ARTICLE



New student residence unit typologies: introducing Housing Unit Classification (HUC), a framework for understanding student socialization

Shelagh McCartney^{1,2} · Ximena Rosenvasser^{2,3}

Received: 4 August 2020 / Accepted: 8 April 2022 © The Author(s), under exclusive licence to Springer Nature B.V. 2022

Abstract

Increasing privacy demands have led to the design and construction of new and diverse universities student residences across Northern America, that prioritize private spaces for students. This paper proposes the Housing Unit Classification (HUC) using historical professional standards (ACUHO-I) to generate a nuanced unit typology of student housing. The refined typology permits engagement with additional variables of agent control, including density of usage (i.e., density) and governance (i.e., territoriality), in addition to unit facilities (i.e., bathroom, kitchen, lounge). The HUC is complemented by the analytical tool Hierarchy of Isolation and Privacy in Architecture Tool (HIPAT), together classifying levels of privacy in built space through a visual matrix. HUC allows spatial analysis of how agents acting on built space can create different feelings associated with privacy, crowding, isolation, and socialization in university housing and enables further multidisciplinary study of housing challenges using common terminology and systematic methods.

Keywords Privacy \cdot Student housing \cdot Student development \cdot Socialization \cdot Student wellbeing \cdot Agent control \cdot Crowding \cdot Architecture \cdot HIPAT \cdot HUC

1 Introduction

In the last two decades, both the demand for—and subsequent growth of—the number of new student residences have increased dramatically (Brown et al., 2019; La Roche et al., 2010). In the USA and Canada, the student housing investment sector is attracting increasing institutional capital and the market for student housing has continually thrived (Anderson, 2018). Increased demand from students for more privacy within their living space in

Ximena Rosenvasser xrosenvasser@gmail.com

Shelagh McCartney Shelagh.mccartney@ryerson.ca

¹ School of Urban and Regional Planning, Toronto Metropolitan University, Toronto, Canada

² Together Design Lab, Toronto Metropolitan University, Toronto, Canada

³ Facultad de Arquitectura y Urbanismo, Universidad de Buenos Aires, Buenos Aires, Argentina

university housing (Devlin et al., 2008) has led to new design strategies and building programming, and universities have moved away from traditional and apartment unit types to unit types and models with spaces of increased privacy per student. As such, these new unit living types have living spaces and facilities—which, traditionally, were shared between many students—have been reduced from being shared by an entire residence floor to being shared between either a small group or just two people—or not shared at all, and completely private. This phenomenon of increasing the amount of privacy is demonstrated by the strong preferences among students—and thus, university administrators—for amenities like bigger beds, private kitchens, and private laundry facilities in newly built student university residences (La Roche et al., 2010). As this demand for increased privacy for students has risen, researchers have begun to understand the repercussions of these new paradigms of student housing unit typologies on the students themselves, as such current unit types classifications available in student housing literature fall short to address these issues.

There is demand for increased privacy although conversely, socializing architecture in student university residences is positively associated with higher levels of engagement, retention, degree attainment, and grade point average (GPA), as well as having many additional positive benefits for individuals—ones that have historically been accredited to positive aspects of on-campus living (Bronkema & Bowman, 2017; Brown et al., 2019; Terenzini & Pascarella, 1984). Furthermore, although the literature does focus on discussions around socialization, the types of units discussed were not defined by amounts of people using the units and governance over the space by these students (agents) and subsequent socialization. These studies examined the opposite ends of the privacy spectrum—private apartment types versus common traditional unit types, this dichotomy remains in most of the literature today (Bronkema & Bowman, 2017; Devlin et al., 2008; Valins & Baum, 1973). We are raising the question: How can university administrators, architects, and researchers address student well-being and academic success by designing housing units that encourage socialization? How can spatial analysis tools that embed and visualize levels of agent control, be used to expand professional standards of student housing living unit typologies to include socialization?

