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Mapping architectural student's perception on educational spaces: a guideline towards understanding spatial belonging.

Keywords: Spatial belonging, Architectural education, Materiality.

Abstract

Belonging within higher education institutions is a multifaceted construct encompassing personal relationships, academic content engagement, and interactions with the physical environment. Current literature indicates that while the importance of social and pedagogical factors is well-researched, there is a lack of studies specifically examining the role of architectural elements. This study addresses this gap by exploring how physical factors foster a supportive and welcoming atmosphere conducive to learning and personal development.

The research highlights the relevance of "spatial belonging" as a novel concept associated with the materiality of buildings in higher education institutions, explaining how the physicality of architectural space directly impacts students' success and learning experience. The study used collaborative cartographies displayed in the School of Architecture foyer. These cartographies, created by undergraduate students, responded to the following questions: How do you feel in the spaces of the School of Architecture? What would you add, remove, or improve within the educational spaces? Which spaces do you enjoy most at the School of Architecture? The findings show a relationship between well-designed educational spaces and students' heightened sense of belonging. Implications for educational policy and campus design are included as areas for future research, emphasizing the need for architects, educators, and policymakers to collaborate in creating spaces that meet functional academic requirements.

INTRODUCTION: The relationship between belonging, materiality and quality in Higher Education Institutions.

Higher Education Institutions (HEIs) comprise various intangible elements, such as the goals of knowledge production and educating individuals to become productive members of society. These objectives, among others, guide HEIs in fulfilling society's educational needs. HEIs are built on human aspects (like a sense of belonging) and physical and material assets (such as educational spaces). Different scholars have considered belonging as a concept that is not fixed but constantly evolving and developing (Ilcan, 2002; Kannabiran *et al.*, 2006; Mackenzie, 2004; Mee, 2009; Scheibelhofer, 2007).

Gravett and Ajjawi (2021) and Ghosh (2021) describe a sense of belonging as being associated with positive outcomes at university and an intrinsic predictor of student success. Research documents that belonging is fundamental within higher education practice (Gravett and Ajjawi, 2021), and various pedagogical models include belonging as a critical factor in student success (Kahu and Nelson, 2018; Tinto, 2017; Stone & O'Shea, 2019; Groves & O'Shea, 2019). Ahn and Davis (2020) explain the need for students to feel part of an educational community, identifying four dimensions crucial to belonging within higher education: academic (e.g., curriculum, lecturer); social (e.g., participation in communities, societies, friendships); surroundings (living space, geographical and cultural location); and personal space (life

satisfaction, attitudes, identity, and personal interests). According to various scholars, belonging is connected to both people and physical environments. Hurtado and Carter (1997), for instance, explain that connections with others involve relationships with individuals and spaces. They employed Spady's (1970) definition of "perceived social integration," which describes belonging on campus through environmental perceptions. Spady's concept of social integration is tied to psychological factors that influence students' interactions within the campus environment. This concept is based on Tinto's model of student persistence, which is related to engagement within an educational community.

Markus (1987) presents an argument for three key realms of architectural discourse, each reflecting a distinct aspect of what he terms "primary experiences of buildings": a) Function, referring to the explicit or implicit activities a building is intended to house; b) Form, encompassing geometric properties, proportions, articulation, colour, ornamentation, and surface treatments—summarized under the term "style"; and c) Space, which includes the number, location, sequence, and linkage of spaces (Markus, 1987, p. 469).

Markus' model is especially relevant for integrating environmental and behavioural research. He argues that each of these architectural elements plays a primary role in a building's experience, embodying ways to classify human action and experience (p. 109).

Belonging and space are integral to educational settings. It is essential to relate them to Sustainable Development Goal (SDG) 4, which aims to ensure inclusive, equitable, and high-quality education while promoting lifelong learning opportunities for all (United Nations, 2015). SDG 4 includes ten targets; however, this research focuses on target 4.3 (technical, vocational, tertiary, and adult education), which directly links to educational spaces. Both education and architecture should promote sustainable development.

An effective teaching and learning dynamic requires recognizing that connections with people, objects, and places where these dynamics unfold are as vital as the curriculum. Higher education is a rich cultural and scientific asset that fosters personal development and drives economic, technological, and social change. It encourages the exchange of knowledge, research, and innovation and equips students with the skills to navigate evolving labour markets (UNESCO, 2024). HEIs are increasingly under pressure to adapt and continually challenge themselves to remain relevant and competitive (Prakash, 2018). Therefore, quality is essential within HEIs and should be understood as a term that is adaptable to specific contexts and multi-dimensional (Vlasceanu *et al*., 2004). In HEIs, quality should be approached as a pursuit of excellence, transformation, and uniqueness (Harvey, 2007). According to Mok (2002) and Rosa *et al*. (2003), educational quality relates to the teaching process and stakeholders' perceptions, while administrative quality pertains to infrastructure and administrative processes. HEIs should aim to provide valuable, affordable, and high-quality education (Mazzarol *et al*., 2003).

