around various themes, such as transition, folding, border, fluidity, flowability, change, movement, multifunctionality, connection and threshold. Figure 1, created within the scope of this study, conceptually visualises this thematic diversity and provides a holistic framework for understanding the multifaceted nature of interstitial space. Each concept in the figure emphasises that interstitial spaces have physical and socially transformative potential (Figure 1).

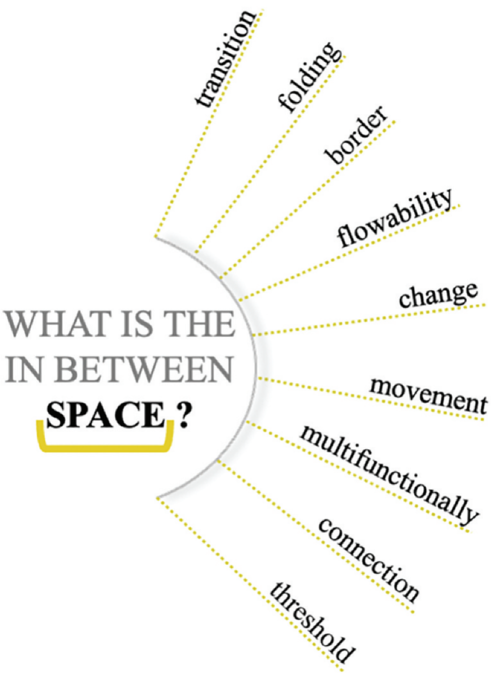


**Figure 1.** Concepts of in-between spaces (created by the authors, 2025).

Definitional ambiguities about the concept of in-between space also make it challenging to understand the impact of campus physical structures on learning and social interaction. The concepts of the "third space" (Oldenburg 1999; Soja 1996) and the "informal learning space," which play an important role in the literature, emphasise the potential of intermediate spaces to support social interaction and learning processes, but these terms are often treated in a limited and generalised framework (Matthews, Andrews, and Adams 2011). However, the concept of ''in-between space'' has a deeper and more comprehensive meaning in terms of spatial experience and interaction.

The unique consideration of this concept on the university campus allows for a more detailed understanding of not only the physical design, but also the user interactions. In this context, it is concluded that the concept of "in-between space" should be examined both in terms of its experiential and interactional dimensions as well as its functional dimensions. Such an approach will enable more effective planning and implementation in the design of the campus and provide an infrastructure that deepens learning and social interaction between students and other users.

### 2.2. Space and learning relationship

In the 21st century, higher education has undergone a substantial transformation under the influence of social, technological, and economic dynamics. Barnett (2011) conceptualizes this transformation as a process shaped by the marketisation of higher education, the consumerist positioning of students, the proliferation of digital technologies, and the expansion of higher education to broader populations. This evolution has necessitated a reconsideration of the spatial organisation of university campuses, prompting the emergence of learning environments that accommodate both academic and social development.

Technological advancements have redefined students' learning practices, enabling effective learning experiences beyond traditional classroom settings. Corridors, atriums, and in-between spaces have increasingly been recognised as zones that foster informal learning and social interaction (Gehl 2011). Gehl and Gemzoe (2000) emphasise the characteristics of quality public spaces – such as "main street," "meeting place," and "market place" which can be translated into campus contexts to promote interaction and knowledge exchange (Nair and Gehling 2010). Jacobs (2016) similarly argues that well-designed public areas encourage spontaneous social encounters, a principle that also applies to campus settings.

The concept of the "learning landscape" has thus emerged as a holistic design paradigm that encompasses the spatial, social, and academic dimensions of campus life (Neary and Thody 2009). According to JISC (2006), the availability of well-designed informal learning spaces enhances motivation and supports peer interaction. Radcliffe et al. (2008) further conceptualise this relationship through a learning spectrum model, which demonstrates how spatial characteristics, human behavior, and pedagogical practices intersect to shape educational experiences.

Recent scholarly discourse conceptualizes contemporary university campuses as complex, multilayered spatial systems shaped by the dynamic interaction between formal institutional structures and informally embedded social contexts (Deed and Alterator 2017). This spatial reconfiguration reflects a paradigmatic shift toward more flexible, loosely structured learning environments that are responsive to diverse pedagogical practices and evolving student needs.

McAuley et al. (2010) emphasize that the transformation of learning environments is fundamentally contingent upon the adaptability of both educators and students to emerging spatial paradigms. This evolution is further facilitated by the proliferation of mobile and ubiquitous technologies, which enable learning to become increasingly personalized, collaborative, and contextually situated (Solvberg and Rismark 2012). In support of this perspective, Thomas (2010) highlights that a considerable portion of meaningful learning transpires within spaces not originally conceived for educational purposes, thereby reinforcing the critical role of informal learning environments in contemporary pedagogical practices.

The emphasis on informal learning environments necessitates a deeper exploration of how students engage with and make sense of the spatial affordances embedded within campus settings. Greeno (2009) posits that learners actively interpret and respond to the opportunities and constraints presented by their immediate environment. In this context, Sfard's (1998) participation metaphor offers a valuable conceptual framework to understand the interplay between spatial configurations and learning processes. This perspective aligns with prior scholarship (Boddington and Boys 2011; Jamieson et al. 2000), which underscores the pivotal role of spatial design in facilitating and enhancing contemporary pedagogical practices.

Simultaneously, the perspectives and strategic orientations of academic staff and institutional administrators merit careful consideration, given that their conceptual understandings significantly shape the design, implementation, and governance of informal learning environments (Deed and Alterator 2017). Establishing a strong theoretical foundation is essential for formulating research questions that can effectively guide empirical investigations and inform evidence-based spatial planning in higher education contexts.

In recent scholarship, Valtonen et al. (2021) delineate five core dimensions that underpin the effectiveness of informal learning environments: the physical and contextual attributes of the campus, accessibility to educational resources, the adaptability of pedagogical practices, the integration of information and communication technologies (ICT), and the spatial flexibility of learning settings. Complementing this framework, Wu et al. (2021) propose six critical spatial characteristics – namely comfort, adaptability, functional utility, spatial hierarchy, openness, and the presence of supportive facilities – that collectively influence students' engagement and patterns of use within these environments.

In addition to cognitive and academic dimensions, the psychosocial well-being of students has increasingly been associated with the spatial configurations of university environments. Empirical findings indicate that the presence of green spaces and designated relaxation areas contributes positively to students' overall satisfaction and their perceived quality of campus life (Çetinkale Demirkan 2020; Koning et al. 2022; Sun, Liu, and Zheng 2023). Further supporting this perspective, Salihoğlu and Açikgöz (2021) argue that improvements in physical infrastructure, support services, and opportunities for social engagement play a pivotal role in shaping students' holistic experiences within higher education settings.