At one point, the living unit definitions, or typologies were expanded for construction and renovation survey purposes: to address the new construction types, and subsequent costs, not to expand the fields of student development or student preferences. The typology of student housing units used broadly by the Association of College and University Housing Officers-International (ACUHO-I), and the literature was first established by Thomas in 1975, then expanded on by Balogh, Grimm & Hardy in 2005 and last revised by Balogh, Price, Day and Moser in 2010. These living unit typologies (Balogh et al., 2005) were established for the ACUHO-I construction and renovation data survey to document the facilities to be constructed in each unit. The expanded definitions did not quantify elements of how agents (students) control the built environment (1) density of usage of these facilities by amounts of students; and (2) the level of control or governance (territoriality) by agents over space. However, the living unit typologies have been used by researchers in fields beyond construction and renovation that study the impact of types of living units on student well-being. The lack of inclusion of agent control and thus socialization in these definitions are limiting the expansion of understanding of the living units as they relate to student development. Authors in these literatures have recognized that there is a need to include more specific spatial analysis, seeking to explain patterns of human behavior by examining configurations defined by use and position of space within the whole, and to study its link to agent-control classification when discussing the relationship between university residence types and student success, satisfaction and well-being. In order to advance the work on student preferences, student development and the architecture of student housing the current typologies need to expand to encompass the variables discussed in these literatures while also seamlessly relating to the existing ACUHO-I construction and renovation data survey data.

The student housing industry is expanding and continually developing new units, and the research and understanding do not reflect the diversity of units being built. To address this need for expansion of the existing student housing living unit typologies, we are introducing the Housing Unit Classification (HUC) as the new taxonomy of university student housing living units providing a framework to advance industry and academic research. This new typology uses historical developments in professional standards (ACUHO-I) to generate a nuanced unit typology of university residence halls. The HUC is complemented by the analytical tool Hierarchy of Isolation and Privacy in Architecture Tool (HIPAT)) (McCartney & Rosenvasser, 2022) that classifies levels of privacy in built space through a visual matrix. The HUC defines the living units taxonomy beyond facilities provided in each unit to include levels of governance within each of these types, using a theoretical framework of agents and hierarchical models of control. The HUC typology permits an engagement with additional variables of agent control within multiple dimensions of interest, including, usage (i.e., density) and governance (i.e., territoriality), in addition to unit facilities (i.e., bathroom, kitchen, lounge. The combination of all three elements permits the authors to generate a visual matrix of the various dimensions. This presents researchers with a framework of spatial analysis and classification to not only link qualitative and quantitative data of student housing to the architecture being built, but to systematically analyze and visualize socialization in university housing. Enabling them to better understand students' well-being, optimizing built environment conditions that foster their academic success.

2 Literature review

In the 1970s, numerous studies addressed the way privacy, socialization and overall student achievement were impacted by student university housing (Devlin et al., 2008). These discussions centered on the architecture of student housing as an object, particularly the preferences students had regarding aspects of a shared environment, including environmental mechanisms and how they increased social interaction (Vinsel et al., 1980); the influence of suite typologies (Corbett, 1973); levels of student attrition based on the amount of shared environment (Terenzini & Pascarella, 1984); and dormitory architecture's ability to foster relationships (Case, 1981; Heilweil, 1973) or create feelings of crowding (Valins & Baum, 1973).

However, most of these studies were completed over 40 years ago and focused on the dichotomy between the suite (or apartment) and traditional unit types (Baum et al., 1975; Bronkema & Bowman, 2017; Devlin et al., 2008; Valins & Baum, 1973) and the relationship between building type and metrics like first-year completion, degree completion, or likelihood to graduate, as well as student satisfaction using an analysis of social interaction. Recent investigations using an analysis of social interaction within the built environment of residence halls have identified how socialization of a diverse student body, differentiated by: personality type, e.g., level of extraversion (Rodger & Johnson, 2005), education level (Cheng, 2004), demographic group, e.g., age (Bowman, 2010), gender, ethno-cultural group (Shook et al., 2016), and socioeconomic status (Moore et al., 2019), impacts student