Three key concepts regarding quality in HEIs are student engagement, service quality, and student satisfaction (Prakash, 2018). Student engagement is crucial as it reflects the learning experience within the campus environment, notably the physical setting (Mandernach, 2015). This engagement is associated with positive learning outcomes and student retention (Carini *et al*., 2006; Crisp and Cruz, 2009). Service quality relates to the administrative, physical environment, core education, support facilities, and transformative quality (Teeroovengadum *et al*., 2016). It encompasses service delivery, divided into academic and non-academic resources (Abdullah, 2006). Academic resources include teaching staff, pedagogy, curriculum,

and research resources, while non-academic resources pertain to technological infrastructure, facilities, and non-teaching staff (Grant *et al.*, 2004). Lastly, student satisfaction involves learning, curriculum, supervision, feedback, support facilities, physical infrastructure, leisure activities, and social climate (Wiers-Jenssen *et al*., 2022). To achieve quality within an HEI, two additional factors are essential: student learning, which can be fostered through dialogue and a community of learners (Carnell, 2007), and classroom innovations, which emphasize the need for a flexible physical setting and diverse learning styles.

The importance of architectural form and function in educational spaces.

On the other hand, *space* is a critical concept for architectural students in their lectures and the design studio. Due to their spatial education, these students become conscious of their surroundings and learn to perceive different environments as inhabitants and designers. By learning about dimensions, materials, textures, light, acoustics, layouts, and architectural features, architecture students become more attuned to physical characteristics (Arzate Quintanilla *et al*. 2023). This awareness fosters "spatial belonging," where these physical attributes contribute to how students feel integrated within a setting, particularly within Higher Education Institutions. Architecture students need to understand both perspectives—designing and inhabiting spaces. Consulting users during the design of new buildings is crucial, as neglecting the needs of occupants may result in a building that fails to serve its intended purpose (Gifford, 1976).

In architecture, a building's form is tied to its function, creating what is known as architectural character. According to Naubada and Zhou (2020), buildings possess individuality and identity based on this architectural character. Factors such as shape, materials, and overall character define a building's physical and visual aspects (Nelson, 1988, p. 808). Nelson proposes a three-step guide for recognizing the visual character of buildings, encouraging attention to general visual characteristics such as setting, shape, openings, and materials over specific details. Salama and MacLean (2017) note the relationship between inhabitants and buildings, who link a building's physical attributes to fulfilling human needs.

Goldberger (2012) explains that our relationship with a building typically begins with our first visual impression. Beyond its architectural elements, psychological factors also affect our interaction with buildings. What is needed is a comprehensive understanding of the materialization of all entities—both "human" and "nonhuman"—and the material-discursive practices that distinguish them (Barad, 2003, p. 810). In modern times, many buildings seem to lack distinct architectural character. However, is this a concern for HEIs? Some buildings, such as hospitals, resemble hotels, and vice versa. Likewise, houses like Villa Tugendhat by Mies Van der Rohe in Brno, Czech Republic, and Villa Savoye by Le Corbusier in Poissy, France, have become museums. However, they retain their residential character despite a transformed function. Buildings communicate with their occupants; architectural character is meaningful because it helps us understand how cities function. If the form of a building is our initial connection to it, what impact does it have when an educational building does not appear as expected? Is there an established form for educational buildings? Furthermore, are there consequences for occupants if a building's external form does not align with its internal function?

Venturi and Scott Brown explore the differences and similarities between Italian piazzas and the American strip in Las Vegas, explaining that the meaning of constructed environments communicates not through allusions to pre-existing forms but through the characteristics of the form itself (Venturi, 1978). This concept is relevant for HEIs, as many educational buildings are adapted from structures initially intended for other functions, such as the main building of the Architectural Association (AA) in London. Similar to Villa Tugendhat and Villa Savoye, which retain a housing character despite a shift in primary function, educational building design has evolved, reflecting the constant change in user needs.

This notion also relates to pedagogy, as educators must consider innovative approaches where students are viewed not as passive listeners but as active learners (Salama, 2015). This perspective supports the built environment's potential as an educational tool, influencing human actions and emotions (Salama & Maclean, 2017). The building's impact can be perceived at multiple scales, from its exterior to interior spaces. For example, Sommer (1969) notes that school furniture arrangement is key in shaping user behaviour and communication.