Informal learning is commonly characterised as a self-initiated, spontaneous educational process that takes place beyond the boundaries of formal instruction (Callanan, Cervantes, and Loomis 2011). According to Jackson and Shenton (2010), the effectiveness of such environments depends not only on the availability of appropriate physical settings but also on the presence of social stimuli that facilitate interaction. Painter et al. (2013) further underscore that specific spatial attributes can actively promote both autonomous learning and collaborative engagement. A growing body of literature on Informal Learning Spaces (ILS) demonstrates their significant contribution to enhancing students' social integration (Matthews, Andrews, and Adams 2011; Temple 2008), academic performance (Matthews, Andrews, and Adams 2011), and behavioral participation in learning processes (Chang et al. 2009; Phillips and Trainor 2014; Tanner 2000).

COVID-19 has intensified scholarly attention on the design of learning environments, with a heightened emphasis on digital and hybrid modalities. Empirical studies from this period underscore the critical role of fostering a sense of community and facilitating active engagement within virtual learning spaces (Mačiulienė, Gulevičiūtė, and Skaržauskienė 2024). However, they also reveal persistent challenges, such as learner isolation, diminished motivation, and reduced interpersonal interaction (Nuñez 2021). Although online platforms offer considerable advantages in terms of flexibility, convenience, and accessibility (Altunoğlu 2020), the design and spatial organisation of both virtual and physical learning settings continue to play a pivotal role in shaping meaningful educational experiences and sustaining student engagement.

In conclusion, the spatial design of higher education environments must transcend traditional notions of physical layout to holistically support students' academic performance, social interaction, and emotional well-being. As active and collaborative learning paradigms become increasingly embedded in institutional pedagogies, the intentional configuration of both formal and informal spaces emerges as a critical component of the student experience. In response to these evolving demands, this scoping review aims to systematically synthesise fragmented and interdisciplinary literature published between 2000 and 2025, offering an integrative framework that explicates the complex interplay between spatial design, student behaviour, and informal learning dynamics within university campuses.

### 2.3. Types of University campuses and their relationship with learning space

University campuses differ widely in their spatial organisation, settlement patterns, and functional components. This diversity significantly influences how students engage in both formal and informal learning processes (Temple 2009). Campus typologies are generally classified according to their physical configuration and the degree of integration they establish with their urban context.

Urban campuses are typically embedded within the fabric of the city and are characterised by high density and compact spatial layouts. Open spaces in these campuses are often limited to small courtyards, alleyways, and campus squares (Jamieson et al. 2000). However, these environments offer rich opportunities for student interaction by blending academic buildings with public amenities, such as cafes, libraries, pedestrian pathways, and co-working spaces (Kenney, Dumont, and Kenney 2005). The integration with urban life fosters incidental social encounters and informal learning.

In contrast, suburban campuses are usually located on the outskirts of cities and are spread across large tracts of land. Although spatially expansive, these campuses can still promote interaction through well-designed social hubs, campus centres, and outdoor study areas that serve as in-between spaces (Neary et al. 2010).

In recent decades, university campuses have significantly reconfigured their spatial layouts and educational roles. Traditional models – centered on discipline-specific buildings – have shifted toward integrated, flexible, and student-centred environments. This trend mirrors broader pedagogical movements that prioritise collaborative, informal, and technology-enhanced learning. Teemu Valtonen et al. (2021) report a "shift toward informal and flexible learning environments" in higher education. Recent trends also emphasise multipurpose and open-concept campus spaces that facilitate spontaneous interaction, well-being, and adaptability. Such transformations are not only spatial but pedagogical, aligning curricular innovation with modular design and ICT integration (Kerimbayev et al. 2023).

COVID-19 has accelerated these shifts by foregrounding the limitations and opportunities of virtual learning. Based on interviews with students and academics at Cambridge University, Eringfeld (2021) identified a dual narrative of hope and concern: while online platforms improved accessibility and participation, many mourned the loss of embodied, communal experiences inherent to physical campuses. These findings underscore the enduring value of spatial proximity, face-to-face interaction, and shared learning environments. As a response, the hybrid campus model has gained traction – integrating physical and digital spaces to address diverse learning needs while preserving the socio-spatial qualities of in-person education (Papaioannou et al. 2023).

In this evolving context, some universities have begun to overcome the traditional campus-city divide, embracing hybrid models that blur the boundary between academic institutions and urban life. These models involve shared public squares, multifunctional university buildings, and communal areas where students and city residents interact (Kenney, Dumont, and Kenney 2005; Temple 2008). This approach enhances the availability and quality of in-between spaces, which are critical to informal learning.

Recent literature introduces the concept of "University Hubs" – flexible, hybrid environments that merge educational, social, and work-related functions. These hubs transcend traditional campus boundaries, acting as catalysts for interdisciplinary collaboration and social inclusion. They also represent a growing shift toward distributed and networked models of education that extend learning beyond the classroom (Migliore et al. 2024).

In addition, the digitalisation of learning environments has led to the rise of digital campuses, where learning continues beyond physical settings. In these spaces, online platforms serve as virtual in-between areas, facilitating spontaneous dialogue and peer collaboration even when students are not co-located Zandvliet and Straker (2001). The importance of these environments has become more apparent in the post-COVID-19 era, as universities strive to create inclusive, resilient, and future-ready campuses (Di Marino et al. 2023; Kesim and Bengü 2024).

In conclusion, university campus typologies – urban, suburban, hybrid, and digital – each offer distinct spatial frameworks that influence how students experience learning. The design and organisation of these spaces directly affect students' behavioural patterns, access to resources, and opportunities for informal learning. As such, the spatial configuration of in-between spaces should be regarded not as residual or secondary, but as central to the academic and social vitality of university life.

## 3. Materials and methods

This study adopted a scoping review design to systematically investigate the interaction between in-between spaces, informal learning, and spatial design in university campus environments. The review is structured according to the methodological framework developed by Arksey and O'Malley (2005), which provides a systematic approach for mapping the breadth and scope of existing research within a given field. The purpose of this method is to synthesise current knowledge and delineate conceptual boundaries, identify key themes, and highlight existing gaps in the literature that may inform future research and practice.

To ensure methodological rigour and transparency, the review process was supported by the decision tool developed by Khalil et al. (2021), which was used to confirm that the scoping review approach was more appropriate than other evidence synthesis methods, such as a systematic review. This decision was guided by the exploratory nature of the research questions and the heterogeneity of the available literature. Furthermore, the review process was aligned with the PRISMA-ScR (Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews) guidelines (Moher et al. 2009), which served as a protocol for data identification, selection, and synthesis.

The scope of this review included empirical and conceptual studies that examine the impact of in-between spaces on informal learning practices within university campuses. These in-between spaces – defined as transitional, residual, or interstitial areas between formal learning environments – are analysed in relation to their capacity to support spontaneous interaction, collaborative learning, and socio-spatial engagement.

Special attention is given to the methodological approaches and data collection tools employed in the included studies, such as spatial analysis, behavioural mapping, ethnographic observation, surveys, and interviews. Through this analysis, the review assesses how different spatial configurations and design strategies contribute to informal learning processes and user experiences in campus settings.