Fig. 1 Typical Floor plans of: traditional single and double units, located along a typical barrack style corridor (top left), suite units of various sizes, located along a corridor (left) and apartment units of various sizes, located along a corridor (right). *Source*: Authors

success and well-being. The living environments of students have different types of social interactions embodied within their spatial layouts and the literature includes this—but not necessarily an analysis of the spaces and units themselves. In many instances, studies are limited by the dichotomy of traditional rooms and suites or apartments and do not reflect the diversity of social interactions with living units available today.

2.1 Taxonomic classification in housing

To allow for analysis of spaces and units, the analysis of typologies or types is required. Architectural typology is the taxonomic classification of the physical characteristics commonly found in buildings and urban places. Formal building typologies or types may be based on configuration, format, or the relationships between building elements and the people who inhabit them. The literature of student preferences and student development typically focuses on three types: traditional, suite and apartment (Fig. 1).

Traditional room types are typically defined as single- or double-accommodation, with rooms situated on both sides of a long central corridor; in this configuration, all hygiene, cooking and gathering facilities are shared communally among those living on the same corridor. Suite types are defined as a group of private or semi-private rooms that have hygiene facilities and shared space used for socialization or study offered within the unit and are situated on both sides of a central corridor or space. Apartment types, meanwhile, are defined as single or double rooms of an individual or small group that have all hygiene and cooking facilities offered within the unit; they, too, are situated on both sides of a central corridor or space. In addition, in the apartment- and suite-type buildings, there is typically a small gathering space within the unit, and a larger gathering space shared communally for all building residents. Importantly, in the literature, these unit types are defined from a facilities construction and management perspective, rather than by the number of students in each unit, which affects crowding, community and privacy.

2.2 The need for privacy

Architecture constitutes an intrinsic part of how we interact with the world and with each other. Personal growth, individual development, discovering who we are and how we connect with others—these are essential parts of life. This is particularly important for students attending university. "Personal autonomy deals with the central core of the self and the importance of issues of self-worth, self-independence, and self-identity" (Altman, 1975). Achieving balanced privacy—or failing to do so—can teach students lessons about themselves and how best to interact with others. Privacy allows for independence, self-esteem and identity displays; control over the built environment creates a context for emotional release, which "permits people to relax from social roles" and do things they normally wouldn't do in public. Privacy creates mental space to plan future actions and also connect with others in a safe environment. Given the various roles that it plays, privacy affects



APARTMENT RESIDENCE

students' well-being and growth in important ways—and hence should be a significant part of the design decisions in student residences.

Social interaction and balanced privacy are key elements of students' wellness, particularly for students who move from home to university for their first-year studies. Since architectural design frames and facilitates student socialization in university housing, the building of more privatized units reduces the interactions, or passive encounters (Case, 1981), each student will have with other students—for instance, when they leave their units to access the common hygiene and eating facilities. This reduction of interactions thus diminishes passive socialization between students, which can create feelings of isolation and negatively affect student success and well-being.

2.3 Crowding and socialization

Social interactions are important for students' success and well-being although excessive social stimulation can leave students feeling crowded. Residential crowding has multiple dimensions and causes. Since the 2000s, measures of crowding in the USA and Canada have expanded from the person-per-room definition, where a house was deemed not crowded if it had less than one person per room (Canada, 1949, p. xxxiii), although in university student housing literature, crowding is considered through the lens of the number of interactions a student has (Baum et al., 1975; Evans et al., 1996). The literature outlines that crowding is a concern: with too many residents to interact with, many students would consider the dorms or traditional rooms to be crowded (Valins & Baum, 1973). When students feel crowded the negative impacts are stress (crowding, discomfort) and social withdrawal (distancing) (Valins & Baum, 1973). Students reach the amount of privacy desired by balancing between feeling isolated (due to excessive privacy) and feeling crowded (due to insufficient privacy) (Altman, 1975).