From an architectural perspective, it is essential to recognize that HEIs are designed by people to meet human needs and must incorporate standards regarding human dimensions. According to Neufert *et al*. (2012), architects must understand how much space a person occupies in various postures and the equipment they might use. Architects need to know the minimum practical dimensions of spaces where people regularly move, considering elements like colour, light, scale, and furniture. A building's design is critical in shaping an emotional response from its occupants (Neufert *et al*., 2012, p. 26). Monahan (2002) further explains the concept of built pedagogy—that design elements such as lecture hall layouts, furniture, lighting, and noise levels significantly affect educational outcomes.

Ellis and Goodyear (2016) distinguish between the concepts of place and space, where space is where actions occur, and place is where individuals can be (Painter et al., 2003). Turnbull (2002) elaborates on four types of spaces: discursive (social interaction), cognitive (thinking and learning), existential (self-reflection), and material (enabling activities and processes). Thus, the difference between spaces and places lies in how each supports action. A place imbued with meaning is inherently linked to its occupants. For example, a classroom with resources like books, technology, proper lighting, or adequate ventilation may be suitable for learning. Similarly, if students feel unsafe or unsupported, the classroom becomes a complex learning space (Dunk-West *et al*., 2023). Therefore, educational spaces incorporate tangible and intangible aspects impacting students' learning experiences.

Post-occupancy assessments are essential for educational buildings, as they gather feedback from HEI occupants, guiding planners and designers to align future projects with users' needs and building purposes. HEIs can benefit from post-occupancy evaluations by using past performance insights to improve future facilities, ensuring functionality and efficiency (Tookaloo and Smith, 2015). For instance, post-occupancy assessments of flexible learning spaces have positively impacted students due to the options for where and how they learn (Sigurðardottir *et al*., 2021). Connor (2024) suggests that flexible learning spaces foster a student-centred approach and encourage creativity with adaptable methods, contrasting with traditional models in some countries where didactic instruction remains prevalent (Gilbert, 2007). Flexible and open spaces support diverse learning paths, focusing on collaboration, creativity, and innovative knowledge-building (Alternator and Deed, 2013; Dovey and Fisher, 2014; Gislason, 2010).

However, Niemi and Katila (2022) note that flexible and open learning spaces can sometimes lead students to feel exposed, potentially counteracting their benefits. Dunk-West, Riggs, Vu, and Rosenberg describe how built pedagogy and learning environments in Australia allow individuals to create relationships with each other and their surroundings. Some features of built spaces can impact a sense of place positively or negatively. Open designs are often perceived as safe because they encourage social and physical interactions. Additionally, lighting plays a significant role; while natural light through windows contributes to a positive learning environment, artificial light can make spaces feel institutional rather than safe for learning. Once again, this connects to how a building's physical design and function can impact human activity and well-being. Architectural strategies for optimal design include orientation principles, wind assessment, material selection, colour, and shading (Labaki and Kowaltowski, 2018).

The role of environmental psychology and well-being within educational environments.

In the previous sections, we engaged with themes of belonging, space, and quality definitions in higher education institutions. Beyond the material aspects, the transformation of these functions relates to human perceptions. In this section, we will explore concepts of environmental psychology and well-being as part of the interactions between architectural and psychological elements. Environmental psychology studies these interactions between individuals and their physical spaces. This field operates at three levels of analysis. The first level addresses fundamental psychological processes, such as environmental perception and its relationship to human behaviour. The second level examines social space, considering privacy, crowding, and the complexity of spaces for daily activities. The final level explores human interactions with the natural environment and psychology's role in climate change (Gifford, 2008). This branch of psychology has identified ways to enhance the quality of teaching and learning. For example, personalizing educational spaces with objects that evoke a sense of home has positively impacted learning (Wollin and Montagne, 1981).

How we perceive space is essential; these perceptions are closely tied to our emotions. Moors *et al.* (2013) explain that contemporary appraisal theories describe emotions as adaptive responses linked to our environment and well-being. Kraut (2009) defines well-being as a person's awareness of their cognitive, physical, and social capabilities. Three types of well-being—physical, social, and psychological—are critical to student success (Franz, 2019). Physical well-being influences performance, with factors such as sleep (Scullin, 2019; Curcio *et al.*, 2006), hydration (Pawson *et al.*, 2012), exercise (Raspberry *et al.*, 2011), and diet (Florence, 2008) directly affecting how well students perform. Physical rest also positively impacts learning and problem-solving (Buch *et al.*, 2021).