The temporal scope of the review is limited to studies published between 2000 and 2025, a period marked by significant transformations in higher education, campus planning, and learning paradigms. This timeframe allows for the inclusion of literature reflecting both pre- and post-COVID-19 developments, digitalisation trends, and evolving spatial practices within academic environments. The selection also responds to the growing interest in learner-centred design and informal pedagogies that gained prominence in the early 21st century.

In conclusion, this scoping review consolidates empirical findings related to the interaction between spatial design and informal learning and provides a theoretical foundation for future campus planning initiatives. By mapping the current state of research, this study contributes to a deeper understanding of how in-between spaces can be strategically utilised to foster inclusive, interactive, and flexible learning environments in higher education contexts.

### *3.1. Identifying relevant studies and study selection*

In this study, a scoping review was conducted to identify and evaluate scholarly literature focusing on the interaction between in-between spaces and informal learning within higher education campuses. To ensure methodological rigor and transparency, a structured set of inclusion and exclusion criteria was applied throughout the selection process.

Scopus and Web of Science (WoS) databases were chosen due to their extensive coverage of high-impact journals in disciplines such as architecture, education, sociology, urban planning, and environmental design. The search was limited to publications released between 2000 and 2025, a period marked by substantial shifts in campus spatial planning and pedagogical practices, particularly influenced by digital technologies and the impacts of the COVID-19.

Only peer-reviewed journal articles based on empirical data were included to maintain academic quality and analytical reliability. The review prioritized both qualitative and quantitative studies. Theoretical and conceptual papers were excluded unless supported by empirical evidence. Publications such as books, editorials, conference proceedings, and grey literature were not considered due to inconsistencies in peer-review standards.

Language was another filter: only studies published in English were included to ensure analytical consistency and global accessibility. No geographical limitations were applied, given the universal relevance of in-between spaces as informal learning environments across various socio-cultural and spatial contexts.

As a result of the database search, 274 sources were retrieved from Scopus and 95 from WoS. After importing all records into the Mendeley reference management software, duplicate entries were removed, resulting in 320 unique sources. Titles and abstracts were screened for relevance to the topic. This rigorous and systematic filtering process enabled the identification of high-quality, contextually relevant studies that contribute to a deeper understanding of the spatial dynamics of informal learning in university campuses (Table 2).

Articles that did directly refer to informal learning spaces on campus were excluded in this review. Also, excluded were contributions related to different educational or socialisation practises (e.g., digital learning environments) or other processes related to architecture but not focused on campus design (e.g., urban planning) and not on in-between spaces in general. As a result of this evaluation, 51 articles were identified. To verify the selection of the articles, titles and abstracts were analysed in more detail. A total of 27 articles were read in detail, but 13 were excluded because they did not meet the above criteria. As a result, 14 articles were selected for inclusion in this review. Figure 2 contains a flowchart that describes the screening process in detail.

### 3.2. Data extraction and analysis

In this study, the selected articles were analysed according to various parameters, such as the author's name, the year of publication, the geographical location where the research was conducted, the purpose of the study, the research design and methods used, the architectural and design features of the in-between spaces, the impact of these spaces on informal learning experiences and the main findings, and presented graphically in an Excel spreadsheet. A qualitative, descriptive approach was chosen depending on the research question to investigate the impact of in-between spaces on informal learning on university campuses more comprehensively (Elliot and Timulak 2005). The findings were grouped under common themes, which were defined about the research question and listed in Table 3. This comprehensive analysis aims to provide a comprehensive framework to understand the contribution of in-between spaces to informal learning processes on university campuses.

### 3.3. Characteristics of the articles

This scoping review systematically examined 14 empirical studies that investigate the impact of university campus spaces – particularly in-between spaces – on informal learning processes. Notably, four of these studies were published within the last two years, reflecting a growing scholarly interest in the topic. The selected studies were conducted across diverse geographic contexts, including universities in the United Kingdom, the Netherlands, Australia, China, Malaysia, New Zealand, the United

**Table 2.** The research strategy and criteria (created by the authors, 2025).

| Component | Details |
|---|---|
| Databases Used | Scopus, Web of Science |
| Search Strategy | Keyword method<br>(Using keyword string: ("in between space" OR "third space" OR "transitional spaces" OR "informal learning" OR "informal learning environments") AND ("university campus" OR "campus planning" OR "spatial design" OR "campus design" OR "learning environment" OR "social space" OR "spatial organization" OR "campus interaction space" OR "semi-public space" OR "campus architecture") AND ("impact" OR "role" OR "effect" OR "influence") |
| Publication Type | Included: Peer-reviewed journal articles<br>Excluded: Books, book chapters, conference proceedings, editorials, non-peer-reviewed sources |
| Language | Included: English (title, abstract, keywords, full text)<br>Excluded: Non-English publications |
| Time Frame | Included: 2000–2025<br>Excluded: Studies published before 2000 or after 2025 |
| Thematic Focus | Included: Studies addressing in-between spaces and informal learning in university settings<br>Excluded: Studies unrelated to informal learning or higher education |
| Educational Level | Included: Higher education (university-level campuses)<br>Excluded: Studies focused on primary or secondary education contexts |
| Geographical Scope | Included: Global-no geographic restrictions<br>Excluded: N/A (all regions considered relevant) |
| Duplicate Records | Included: Unique references only (deduplicated in Mendeley)<br>Excluded: Duplicated records across databases |