While crowding ought to be mitigated, increasing privacy should not result in isolation. Use of positive-socializing forms of architecture in student university housing can increase students' well-being and academic performance—for example, common activities can foster new relationships through interactions in secondary territories, like dining spaces: "Common dining does provide an informal and shared activity, in which new friends may be made, or old friendships continued" (Heilweil, 1973, p. 383).

Architectural design alone cannot determine that friendship and socialization will be guaranteed to occur. Rather, it provides instances for social interaction to occur passively through different types of physical barriers (Altman & Chemers, 1993) that divide spaces into those with more and less privacy. Enclosed spaces are designed to strengthen in-group formation, whereas open spaces are designed to encourage association and socializing (Al-Homoud & Abu-Obeid, 2003). In a college or university context, these spaces influence numerous important determinants of social life and learning (Sotomayor et al., 2022), and architectural design can either encourage socialization or isolation, engagement or estrangement, among university students (Gieryn, 2000, 2002).

The crowding literature focuses on traditional and apartment residences creating an apartment/traditional dichotomy that examines them as opposite ends of the privacy spectrum and not addressing the nuances of crowding, isolation and socialization in unit types that are central on the spectrum. To address the issue of crowding in traditional residences in the literature, the building of apartments is presented as a solution to achieve balanced privacy (Baum et al, 1975; Evans et al., 1996); however, not all apartments have the same level of socialization, as the number of bedrooms differs. The literature is not specific in

discussing the different apartment types and focuses on multiple occupancy apartments with shared hygiene and cooking and dining facilities. Unfortunately, the taxonomic classification of units in the literature is insufficient to measure how governance impacts crowding and socialization in the university residence context, leaving a gap when addressing these concerns in relation to university housing design and the fostering of student well-being.

2.4 Architectural design and its effects on privacy, isolation, and community

Architecture is the vessel in which students live and socialize. The unit types that students inhabit can have an impact on their feelings of crowding and isolation which in turn encourages or discourages socialization and community involvement. Studies that address university student housing examine these buildings in separate disciplinary literatures of student preferences (La Roche et al., 2010), and student development (Brown et al., 2019), or the relationship between the two (Bronkema & Bowman, 2017).

Studies have shown that traditional-type rooms facilitate socializing and making friends at university, attributing this to the rooms' proximity to each other, the practice of doors to the common hallway being kept open, and the increased interaction within common spaces (Rodger & Johnson, 2005; Devlin et al., 2008; Chambliss & Takacs, 2014). Studies have also highlighted the importance of spatial analysis in regard to achieving balanced privacy and addressing issues of crowding (Baum et al., 1975; Bronkema & Bowman, 2017; Devlin et al., 2008), a sense of belonging (Devlin et al., 2008), as well as student success and well-being. Architectural plan views are used to illustrate students' movement within and between spaces and can enable visualization of human interactions "emphasiz[ing] the notion that community cannot be built in a vacuum, that students must interface with one another to develop a sense of shared identity and experience" (Erb et al., 2015, para. 24). Case (1981) analyzed the traditional residence student dynamics, focusing on required paths—and the spaces along them—students take to access facilities for everyday needs, like common showers and staircases, that contribute to engagement in friendly conversation: "The closer together people live in terms of physical distance, as well as the closer they are brought together by a phenomenon called functional distance, the greater the chance they will have of meeting one another. The greater the chance of meeting one another, the greater the chance for the formation of friendships and groups" (Case, 1981, p. 24).