Regarding social well-being, studies show that isolation and loneliness decrease students' concentration (Cacciopo *et al.*, 2008). Thus, social interaction is essential for academic performance. Psychological well-being is also crucial, as high levels of negative emotional arousal can hinder concentration and problem-solving (Hughes et al., 2018). Postareff (2017) further explains that well-being and learning are interconnected, with engagement levels impacting well-being. Hughes (2021) highlights a transactional relationship between learning and well-being, each influencing the other. From a psychological perspective, personal experience is also closely tied to well-being; people experience the world

from a neuro-cognitive standpoint, which is essential for defining spaces that foster ideal learning conditions (Blaszak, 2019).

Belonging, well-being, and engagement are thus closely linked to students' success and experiences in higher education institutions, with these factors also connected to spatial characteristics. A sense of belonging is influenced by sensory perceptions of our surroundings (Ahn & Davis, 2020), establishing a relationship between space and belonging. Hughes (2021) notes that university students can thrive in spaces where they feel safe and connected to others, emphasizing the importance of a secure learning environment. This aligns with Feldman's (2007) concept of emotional experiences as physical processes shaped by external events. Feldman (2007) argues that psychological events are primarily rooted in neurobiological processes, underscoring the relevance of understanding emotions scientifically and how they relate to our immediate surroundings. Franz (2019) elaborates on the association between spatiality and well-being by advocating for flexible learning spaces that promote autonomy, comfort, and collaboration (Kariippanon *et al*., 2017). This aligns with Bandura's (1992) perspective on learning as highly influenced by social aspects of human behaviour.

Our physical and mental well-being is also closely tied to our relationship with natural environments (Kellert *et al*., 2011). Ulrich's (1984) studies show that nature positively impacts the human body, comparing patients' healing processes when observing a concrete wall or a green space. Additionally, research by Li and Sullivan indicates that high school students concentrate better in classrooms with views of green spaces, showing a 13% improvement in attention compared to those in windowless rooms. Modrzewski and Szkolut (2014) further explore human development's connection to nature, examining qualities such as light, sound, smell, wind, and other physical factors. Blaszak (2019) emphasizes that understanding space requires an awareness of bodily emotions managed by the insular cortex's frontal region, highlighting differences in human perceptions of indoor and outdoor spaces.

Methods

Ethical approval was obtained from the School of Psychology Research Ethics committee (PSCETHS-1163). The research was conducted as a case study during the week of the annual student showcase at the School of Architecture on UNAM's Central Campus. This showcase adopts a different theme each year, and the 36th edition focused on "Other School" ("Otra Escuela"). The event is an exhibition where the School of Architecture opens its doors to host the four disciplines—Architecture, Industrial Design, Urbanism, and Landscape Architecture—inviting them to explore ideas and issues relevant to the institution. The showcase lasts a whole week, during which the usual dynamics of the design studio and independent study are altered, allowing everyone to visit various studios within the school to observe and engage with their classmates' work across different semesters. This year's showcase aimed to raise questions central to this research, such as: Is this the ideal way for a school of architecture to function? Why are these pedagogical approaches chosen over others? Could a school of architecture be re-imagined pedagogically or spatially?

Image 1. Main entrance of the School of Architecture at UNAM's Central Campus, the Yazpik Sculpture and the Arts and Sciences Museum. The School of Architecture is located in UNAM's Central Campus listed as heritage by UNESCO. Source: Authors own work.

To address these questions, the event organizers—a group comprising primarily students—organized the showcase around three main themes: (1) "Open Classrooms," where students and faculty participated in activities related to the four disciplines, (2) an "Open Exhibition," where students selected work to present to the community as an opportunity to connect with others and share perspectives in a horizontal, inclusive manner, and (3) a "Permanent Exhibition," designed to foster community reflection on questions like Who are we (the people of the school)? Where are we (the spaces we inhabit)? What do we do (the process of becoming an architect)? This year, the showcase included collaborative cartographies, where participants explored spatial possibilities for a re-imagined school of architecture based on individual and collective needs. Consequently, the fieldwork began

when participants deviated from typical design studio practices to navigate spaces more freely and were encouraged to view the environment from different perspectives. The atmosphere of the showcase likely boosted student participation. However, it may also have influenced the emotional responses recorded in the cartographies—a potential bias worth noting, given that this research employs a single case-study methodology.