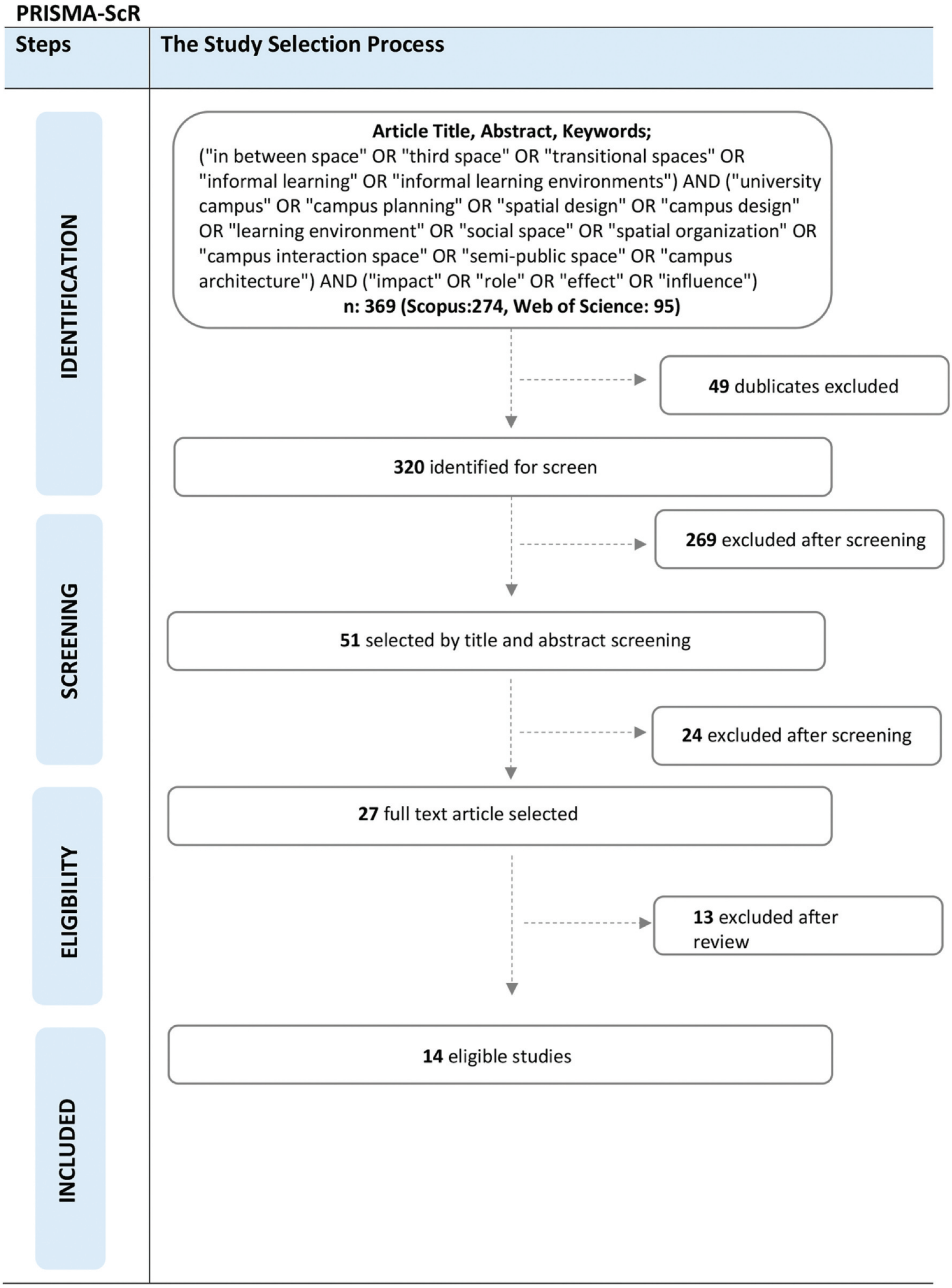


**Figure 2.** Study selection process for scoping review (Moher et al. 2009).

States, and Hong Kong. Institutions such as Loughborough University, the University of Sheffield, Nottingham Trent University, HAN University of Applied Sciences, Monash University Malaysia, and Texas A&M University were among the examined cases.

The most frequently employed data collection methods include surveys, which capture user experiences at scale, as well as systematic observations and semi-structured interviews, which offer in-depth insights into user behavior and spatial interactions. The analysed learning environments encompass both multifunctional spaces – such as libraries, student centers, and general campus areas – and purpose-specific environments designed to support particular learning activities. Findings reveal that in-between spaces are not only physically situated between primary functions but also act as socially and pedagogically dynamic environments.

**Table 3.** Summary of included articles (created by the authors, 2025).

| Authors (Year) | Study Aim | Research Method | Research Area (Campus/ University and Location) | In-between spaces/design features | Impact on Informal Learning | Main Findings/Conclusion |
|---|---|---|---|---|---|---|
| Riddle and Souter (2012) | The study investigates informal learning environments at La Trobe University to inform spatial design strategies | Applied case study and spatial prototype design | La Trobe University Australia | Comfort, aesthetics, flow, equality, mixing, possibilities and reuse | They frequently lack the spatial qualities required for active, collaborative, and tech-enabled learning | Emphasis was placed on integrating student views into learner-centred space design |
| Cunningham and Walton (2016) | The study explores students' use of library and informal learning spaces at Loughborough University, focusing on activities, preferences, and technology use | Case study (Semi-structured interview) | Loughborough University England | Accessibility<br>Informality<br>Social Interaction | Library and informal spaces facilitate out-of-class informal learning. | Library and social learning spaces support individual student learning |
| Beckers, Van der Voordt, and Dewulf (2016) | The study explores factors influencing students' learning space preferences in higher education | Questionnaire with exploratory factor analysis (EFA) to assess variable correlations | HAN University of Applied Sciences Netherlands | Social characteristics (privacy, interaction, autonomy)<br>Physical characteristics (comfort, aesthetics, technological possibilities, layout) | Spaces supporting social interaction must be complemented by those meeting individual learning needs. | Findings indicate that students value learning spaces, which support test performance and collaboration. Exploratory factor analysis revealed three social and four physical environmental factors |
| Lau et al. (2020) | This study investigates how physical (comfort, aesthetics, IT, organisation) and social (privacy, interaction, autonomy) factors relate to students' learning activities. | Survey analysis conducted using SmartPLS | A public university in Malaysia Malaysia | In-between spaces enabling social aspects like privacy, interaction, and autonomy are preferred by students | Spaces promoting autonomy and interaction positively influence informal learning | Students' learning space preferences are strongly shaped by social factors, particularly autonomy and interaction. The growing significance of technological infrastructure also warrants consideration in future campus design |
| Wang (2020) | This study proposes a model for indoor and outdoor informal learning spaces by analysing environmental factors on campuses | Observation<br>Survey | Anhui Jianzhu University China | Different spatial types (open, semi-enclosed, elevated, enclosed) offer diverse learning and social interaction experiences | While private-shared spaces support focused and group work, public-shared areas promote interaction and connectivity | Students' experiences in various spaces highlight key considerations for learning space design |
| Wu, Oldfield, and Heath (2020) | This study evaluates atrium openness in higher education and its impact on students' social learning | Mixed Method<br>3d izovist anova<br>Interview,<br>Observation and Qgis | Nottingham University England | Atriums, as in-between spaces, facilitate social interaction and learning through visibility and visual access | Movement across atrium levels reveals diverse learning settings, promoting visibility and social interaction | Atrium design informs their role in social learning, as spatial openness enhances student activity and interaction |
| Wu et al. (2021) | This study employs a mixed-methods approach to explore student activities and preferences in informal learning spaces | Mixed method;<br>Quantitative Surveys<br>Qualitative Observation, interviews and focus groups | Diamond at the University of Sheffield and Newton at Nottingham Trent University England | Comfort, flexibility, functionality, spatial hierarchy, openness, technology | Design strategies promote cooperative and informal learning processes | This analysis of spatial features offers insights into designing informal learning spaces and provides a framework for empirical evaluation |

(*Continued*)