An architectural plan layout reflects social exchange of people within and between spaces. The 'architectural depth' in a layout of a residence is the number of spaces a person must go through to get from one point in space to another, crossing some physical barrier or marker—this distance is measured in terms of the number of barriers crossed (Evans et al., 1996). Buffer zones, or spaces or zones between two destinations, influence agents' perception of the space. According to Evans et al. (1996), these buffer zones help alleviate the feelings of crowding and eventual "social withdrawal." Therefore, "...architectural elements such as floor-plan layout—believed to influence social interaction patterns within the home—could play a role in the household crowding–psychological distress link" (Evans et al., 1996, p. 41). In apartment-type units, the depth in the layout is deeper than in traditional ones, as students in the latter would move from the secondary territory of the corridor directly into their private territory, whereas in an apartment, it is necessary for students to travel through the living and sometimes kitchen space in order to reach their bedroom. In shared apartments, this space would allow some kind of interaction with a group or with

another individual, but if it was an individual apartment, the student would not be interacting with anyone else. Thus, although both of the apartments have the same living, kitchen and bathroom spaces, they do not present the same opportunities for human interaction. The greater the architectural depth of each unit, the lower the number of buffer or secondary territories, and thus, the lower the number of human interactions that typically occur within larger groups. This creates a risk of feelings of isolation: "While the new apartmentstyle design offered students has increased privacy, technology, and amenities, the social or academic costs associated with the new isolating design have remained unclear" (Brown et al., 2019, p. 280). Given that university housing design plays a role in student interaction and well-being, a new typological framework to classify units that links the literature around isolation with architecture would enable important research on the subject.

2.5 Territories and the need for agent-control classification

Grant (1974) suggests that territoriality is a primary device, universal to all cultures, that permits individuals to structure their environment so that they maintain the proper levels of stimulation, security (privacy), freedom, and order. Applied to university student housing or residence halls, territoriality simply means allowing individual students or groups of students to personalize and exert maximum control over their physical environment (Schroeder & Jackson, 1987). However, who has control over a given space can vary, and this variation can have an effect on an individual's feelings of isolation or crowding, as well as their overall well-being. To this end, developing a framework to identify who controls the space would allow administrators, students, and universities to make decisions over their student living conditions that residence hall environments can sometimes create for students, they must help students participate in restructuring the environment" (Schroeder & Jackson, 1987, p. 52).

Altman (1975) sorts territories into primary, secondary, and public spaces. This classification is a reflection of governance over the built space: who controls the space and how much of it. Each territory provides students with different levels of control and engagement, and the combination thereof gives students a range of levels of privacy. In certain spaces, students can control their living area by allowing people to access it, or preventing them from doing so. These primary territories are defined as such by the high level of control the agents living in them exercise over the built environment: they are spaces where a group, two people or an individual can exert control over and modify the lived environment. Secondary territories are spaces where students can exert some control over the lived environment for brief periods of time. Secondary territories are also not solely identified by a single set of users, as are primary territories, and the set of users will vary over time. Finally, public territories are open to all—but consequently, are much less modifiable by any given agent, as openness and control are inversely proportional. The amount of control that agents have over space, governance, differs between primary and secondary territories, and this impacts group dynamics and privacy.

The way we, as agents, control space is a function of how we perceive it. Control over a space—to be able to choose where and with whom we spend our time—affects the way we perceive privacy. Success, as Altman (1975) defines it, relies on balance; not enough privacy can lead to feelings of crowding, while too much can lead to feelings of isolation. The answer does not lie in tilting the balance one way or the other, but rather in providing

students with the tools (environmental and otherwise) to manage the built space, thereby generating a community of growth and learning.

In living situations, agents use environmental mechanisms to manage their spatial environment (Vinsel et al., 1980) in order to reach the amount of privacy desired by balancing between feeling isolated (due to excessive privacy) and feeling crowded (due to insufficient privacy) (Altman, 1975). Environmental mechanisms include agent behaviors that alter the physical space in some way (e.g., shutting or locking a door) (Altman, 1975). Changes in the density or number of people sharing the use of apartment facilities will have a significant impact on the levels of agent control that each student has over the space, as well as the privacy they experience. The ability to govern space shifts based on different territoriality types (e.g., primary, secondary, or public territory), and this impacts group dynamics and privacy.