To conduct this study, we documented 32 cartographies displayed in the School's Architecture Foyer. Undergraduate students contributed to these cartographies, organized by two showcase committee members: an architect coordinating the event and an urbanist experienced in cartographic practices, who invited the researcher to join the team. Cartography as a medium is valuable here because it bridges storytelling and mapping, emphasizing the role of spatial concepts in social sciences and arts (Cosgrove, 1999; Sui, 2010; Warf and Arias, 2009). This aligns with the idea of maps that tell a story according to MacFarlane (2007), which link human experiences to particular places, representing them as spatial expressions. Caquard (2011) suggests that mapping can express emotions and a sense of place. Nold (2009) argues that adding emotions to a map can be a political act, asserting control over the spaces people inhabit. To encourage students participation in this spatial and artistic process, we posed three questions:

1. How do you feel in the spaces of the School of Architecture?

2. What would you add, remove, or improve in the space?

3. Which spaces do you enjoy the most at the School of Architecture?

Image 2: Foyer of the School of Architecture with the displayed cartographies where students could walk around and write or draw to respond the different enquiries. Source: Authors own work.

These questions were designed to address the central inquiry of this research: Do the material characteristics of space influence students' sense of belonging in a higher education institution? Using a deductive approach, the research aims to understand how materiality shapes a sense of belonging. To analyze this, Ahn and Davis's (2020) concept of belonging was employed, categorizing responses into academic, social, and surrounding domains. The domain of personal space was adjusted to include "security," given students' frequent mention of safety concerns, which are especially relevant in this particular setting. This adaptation extends the existing literature by tailoring categories to this specific location.

Two key factors underpin this research: first, a sense of belonging is widely recognized as a fundamental human need; second, space itself is crucial in shaping this sense of belonging within educational environments, particularly in a school of architecture. The researchers

positionality prioritizes human and spatial aspects equally, avoiding hierarchical distinctions. This approach evolved as the research progressed, based on observations of human and non-human interactions. The primary goal is to determine whether physical spaces foster a sense of belonging among undergraduate students. Student responses were collected in Spanish and analyzed in the same language to develop codes and themes translated into English. The analysis categorized responses into space, gender, finances, academics, health, furniture, recreation, classism, emotions, and services.

The connection between the tangible and the intangible: architectural space and emotions

The initial findings detail students' responses regarding both negative and positive emotions and various design requirements, such as furniture and different spaces, to meet a wide range of needs. Items like inclusion, qualified staff, and more affordable food options were highlighted as important. These responses contributed to a checklist that administrators, stakeholders, and the community can use to create suitable learning spaces that foster a sense of belonging.

The first question, *"How do you feel in the spaces of the School of Architecture?"*, yielded responses that were sorted into positive and negative emotions as shown in Table 1. Some emotions, such as "cold" or "warm," were categorized based on individual perception, as these may differ for everyone. The responses are organized by level of importance:

Positive Emotions	**# Responses**	**Negative Emotions**	**#Responses**
Happy	*13*	*Depressed*	*12*
Good	*5*	*Tired*	*9*
Fulfilled	*3*	*Anxious*	*8*
Enjoyment	*2*	*Stressed*	*6*
Love	*2*	*Unmotivated*	*5*
Inspired	*2*	*Fear*	*4*
Welcome	*1*	*Uncomfortable*	*4*
Free	*1*	*Oppressed*	*3*
In company	*1*	*Pain*	*3*
Humble	*1*	*Unwanted*	*3*
Focus	*1*	*Segregated*	*3*
Calm	*1*	*Hunger*	*2*
		Exhausted	*2*
		Lonely	*2*
		Hate	*2*
		Overwhelmed	*2*
		Isolated	*2*
		Bad	*1*
		Ignored	*1*
		Behind	*1*
		Lost	*1*
		Cold	*1*
		Warm	*1*
		Unsafe	*1*
		Nostalgic	*1*

	Observed	*1*
	Frustrated	*1*

Table 1: Responding to the question: *How do you feel in the spaces of the School of Architecture?"* a categorization of the emotions was made into positive and negative. Source: Authors own work.

According to the findings, there is a connection between the academic domain and the relationship between students' well-being and learning, closely tied to the emotions students experience in school. The maps predominantly show negative responses, with students expressing feelings of depression, fatigue, anxiety, and stress—emotions mentioned most frequently. However, it is essential to consider that these responses were collected near the end of the semester when the showcase event occurs to display the year's work. Given the timing, students are understandably exhausted, which can lead to negative emotions.