**Table 3.** (Continued).

| Authors (Year) | Study Aim | Research Method | Research Area (Campus/ University and Location) | In-between spaces/design features | Impact on Informal Learning | Main Findings/Conclusion |
|---|---|---|---|---|---|---|
| Peng et al. (2022) | This study examines the strengths and limitations of active learning classrooms from an informal learning perspective | Student-centred questionnaires and semi-structured interviews | Huazhong University of Science and Technology (HUST) China | The study targets socially oriented campus spaces—libraries, cafeterias, dormitories, and outdoor areas—due to the informal nature of learning in higher education | Perceptions of flexibility, comfort, and humanised environments are key to informal learning | Students reported satisfaction with and preference for informal learning in active learning environments |
| Ramu, Taib, and Massoomeh (2022) | This study examines students' preferred physical spaces for interactive informal learning and explores their preferences based on spatial and social attributes | Survey; Analyses (Descriptive analyses Manova, T-Test Exploratory factor analysis (EFA) | Ungku Omar Polytechnic, Sultan Abdul Halim Muadzam Shah Polytechnic, Seberang Prai Polytechnic Malaysia | Informal learning occurs across semi-closed (e.g., corridors, foyers), semi-open (e.g., atriums, terraces), and open (e.g., green areas, squares) campus spaces | Semi-open spaces were favoured for informal learning | Students prefer semi-open, nature-connected, and freely accessible spaces for informal learning. While these areas foster interaction and collaboration, the social dimension is considered more critical than physical attributes. The study recommends enhancing such spaces with natural elements and identifies eight types of informal academic learning environments for campus design |
| Zhang et al. (2022) | This article examines students' learning space preferences in relation to their social needs. | Space syntax analysis and questionnaire data were statistically evaluated using the Mann-Whitney U test for two-group comparisons and the Kruskal-Wallis H test for multiple groups. Post-hoc analyses, including Dunn's procedure, were employed for detailed comparisons | Deakin University Australia | University students increasingly engage with diverse learning settings, including common areas, cafés, dining spaces, in-between zones like verandas, and even circulation path | Active-public and active-private spaces support relaxed communication, while students in active-private and quiet-private areas express greater concern for visual and acoustic privacy | The study indicates that quiet spaces conflict with the need for social interaction, and users place limited value on ease of communication in these settings |
| Chang-Tik and Goh (2023) | This study investigates students' collaborative engagement in informal learning spaces and the socio-emotional challenges encountered | Case study (Group discussions Thematic analyses) | School of MUM Monash University Malaysia | In-between spaces like Idea Link, Hive, Lepak Café, and the Library Collaboration Space facilitate informal learning | Informal learning spaces enable individual engagement in collaborative processes | Spatial design and function support informal learning, while identifying socio-sensory challenges enhances learning environments |
| Carvalho and Freeman (2023) | This study examines PhD students' place-based experiences at a New Zealand university. | Methods included semi-structured interviews and digital multimodal artefact analysis, where participants created visual–audio postcards | A university in New Zealand New Zealand | The study examines how people, spaces, materials, and digital artefacts intersect across physical and virtual settings such as classrooms, libraries, corridors, canteens, and online platforms | Learning-supportive social spaces that enhance peer connection have become increasingly significant | Socially interactive and nature-connected spaces were found to foster community and support learning processes |

(*Continued*)

**Table 3.** (Continued).

| Authors (Year) | Study Aim | Research Method | Research Area (Campus/ University and Location) | In-between spaces/design features | Impact on Informal Learning | Main Findings/Conclusion |
|---|---|---|---|---|---|---|
| Yau, Chin, and Hsu (2023) | This study investigates types, preferences, and behaviours related to informal learning spaces | Qualitative Research (Interviews and focus groups)<br>Quantitative Research (Survey) | A university in Hong Kong China | Hygiene<br>Comfort<br>Functionality<br>Furniture organisation | The need to increase and repurpose enclosed informal learning spaces is emphasised | The findings propose user-centred strategies for developing in-between spaces in universities |
| Budzise-Weaver et al. (2024) | This study explores university students' perceptions and use of workspaces in affiliated campus colleges | Visual survey | Texas A&M University, America | It incorporates design elements that enhance students' sense of belonging and encourage extended campus use | These spaces promote active campus engagement by fostering social interaction and collaborative learning | Informal learning and study spaces are thought to enhance students' campus engagement, fostering belonging and integration |

These spaces facilitate informal learning by enabling spontaneous interactions, collaborative activities, and user engagement with spatial design elements.

The studies examined how users appropriate these transitional areas, how design features influence behavior, and how these interactions contribute to informal educational experiences. Overall, the review underscores that in-between spaces operate beyond their physical boundaries; they emerge as meaningful contributors to the social and cognitive dimensions of student learning. By drawing upon varied research methods and spatial configurations, this analysis provides a comprehensive framework for understanding how spatial design on university campuses can foster informal learning in a more inclusive, adaptive, and participatory manner (Table 3).

## 4. Discussion

### 4.1. Methods and models for evaluating the relationships between In-between spaces and informal learning

In-between spaces have emerged as critical components of the contemporary learning landscape, reflecting the broader transformation of higher education institutions in the 21st century. As universities have evolved under the pressures of marketisation, digitalisation, and diversification of student needs (Barnett 2011), the spatial configuration of campuses has undergone significant change. Within this new spatial paradigm, in-between spaces, such as corridors, atriums, courtyards, and interstitial zones, have gained prominence as sites for informal learning and spontaneous social interaction (Gehl 2011; Jacobs 2016). This scoping review reveals that various research methods have been used to examine the educational and social functions of in-between spaces (Table 4), highlighting their increasing relevance in both urban and suburban campus typologies.

Student response surveys have been a crucial tool to provide valuable insights into how informal learning spaces support collaboration and social interactions. These questionnaires are used to collect data about students' experiences, expectations and the way they interact in these areas. In particular, the open-ended questions in the questionnaires make it possible to obtain in-depth information about the functionality and effectiveness of the spaces from the students' own perspectives. Post-occupancy evaluations are also used to analyse user experience after the design of a particular space and the impact of these spaces on informal learning. Post-use evaluation processes aim to assess the extent to which users have adopted the spaces, the problems they encounter in these spaces and the contribution of the space to their learning experience. This method provides objective data about the functionality of the space and its suitability for user needs (Beckers, Van der Voordt, and Dewulf 2016; Budzise-Weaver et al. 2024; Lau et al. 2020; Peng et al. 2022; Ramu, Taib, and Massoomeh 2022; Wang 2020; Wu et al. 2021; Yau, Chin, and Hsu 2023; Zhang et al. 2022).

Observational studies use various techniques to collect data on the use of in-between spaces. Behaviour mapping, time-lapse studies and ethnographic observations allow us to understand how students use these spaces and the social dynamics. These techniques are particularly critical for understanding how interactions take place in the natural environment. Ethnographic observations provide an in-depth insight into users' behaviour and social interactions within the space (Wang 2020; Wu et al. 2021; Yau, Chin, and Hsu 2023).

Spatial analysis methods evaluate the settlement relationship of areas with techniques, such as spatial sequence analysis and proximity analysis. These methods contribute to our understanding of how the physical organisation of space affects learning processes. In particular, the relationships between the layout of spaces and their locations shape how students interact and informal learning processes (Zhang et al. 2022).