Authors in the literature have recognized that there is a need to include more specific spatial analysis when discussing the relationship between university residence types and student success, satisfaction, and well-being (Corbett, 1973, Rodger et al., 2005). Corbett (1973, p. 414), when referring to the insufficient existing typological definitions, stated, "Due to the variety of possible forms, it may prove important in research to clarify precisely the form one is referring to rather than to use the amorphous term, suite", which can be comprised of various densities and uses. In short, the typological classifications available are insufficient to accurately evaluate levels of agent control and privacy. Although agent control alone is insufficient to describe—or neutralize—how space impacts student well-being, socialization, achievement, and development, there is a need for a classification system to analyze usage (i.e., density, number of agents), governance (i.e., territoriality, control by agents), and unit facilities (i.e., bathroom, kitchen, lounge, etc.) to advance the study of student development. Currently, the accepted typical student housing typologies are insufficient when it comes to addressing the role of privacy in student well-being. Typologies must be defined based on student experience-including feelings of privacy, crowding and well-being-rather than solely on the built form and available amenities. Moving to a design and social-oriented discussion of typologies, then, will bring greater understanding of the student experience and the role that universities can play in increasing student satisfaction and academic success.

2.6 Historical development of student Housing Unit Classifications

The increased demand for privacy in student residences has created new student residence designs, as well as variations on older ones. To address this, housing organizations such as The Association of College and University Housing Officers—International (ACUHO-I), established in 1949, in 1975 developed a survey entitled "ACUHO-I Construction and Renovation Survey" that included living unit typologies to collect data of how many units with particular hygiene and dining facilities have been constructed or renovated and their associated costs. The living units included: single traditional, double traditional, suite and apartment typologies (Thomas, 1975). In 1993, when Jim Grimm became president of the ACUHO-I, he expanded the Construction and Renovation Survey by using a unit-classification framework that separates out spaces for sleeping and studying, as well as bathrooms with showers and kitchens—resulting in the following typologies: Traditional Rooms, Modified Traditional Rooms, Adjoining Suites, Super Suites, and Apartments later on (Balogh et al., 2005) (Table 1). This taxonomy was developed to assist institutional decision makers (Balogh et al., 2010) in data collection for the purpose of university planning:

Balogh, Grimm & Hardy Balogh, Grimm & Hardy 1 Traditional Rooms 2 Modified Traditional Rooms 3 Adjoining Suites 4 Designed as double and/or single occupancy rooms and community bathrooms. Include no bath 3 Adjoining Suites 1 Designed as double and/or single cooms that include a private bath facility in each room with an adjoining room) 3 Adjoining Suites 4 Super Suites 5 a b Apartments Designed as double and/or single occupancy rooms with private or shuth iving area or study; 5 a b Apartments Designed as double and/or single occupancy rooms with private or shared kitchens. Inc study and kitchen or kitchenette. Rented by the bed space b Apartments Designed as efficiencies, one-bedroom or multiple bedroom apartments. Includes a full the unit		Type of living unit	Definition
Batogn, Grumm & Harry Iraditional Rooms Designed as double and/or single occupancy rooms and community bathrooms. Include 2 Modified Traditional Rooms Designed as double and/or single rooms that include a private bath facility in each room 3 Adjoining Suites Designed as adjoining room) 4 Super Suites Designed as adjoining two double and/or single occupancy rooms connected by a bathr 5 a Individual contract apartments Designed as adjoining the suite. Includes separate living area/study 5 a Individual contract apartments Designed as double and/or single occupancy rooms with private or shu 6 Apartments Designed as double and/or single occupancy rooms with private or shared kitchens. Includes separate living area/study 6 Apartments Designed as double and/or single occupancy rooms with private or shared kitchens. Includes separate living area/study 7 b Apartments Designed as double and/or single occupancy rooms with private or shared kitchens. Inc			
1 Traditional Rooms Designed as double and/or single occupancy rooms and community bathrooms. Include 2 Modified Traditional Rooms Designed as double and/or single rooms that include a private bath facility in each room 3 Adjoining Suites Designed as adjoining room) 4 Designed as adjoining two double and/or single occupancy rooms connected by a bathr 5 a Individual contract apartments 6 Apartments Designed as adolone and/or single occupancy rooms with private or shi 6 Apartments Designed as a double and/or single occupancy rooms with private or shi 7 a Individual contract apartments 8 Apartments Designed as double and/or single occupancy rooms with private or shared kitchens. Inc 6 Apartments Designed as double and/or single occupancy rooms with private or shared kitchens. Inc 7 b Apartments Designed as double and/or single occupancy rooms with private or shared kitchens. Inc 8 Individual contract apartments Designed as double and/or single occupancy rooms with private or shared kitchens. Inc 9 Apartments Designed as efficiencies, one-bedroom or multiple bedroom apartments. Includes a full 9 Apartments Designed as efficiencies, one-bed	Balogh, Grimm & Hardy		
2 Modified Traditional Rooms Designed as double and/or single rooms that include a private bath facility in each room 3 Adjoining Suites Designed as adjoining room) 4 Designed as adjoining two double and/or single occupancy rooms connected by a bathr 5 a Individual contract apartments 5 a Individual contract apartments b Apartments Designed as double and/or single occupancy rooms with private or shared kitchens. Inc b Apartments Designed as double and/or single occupancy rooms with private or shared kitchens. Inc b Apartments Designed as double and/or single occupancy rooms with private or shared kitchens. Inc b Apartments Designed as double and/or single occupancy rooms with private or shared kitchens. Inc b Apartments Designed as double and/or single occupancy rooms with private or shared kitchens. Inc b Apartments Designed as efficiencies, one-bedroom or multiple bedroom apartments. Includes a full the unit	1	Traditional Rooms	Designed as double and/or single occupancy rooms and community bathrooms. Includes rooms with sinks, no bath
3 Adjoining Suites Designed as adjoining two double and/or single occupancy rooms connected by a bathr 4 Super Suites Designed as a small group of double and/or single occupancy rooms with private or shx 5 a Individual contract apartments Designed as double and/or single occupancy rooms with private or shared kitchens. Inc b Apartments Designed as efficiencies, one-bedroom or multiple bedroom apartments. Includes a full b Apartments Designed as efficiencies, one-bedroom or multiple bedroom apartments. Includes a full	5	Modified Traditional Rooms	Designed as double and/or single rooms that include a private bath facility in each room (i.e., not shared with an adjoining room)
4 Super Suites Designed as a small group of double and/or single occupancy rooms with private or sha 5 a Individual contract apartments Designed as double and/or single occupancy rooms with private or shared kitchens. Inc 5 a Individual contract apartments Designed as double and/or single occupancy rooms with private or shared kitchens. Inc 6 Apartments Designed as efficiencies, one-bedroom or multiple bedroom apartments. Includes a full the unit	3	Adjoining Suites	Designed as adjoining two double and/or single occupancy rooms connected by a bathroom. No separate living area or study;
5 a Individual contract apartments Designed as double and/or single occupancy rooms with private or shared kitchens. Inc study and kitchen or kitchenette. Rented by the bed space b Apartments Designed as efficiencies, one-bedroom or multiple bedroom apartments. Includes a full the unit	4	Super Suites	Designed as a small group of double and/or single occupancy rooms with private or shared bathrooms contained within the suite. Includes separate living area/study
b Apartments Designed as efficiencies, one-bedroom or multiple bedroom apartments. Includes a full the unit	5 a	Individual contract apartments	Designed as double and/or single occupancy rooms with private or shared kitchens. Includes separate area/ study and kitchen or kitchenette. Rented by the bed space
	þ	Apartments	Designed as efficiencies, one-bedroom or multiple bedroom apartments. Includes a full kitchen. Rented by the unit