Additionally, these findings connect to pedagogical approaches. As illustrated in the table, students experience emotions such as oppression, lack of motivation, feeling unwanted, and frustration. While the cartographies primarily focus on students, their emotional responses are linked to their lectures or design studio experiences. Notably, if students report negative experiences, they may be influenced by their instructors' stresses and challenges in closing the semester. Despite these negative responses, there is a positive aspect: Students also report happiness, fulfilment, and enjoyment within educational settings. Although students express concerns about current pedagogical approaches, they still experience a sense of fulfilment in their learning.

The second question—*What would you add, remove, or improve in educational spaces?* —relates to the surrounding, social, and academic domains for the following reasons:

1. Surroundings: Students emphasize the importance of material and tangible aspects in their environment. Many desire redesigned or updated furniture that is aligned with the specific activities they undertake as architecture students as shown in Table 2. For example, students want different types of furniture suited to tasks such as attending lectures, drawing plans, or creating models, as well as for activities they would like to see more of, like social engagement and relaxation as shown in Table 4. For instance, while closed spaces are currently designated for work and open spaces for rest, modifying these spaces with suitable furniture could transform closed areas into spaces for relaxation or open areas into focused workspaces.

2. Maintenance: Another frequently mentioned aspect was the cleaning and upkeep of facilities as shown in Table 3. While not directly related to design, the cleanliness and maintenance of physical spaces significantly impact students' experiences.

The following charts demonstrate these findings.

Furniture	***# Responses***
New benches	14
Couches	11
Hammocks	5
Swings	9
Beds	9
New Furniture	6
Big working tables	3
Lockers	3
Mirrors	1
Exterior Furniture	1

Mats	1

Table 2: Responding to the question: What would you add, remove, or improve in educational spaces? The suggested furniture needed by the students was written. Source: Authors own work.

Spatial Needs closed spaces	***# Responses***
Cleaning and Maintenance	56
Spaces to Rest	15
Spaces for Social Interaction	12
Neutral Toilet	7
Accessibility	6
Spaces for Study	5
Student Lounges	3
Spaces to Sleep	3
Accommodation	3
Toilets cleanliness	2
Inclusive Spaces	2
Toilet paper	1
Mats	1

Table 3: Responding to the question: What would you add, remove, or improve in educational spaces? The suggested spaces needed by the students were written. Source: Authors own work.

Spatial Needs open spaces	***# Responses***
Add trees and plants	2
Removing Parking lots	1
Outdoor rest spaces	1
Spaces for bicycles	1
Outdoor working spaces	1

Table 4: Responding to the question: What would you add, remove, or improve in educational spaces? The suggested modifications were classified. Source: Authors own work.

3. Social Domain: focusing on factors such as whiteness, minorities, and socio-economic class as shown in Table 5. While these factors may not be architectural features per se, they are essential for understanding students' sense of belonging. Although some of these elements are not directly related to physical space, they pertain to specific settings and the

absence of actions aimed at fostering an inclusive student environment. It is worth noting that while these social experiences are intangible, students' perceptions and experiences often become associated with particular spaces and places. Due to the number of participants, responses are presented in a single table:

	Categories	***# Responses***
	Classism	3
	Inclusion	1
	Stop Transphobia	4
	Equality	1
	Lower prices	1
	Increase Scholarships	1
	Increase budget	1

Table 5: Responding to the question: What would you add, remove, or improve in educational spaces? The suggested conditions for the spaces regarding the social domain were suggested by students. Source: Authors own work.

4. Academic Domain: This is closely connected to the second question, highlighting the need for increased attention from lecturers and administrators regarding the content taught in lecture halls and design studios as shown in Table 6. The findings underscore students' desire for high-quality lectures and educational services that qualified faculty members provide. Additionally, this domain is closely related to students' teaching and learning experiences. One item in the table touches on students' well-being, with some expressing that to perform well academically, they require better food options at school that align with their financial means. The following chart illustrates these results:

	Categories	***# Responses***
	Qualified Faculty Members	2
	Fieldworks	2
	Internal Competitions	1
	Quality in Lectures	1
	Quality in School Services	1
	Different options for students to eat at school	20

Table 6: Responding to the question: What would you add, remove, or improve in educational spaces? The suggested conditions regarding the academic domain were suggested by students. Source: Authors own work.

5. **Surroundings Domain:** this examines students' experiences and perceptions of indoor and outdoor spaces as shown in Table 7. The responses below highlight open or enclosed spaces where students experience positive emotions and enjoyment. The most frequently mentioned space was the design studio, the core learning environment for architecture students, where they spend most of their time.