Techniques, such as semi-structured interviews and focus groups, are used to understand the impact of informal learning spaces in detail. These methods provide a detailed account of individuals' experiences and views, providing a better understanding of the effects of places on learning (Carvalho and Freeman 2023; Chang-Tik and Goh 2023; Cunningham and Walton 2016; Peng et al. 2022; Riddle and Souter 2012; Wu et al. 2021; Yau, Chin, and Hsu 2023).

COVID-19 has transformed spatial and social dynamics in higher education. Demands for social distancing, ventilation, and hygiene have necessitated rethinking openness and proximity within campus environments. Nevertheless, several studies demonstrate that, with appropriate spatial reconfiguration, in-between spaces can continue to serve as vital nodes of community, resilience, and informal learning (Peng et al. 2022; Wu et al. 2021; Yau, Chin, and Hsu 2023). COVID-19 has sharpened awareness of the need for flexible, health-conscious environments that prioritise interaction and psychosocial wellbeing.

In light of these developments, assessing the relationship between in-between spaces and informal learning requires an integrative, mixed-methods approach. This includes triangulating data from surveys, observations, spatial analytics, and interviews while attending to broader socio-cultural and institutional contexts. The methods reviewed here offer complementary lenses to evaluate post-COVID campus design, enabling a more nuanced understanding of how informal learning spaces function under evolving pedagogical and spatial conditions.

**Table 4.** Methods and models used to assess relationships between in-between spaces and informal learning (created by the authors, 2025).

| Research Method | Research Area | Data Collection Techniques | Analysis method | References |
|---|---|---|---|---|
| Qualitative | Loughborough University | Semi-structured Interview | Thematic analysis | Cunningham and Walton (2016) |
| Qualitative | La Trobe University | Interview | Prototype design | Riddle and Souter (2012) |
| Qualitative | School od MUM Monash University Malaysia | Group Interviews | User feedback Thematic Analysis | Chang-Tik and Goh (2023) |
| Qualitative | A university in New Zealand | Semi-structured interview | Digital multimodal work analysis | Carvalho and Freeman (2023) |
| Quantitative | A public university in Malaysia | Surveys | Smart PLS | Lau et al. (2020) |
| Quantitative | At the HAN University of Applied Sciences (UAS) in the Netherlands | Surveys | Advanced data analysis, correlations between variables Exploratory factor analysis (EFA) | Beckers, Van der Voordt, and Dewulf (2016) |
| Mixed | Ungku Omar Polytechnic, Sultan Abdul Halim Muadzam Shah Polytechnic, Seberang Prai Polytechnic | Surveys | MANOVA T-Test Exploratory factor analysis (EFA) | Ramu, Taib, and Massoomeh (2022) |
| Mixed | Diamond at the University of Sheffield and Newton at Nottingham Trent University | Surveys Observation, Focus Group Interview | Advanced data analysis, correlations between variables | Wu et al. (2021) |
| Mixed | Telford Exhibition Hall at the University of Nottingham in the United Kingdom | Interview, Observation and Qgis | Spatial analysis Thematic Analysis 3d izovist ANOVA | Wu, Oldfield, and Heath (2020) |
| Mixed | Huazhong University of Science and Technology (HUST) | Surveys and semi-structured interview | Correlations between variables Exploratory factor analysis (EFA) | Peng et al. (2022). |
| Mixed | At the Geelong Waterfront Campus of Deakin University in Australia | Space syntax Surveys | Spatial Analysis Mann-Whitney U test Kruskal-Wallis H test Post-hoc analyses and Dunn procedure | Zhang et al. (2022) |
| Mixed | A university in Hong Kong | Interviews with focus groups Observation Survey | Concept mapping | Yau, Chin, and Hsu (2023) |
| Mixed | Anhui Jianzhu University North and South Campuses | Observation Survey | Advanced data analysis, correlations between variables | Wang (2020) |
| Mixed | The study was conducted at two colleges at Texas A&M University, the College Station campus, College of Architecture (COA) and College of Education and Human Development (COE). | Visual survey | Qualitative Coding | Budzise-Weaver et al. (2024) |

To advance this field, further studies should integrate post-occupancy evaluations with digital spatial data, including occupancy sensors, Wi-Fi tracking, and real-time behavioural monitoring. This will enhance our ability to assess how students appropriate and personalise in-between spaces over time. In particular, the combination of observational techniques with spatial heat mapping or flow analysis tools (e.g., QGIS) can yield valuable insights into how spatial configurations support safe, interactive, and adaptive learning environments. Moreover, comparative studies across diverse campus typologies – urban, suburban, vertical, and hybrid – can inform context-sensitive and resilient design strategies. These studies should also engage with emerging themes, such as hybrid learning models, urban density, sustainability, and emotional resilience. Research can guide the development of campus environments that respond to changing student needs and cultivate spatial conditions conducive to creativity, community, and lifelong learning.

### 4.2. Focusing on design principles and processes of in-between space

The design principles and processes of in-between spaces are deeply intertwined with the conceptual foundations explored in earlier literature. As discussed in Section 2.1, in-between spaces are not merely physical voids or transitional links between architectural programs; instead, they embody conceptual dualities, such as inside – outside, planned – emergent, formal – informal, and collective – individual (Collins 2003; Deleuze 1992; Grosz 2001; Hertzberger 2008). These spaces operate as spatial thresholds and as social condensers, mediating diverse patterns of use, interaction, and meaning-making on university campuses.

In the literature, terms, such as “third place” or “informal learning space” are more commonly used to refer to in-between spaces. Various studies have explored how design principles and processes are shaped by addressing both the physical and social dimensions of these environments. Based on the findings of 14 different studies, a summary of key design principles for in-between spaces is provided in Table 6. Research indicates that the accessibility of these spaces significantly influences students’ frequent use. In-between spaces seamlessly integrated into the campus flow tend to be preferred by students during extracurricular time (Cunningham and Walton 2016). Semi-open spaces, such as courtyards, atriums, terraces, and external corridors, offer open and flexible environments where physical boundaries are minimized, fostering a sense of comfort and openness. These areas support a more relaxed and engaging learning atmosphere by promoting a connection to nature (Ramu, Taib, and Massoomeh 2022).

The informality of in-between spaces facilitates both individual and collaborative learning while enhancing social interaction among students (Cunningham and Walton 2016). Their flexible configurations are intentionally designed to accommodate diverse user needs. Studies show that such multifunctional and adaptable environments, which encourage student interaction, provide more effective settings for learning and collaboration. Moreover, comfort and openness support prolonged engagement with the space (Ramu, Taib, and Massoomeh 2022).

In-between spaces are widely recognized as essential environments that support peer interaction. These spaces allow students to collaborate, work in groups, and participate in informal learning activities outside the classroom. For instance, atriums are prominent in-between spaces that enhance social interaction and learning through their visual openness and multidirectional access (Wu, Oldfield, and Heath 2020). On university campuses, in-between spaces can be categorized into three main types: semi-enclosed (e.g., interior corridors, entrance lobbies, and foyers), semi-open (e.g., courtyards, atriums, terraces, and external corridors), and open spaces (e.g., student pavilions, gazebos, squares, and green areas) (Ramu, Taib, and Massoomeh 2022). Research has focused on both social factors (privacy, interaction, autonomy) and physical factors (comfort, aesthetics, technological infrastructure) that influence students’ preferences for using these spaces. Elements, such as comfortable seating arrangements, flexible layouts suitable for group work, and access to technology, contribute to students’ effective use of these spaces for learning. Furthermore, the need for autonomy among students has led to the growing demand for spatial arrangements that support independent study (Beckers, Van der Voordt, and Dewulf 2016).