Categories	*# Responses*
Design Studios	10
Cafeteria	4
Arts and Sciences Museum	3
Foyer	2
Student Lounge	1
The islands	7
Pines Patio	5
The bones courtyard	3
Sport Facilities	1
Main library esplanade	1
The Pines Patio corridor	1
The geodesic esplanade	1

Table 7: Responding to the question: Which spaces do you enjoy the most at the School of Architecture? This were the open and closed spaces mentioned by students. Source: Authors own work.

The impact of Architectural Space in learning environments

It has been established that insufficient information is associated with the perception of a sense of belonging in relation to architectural features and their importance within buildings in higher education institutions. This study was developed using the conceptual framework of belonging by Ahn and Davis (2020), which includes Academic, Surroundings, Social, and Personal Space. This perspective on belonging was translated into three areas of inquiry that explored these domains by asking students about their emotional experiences on campus, their

appreciation of educational spaces within the School of Architecture, and the places and spaces that evoke positive emotions.

Q1: How do you feel in the spaces of the School of Architecture?

As discussed in the literature, there is a distinction between place and space (Ellis & Goodyear, 2016), where a space invites action, and a place directs one toward a state of being (Painter et al., 2003). The School of Architecture is a physical environment that encourages action; for instance, its architectural features, such as the design studio, include large tables that facilitate students drawing architectural plans by hand, as well as natural lighting (from windows), which enables students to create drawings and 3D models under high-quality illumination. However, a school of architecture can also promote a sense of being and personal growth, as part of the student experience involves learning about both architecture and oneself. Thus, inquiries about feelings in particular spaces help students recognize how physical spaces contribute to their emotional states.

Additionally, as Turnbull (2002) describes, different types of spaces foster specific actions or emotions, such as discursive (social), cognitive (learning), existential (being), and material (where processes occur) spaces. The School of Architecture encompasses these four types of spaces, and the emotions mapped to these spaces may align with each of these categories as shown in Table 8. This also relates to learning environments, perceptions of safety, and feelings of freedom and support, as these emotions contribute to comfort during the learning process (Dunk West et al., 2003). The emotions may belong to a single category or multiple categories simultaneously. For instance, we could categorize the 39 emotions identified in the maps into these four types of spaces as follows:

Discursive Space (social)	**Cognitive Space (learning)**	**Existential (being)**	**Material (where processes occur)**
welcome	focus	happy	pain
In company	overwhelmed	good	hunger
anxious	behind	fulfilled	hate
oppressed	observed	enjoyment	cold
unwanted	frustrated	inspired	warm
segregated		free	
isolated		humble	
ignored		calm	
nostalgic		depressed	
		tired	
		anxious	
		unmotivated	
		fear	
		uncomfortable	
		oppressed	
		exhausted	
		lonely	
		bad	
		lost	

unsafe

Table 8: The distributions of student's emotions according to different typologies of spaces: Discursive, Cognitive, Existential Material. Source: Authors own work.

Referring to existing literature, we can explore a new approach to categorizing emotions within spaces or places, suggesting that emotions may vary in meaning or perception according to the type of space we inhabit. In this case, focusing on existential space, where most emotions were categorized, shifts the perspective toward recognizing these spaces as holding predominantly negative emotions.

Q2: What would you add, remove, or improve in the space?
Various factors within a HEI contribute to institutional quality; these aspects may relate to both educational and administrative resources connected with each of the three inquiries individually. Vlasceanu et al. (2004) describe HEIs as multidimensional, a perspective aligned with the data from the maps, which reveal insights beyond mere architectural space. The results describe both negative and positive emotions, tangible aspects like design and furniture, building cleanliness, social class, minority representation, lecture quality, dietary resources, and differing perceptions of open versus closed spaces.

When we asked students, *What would you add, remove, or improve in the space?*, this question sought to capture students' perspectives on quality. While Prakash (2018) notes three concepts related to quality in HEIs, including student engagement—linked to the campus environment and physical setting (Mandernach, 2015)—the maps reveal a "bigger picture" of what constitutes a quality physical environment. Students expressed needs for specific types of furniture, like benches, couches, swings, and beds, to better meet their needs. These suggestions align with emotions documented on the maps; for example, students who feel exhausted requested beds, couches, or hammocks. Students experiencing anxiety and stress expressed a need for playful elements, like swings, while those reporting discomfort expressed a need for comfortable furniture and new benches.

Furthermore, cleanliness and maintenance ranked highest on students' concerns, indicating a need for greater cleanliness within their institution. This significantly impacts their perception of educational spaces, linking to emotions such as a lack of motivation, which, as Carini et al. (2006) and Crisp & Cruz (2009) suggest, can affect learning, retention, and a sense of belonging. This concern also relates to Neufert's (2012) work on understanding elements like dimensions, color, light, scale, and furniture in shaping environments. Additionally, students described varying needs between closed and open spaces; in closed spaces, they emphasized the need for rest areas due to sleep deprivation and the importance of spaces for social interaction. In open spaces, they expressed a need for more greenery, which, according to the literature, can help alleviate stress, reduce anxiety, and increase productivity.