Information technology infrastructure has emerged as a critical component of in-between spaces. The availability of power outlets, internet connectivity, and support for mobile device use significantly enhance the efficiency of students’ learning experiences. Especially in self-directed learning contexts, access to such technological amenities increases space usage (Lau et al. 2020).

Empirical studies increasingly reflect these theoretical perspectives by integrating design strategies that acknowledge the multifunctionality and social affordances of in-between spaces. Design interventions that soften rigid spatial boundaries – such as semi-open atriums, courtyards, terraces, and external corridors – mirror Deleuze’s notion of “folded space” and Hertzberger’s emphasis on the intersection of sensory and social experiences (Ramu, Taib, and Massoomeh 2022; Wu, Oldfield, and Heath 2020). These spaces provide flexibility and permeability, fostering both physical comfort and psychological openness.

Moreover, accessibility and integration within the campus circulation emerge as key factors shaping the use of in-between spaces. Aligned with Van Eyck’s concept of “clearly defined but transitional” spaces, accessible spatial configurations integrate in-between areas into students' daily movement and decision-making rather than being relegated to leftover or unused zones (Cunningham and Walton 2016; Eyck, 1991). Similarly, visual and physical connectivity – emphasized in studies on spatial cognition – enhances students' awareness and perception of these environments as valuable for informal learning and spontaneous social interaction.

Design elements, such as comfort, aesthetics, technological infrastructure, and functional diversity, echo Grosz's (2001) argument that in-between spaces must carry the potential for transformation and adaptability. Research shows that spaces equipped with movable furniture, group seating options, electrical outlets, and Wi-Fi are used more frequently for both individual and collaborative learning (Beckers, Van der Voordt, and Dewulf 2016; Lau et al. 2020). These design qualities support autonomy, informality, and user appropriation – characteristics that align with Gahse's (1997) idea of organically evolving spaces and Stavrides's (2018) concept of communal thresholds.

The spatial typology of in-between spaces – semi-enclosed, semi-open, and open – offers a structured lens through which the layered experiences and social possibilities embedded in these spaces can be understood (Ramu, Taib, and Massoomeh 2022). Each typology supports varying degrees of privacy, interaction, and exposure, allowing designers to respond to different student needs while creating inclusive environments.

Importantly, a user-centered design approach – grounded in qualitative student feedback and post-occupancy evaluations – reinforces Stevens's (2007) and Hertzberger's (2008) call for human-scaled, interaction-rich environments that blur the boundaries between formal and informal. The deliberate design of such spaces not only enhances learning outcomes but also nurtures spatial agency, empowering students to shape and co-author their environments. However, echoing Zizek's (2006) warning, the illusion of openness must be critically examined – design must actively resist exclusionary practices that subtly limit participation through inaccessible planning or programming.

To summarize, the design principles of in-between spaces reflect a synthesis of spatial theory and practice. When carefully planned with attention to transition, accessibility, flexibility, and multifunctionality, in-between spaces can transcend their transitional role and evolve into integrated learning environments. The design attributes identified in the literature – ranging from connectivity and adaptability to openness and privacy (see Table 5, Figure 3) – demonstrate that these spaces can be activated not only as connective tissue but also as social infrastructures that support the pluralistic and dynamic nature of contemporary campus life.

**Table 5.** Design principles of in-between spaces (created by the authors, 2025).

| Design Principle | Definition | References |
|---|---|---|
| Connection and Transition | In-between spaces should ensure natural transitions and promote campus continuity through inviting, connective pathways | Riddle and Souter (2012) |
| Flexibility and Adaptation | The adaptability of in-between spaces to user needs and diverse usage scenarios is essential | Wu et al. (2021) Peng et al. (2022) |
| Visual Parameters | Openness and transparency in in-between space design, along with natural light and indoor–outdoor continuity, enhance user experience | Wu, Oldfield, and Heath (2020) Wu et al. (2021) |
| Scale-Proportion | The scale and proportion of in-between spaces influence user engagement. Human-scaled design elements—such as seating, greenery, and shaded areas—enhance functionality and comfort | Peng et al. (2022) |
| Social Interaction | In-between spaces facilitate informal encounters, out-of-class learning, and social interaction. | Cunningham and Walton (2016) Peng et al. (2022) Wang (2020) |
| Informality | Unlike formal spaces, in-between areas typically allow flexible and spontaneous use | Chang-Tik and Goh (2023) Cunningham and Walton (2016) Ramu, Taib, and Massoomeh (2022) Peng et al. (2022) Wang (2020) Zhang et al. (2022) |
| Accessibility | Accessibility is essential for removing physical barriers and ensuring inclusivity | Cunningham and Walton (2016) |
| Comfort | Comfort is essential for the effective use of in-between spaces, encompassing both physical and psychological dimensions. | Wu et al. (2021) Peng et al. (2022) Riddle and Souter (2012) Beckers, Van der Voordt, and Dewulf (2016) |
| Aesthetics | Design richness, colour, and nature-related elements significantly influence students' space preferences | Riddle and Souter (2012) Beckers, Van der Voordt, and Dewulf (2016) |
| Functionally | The multifunctionality of in-between spaces enhances their usage | Riddle and Souter (2012) |
| Spatial hierarchy | Spatial hierarchy in in-between areas enhances user experience by supporting functional and need-based organisation | Wu et al. (2021) |
| Privacy | Privacy in in-between space design enhances functionality by meeting users' need for seclusion | Beckers, Van der Voordt, and Dewulf (2016) |

**Table 6.** The impact of in-between spaces on campuses informal learning (created by the authors, 2025).

| Categories | In-between Spaces | Impact on Informal Learning |
|---|---|---|
| Semi-enclosed areas | Corridors Entrance Lobbies Foyers | These spaces support varied groupings, fostering collaboration and strengthening social connections |
| Semi-open areas | Courtyards, Atriums, Terraces Exterior Corridors | Open and flexible spaces that accommodate both individual and group work enhance student interaction and collaboration |
| Open spaces | Student Pavilions Pergolas Square Areas Green Areas | Open spaces with natural elements promote comfort, motivation, and social interaction among students |

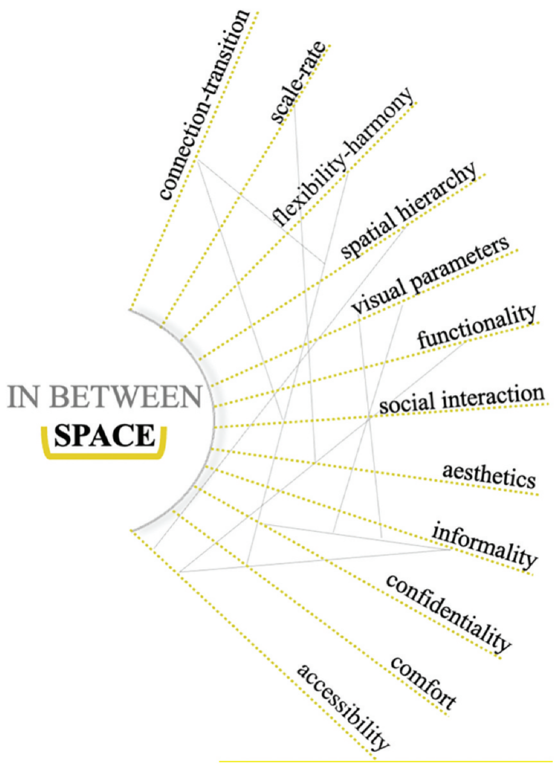


**Figure 3.** Design principles of in-between spaces (created by the authors, 2025).

### *4.3. The impact of in-between spaces on campuses' informal learning*

In the 21st century, the relationship between space and learning has been reconceptualized to account for more fluid, student-centered educational environments (Barnett 2011; Thomas 2010). Within this evolving pedagogical landscape, informal learning has gained significance as a mode of student engagement that occurs outside traditional classrooms – particularly within the interstices of campus architecture, such as corridors, courtyards, terraces, and atriums (Gehl 2011; Jamieson et al. 2000). These in-between spaces, often overlooked in conventional design paradigms, have increasingly been recognised as active environments where meaningful, self-directed, and socially embedded learning can occur (Greeno 2009; Painter et al. 2013).

Informal learning enables students to exchange information and collaborate in non-academic, relaxed environments. According to Jackson and Shenton (2010), the effectiveness of such environments relies on both physical affordances and the presence of social stimuli. Environments like libraries, semi-open spaces, and circulation areas support students' out-of-class learning activities and foster peer interaction (Cunningham and Walton 2016). Students often prefer semi-open areas, such as courtyards and terraces for informal learning due to their flexibility, openness, and capacity to accommodate both solitary and collaborative work. Spatial features, such as exposure to natural light, greenery, and comfortable seating arrangements, have been associated with increased motivation, psychological relaxation, and spontaneous social engagement (Çetinkale Demirkan 2020; Ramu, Taib, and Massoomeh 2022).

The literature on campus spatiality (e.g., Neary and Thody 2009; Radcliffe et al. 2008) identifies informal learning spaces as crucial elements within the broader "learning landscape." When designed intentionally, such spaces can promote both academic development and psychosocial well-being. Flexible, people-oriented environments allow students to remain in informal settings for longer periods, engaging both socially and academically (Peng et al. 2022). Zhang et al. (2022) classify these settings into categories, such as active-public, active-private, and quiet-private, each offering varying degrees of social interaction and privacy. This typology illustrates how spatial design affects the balance between collaboration and autonomy-two key dimensions of effective informal learning.

Moreover, integrating technological infrastructure within informal learning spaces – such as Wi-Fi availability, device charging stations, and digital displays – has enhanced their pedagogical utility. Lau et al. (2020) argue that the demand for information technologies within these zones contributes to more flexible, inclusive, and productive learning environments. Accessibility and environmental factors, such as acoustics and lighting, also play a crucial role in shaping the use of these spaces (Wang 2020).

In addition to their educational utility, in-between spaces also foster a sense of belonging and attachment to the university environment. Carvalho and Freeman (2023) suggest that these spatial conditions facilitate community building and engagement in campus life – functions that became particularly salient in the aftermath of the COVID-19. As hybrid and digital learning models continue to evolve, the role of physical in-between spaces is being re-evaluated to ensure they remain integral to students' holistic learning experience (Mačiulienė, Gulevičiūtė, and Skaržauskienė 2024; Papaioannou et al. 2023). Areas that can be defined as intermediate spaces on university campuses have been categorized and the effects of these areas on informal learning have been explained (Table 6). Such categorization provides a structured basis for understanding how different spatial configurations support diverse learning behaviors. This approach aligns with recent typological frameworks introduced by Wu et al. (2021) and Valtonen et al. (2021), which identify specific spatial qualities – such as adaptability, openness, and the presence of supportive infrastructure – that influence student engagement.

Despite their critical importance, informal learning environments are often shaped without sufficient input from students themselves. As highlighted by multiple scholars (Boddington and Boys 2011; Deed and Alterator 2017), overlooking student perspectives can result in poorly adapted spaces that hinder peer-to -peer interaction and diminish learning potential. Therefore, future research should further explore how evolving post- COVID-19 student needs – particularly regarding safety, inclusivity, and community – can inform the design and governance of informal learning spaces in campus settings.

## 5. Conclusion

Although the concept of "in-between space" holds significant relevance within architectural discourse, particularly concerning university campus environments, the literature notably lacks a clear and comprehensive definition. Although frequently referenced, existing studies rarely articulate explicit parameters and scope for this concept, leading to ambiguities and inconsistencies in spatial design practices. As a result, the potential contributions and applications of these spaces remain underutilized.

This research finds that in-between spaces primarily function as environments facilitating informal learning and social interaction, frequently categorized as "informal learning spaces" or "third spaces." These areas are recognized for enhancing student interactions and fostering learning through their inherently flexible and accessible configurations. Nevertheless, the absence of a universally accepted definition results in divergent interpretations within both academic analyses and design implementations.

Analytical results underscore the positive impact of accessibility and flexibility, particularly within semi-open spaces, on student interactions and learning outcomes. According to principles of student-centered design, intermediate spaces promoting social interaction, comfort, and technological integration significantly enhance the overall student experience. The research identifies semi-closed, semi-open, and open typologies as responsive to evolving student needs, emphasizing their roles in facilitating collaboration, interaction, and informal educational processes.

Further research should aim to clarify the conceptual boundaries of "in-between spaces" and explore their specific impact on informal learning and social interactions within university contexts. Methodologies, such as student surveys, observational studies, spatial analyses, and semi-structured interviews, are crucial for providing nuanced insights into how spatial configurations influence student behaviors and interactions. These methodologies will support more effective design strategies, thus enhancing the utility of intermediate spaces.

Furthermore, COVID-19 has amplified the necessity for thoughtfully designed in-between spaces, highlighting the advantages of flexible open and semi-open environments that enable safe social interactions amid health-related constraints. During periods of increased reliance on digital platforms, technology-compatible in-between spaces have also proven invaluable in supporting continuous learning.

Looking forward, research must consider the integration of digital and physical realms within intermediate spaces. A robust design framework capable of adapting to evolving educational paradigms and technological advancements is essential. Therefore, further studies should concentrate on establishing comprehensive guidelines for designing versatile, accessible, and digitally-integrated intermediate spaces, thus maximizing their potential as vital components of future university campuses.

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