The literature also identifies service quality as a core component of HEI quality, encompassing both the physical environment and administrative quality (Teeroovengadum et al., 2016), as well as academic and non-academic resources (Abdullah, 2006) and aspects such as pedagogy and curriculum (Grant et al., 2004). This connects with students' demands for qualified faculty,

high-quality lectures, and efficient school services. Additionally, students voiced the need for physical improvements, such as reducing car parking areas and creating bicycle parking and outdoor workspaces. Finally, student satisfaction, which encompasses elements like curriculum, infrastructure, and spaces for leisure (Wiers-Jenssen et al., 2022), aligns with student requests for hammocks, beds, swings, social interaction areas, student lounges, rest spaces, and outdoor workspaces.

Q3: Which spaces do you enjoy most at the School of Architecture?

Students' relationships with space are rooted in environmental psychology, which considers the interaction between individuals and different physical environments (Gifford, 2011). Both closed and open spaces emerged from the maps as significant to students. Closed spaces, such as design studios, the cafeteria, arts and sciences museum, foyer, and student lounge, support various activities that can be classified as beneficial for physical and social well-being (Hughes, 2022), including dining and leisure. Open spaces, including the islands, Pines patio, Bones courtyard, sports facilities, library esplanade, Pines patio corridor, and geodesic esplanade, are associated with psychological well-being.

Conclusion

The design of educational spaces is associated with disciplines such as architecture and psychology, which are equally important, as each addresses multiple aspects and needs of the human condition. HEIs are shaped by various human factors—such as students, staff, and the community—and material, including closed, open, and transitional spaces that collectively create social and physical environments suited to diverse activities. These activities are imbued with emotions linked to these tangible and intangible factors. Therefore, the architecture of higher education institutions should adhere to specific guidelines that foster spaces that promote well-being and a sense of belonging, which are essential to achieving student success.

Firstly, modifying a School of Architecture's spatial design can be costly, and budgets are often limited to essential improvements. However, not all changes require significant expense or present complex challenges. For example, the need for improved cleaning and maintenance was highlighted in the mapping process, suggesting a need for enhanced oversight of facilities. This responsibility should also be partially shared with students, fostering a sense of accountability for maintaining their workspaces.

The second factor involves open spaces, which are designated for relaxation. A practical enhancement could include furnishing open areas with adaptable furniture, allowing students to work outdoors. This shift could create a healthier work environment, as indoor spaces may not always suffice or benefit everyone.

Third, while closed spaces are often designated for work, challenging the binary notion that closed spaces equate to work and open spaces to rest could expand work and relaxation areas. This flexibility might stimulate creativity, as students would not be confined to traditional workspaces. Architecture students face particularly demanding workloads, and access to more rest spaces within their school could reduce negative emotions such as depression, anxiety, isolation, and frustration, supporting their well-being through spatial fulfilment.

Students have also requested spaces for social interaction, which could alleviate feelings of exclusion, loneliness, and isolation. Inclusive social spaces could address issues such as classism and transphobia, both of which have surfaced in the mapping exercises. Such needs also intersect with spatial factors like neutral toilets and accessibility, which remove physical barriers and promote a welcoming educational environment.

The fourth key factor from the cartographies was the need for spaces supporting mental health and well-being. Although providing individualized psychological support to all students is challenging, the curriculum should allocate time and space to discuss stress and anxiety. Adjusting work environments may benefit some students but not all; thus, initiatives like stress-management workshops, supported by the School of Psychology, could be valuable. Finally, creating leisure spaces, such as areas for board games, would offer students the chance to feel at ease and "at home" within the school environment.

Understanding the student population's needs is essential rather than assuming them. Therefore, maintaining open communication with students is the first step in enhancing educational spaces and fostering a sense of belonging. The cartographies exercise, which provided students a platform to voice their perspectives, has revealed more negative emotions within the School of Architecture's spaces. However, this could change if the administration implemented similar simple, engaging activities.

While the cartographies exercise may have limitations—such as its showcase format, which could influence participation, and the end-of-semester timing, when fatigue may increase negative emotions—the methods and questions used could be adapted to other contexts. Spatial belonging may vary across schools with different pedagogical approaches, but continuous engagement with the student population remains crucial for all HEIs.

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