"The data gathered can be useful for comparative purposes with similar projects, to negotiate better construction rates (i.e., cost per square foot), and to better understand the scope and components of projects undertaken at other institutions" (ACUHO-I, 2020). The updated survey delineates the Apartment type into apartments that are rented by the room (Individual Contract Apartments) and those that are rented as a full apartment (Apartments). Despite this differentiation, these apartment types are not architecturally distinct from each other and disregard the nuances of privacy and negotiation between one person, two, or a group, and by considering them all to belong to the same category, does not allow for analysis of the privacy in the residential space. Rather, the definition relates to the goal of the work—which is to "provide an overview of the average costs and types of preferences for construction and renovation" (Balogh et al., 2010).

The classification system established through ACUHO-I has enabled the collection of a comprehensive amount of data that relates students' preferences regarding the facility types included in their unit "with a focus on facilities, planning initiatives, configuration styles, amenities, and sustainability issues" (ACUHO-I website). However, by defining the units through a typology based on facilities within the units, these typologies do not distinguish or consider the socialization or privacy territories that occur as a result of spatial design (Brown et al., 2019). The design of a given space encourages interactions between people—and can also encourage estrangement. This implies that space and its layout and relationship to other spaces-influence the way face-to-face interaction takes place, by differentiating and instituting the hierarchy of socializing. Conversely, individualized and too-specific typologies are not helpful for academic researchers, as they may not be able to replicate a given study or create guidelines for university administrators. For example, separating between small groups of three to six students—rather than identifying them as individual groups of either three or four or five or six students sharing a unit-would limit the possibilities of needed clustering and replication of studies. Typologies in architecture are used to order the built space; establish groupings of characteristics and could become a significant instrument for researchers, academics, developers, and designers to approach new and existing university student residences. There is a need for a classification of university student housing as a systematized framework-one that is able to measure, compare, and contrast rate-per-bed and construction costs, but that can also be used to measure and analyze the privacy levels of their residential spaces.

3 Problem

Balanced privacy in student residences can create feelings of belonging, increased rates of university completion, higher GPAs, and overall improved well-being for students, but how various agents control students' living spaces can be decisive in determining the amount of privacy they experience (Corbett, 1973). Unfortunately, studies on the built space and privacy of on-campus student residences and their relationship to student success and well-being are typically limited to a dichotomy between apartments (or suites) and traditional units (Baum et al., 1975; Bronkema & Bowman, 2017; Corbett, 1973; Devlin et al., 2008; Rodger & Johnson, 2005). These definitions focus on the facilities available within each unit—emphasizing the increased cost to construct facilities—but do not address important factors such as density of usage and governance reflected in the levels of agent control and resultant privacy. The studies do not specify the density of use, whether there is one person, two people or a small group sharing the traditional room or the apartment/suite,

despite differences that impact socializing and privacy. Several study authors identify the proposed typologies as incomplete and call for more study into the nuances of new units: "The limited research on the residential paradox examining multiple architectural designs has yielded inconclusive findings, which has led scholars to call for additional research to further understand the complexity of the matter" (Brown et al., 2019, p. 270). Social science studies have been instrumental in documenting how in-housing social interaction between students impacts their academic success (Bronkema & Bowman, 2017; Brown et al., 2019; Terenzini & Pascarella, 1984), but these rigorous studies have not yet explored concerns of spatial analysis.

Our proposed unit classification HUC expands on historical developments in professional standards (ACUHO-I) to generate a nuanced typology that includes spatial analysis for university residence halls—while addressing the economics of providing hygiene, cooking and gathering facilities. The HUC permits engagement with additional variables that include: density of usage of these facilities by amounts of students and the level of control or governance (territoriality) by agents over space. The HUC uses a visual matrix to combine both elements permitting users to generate visual communication that can be used by social scientists to explore the nuances of architectural design to gain a muchneeded understanding of the role that control and privacy play in student well-being and academic success.

4 Housing Unit Classification (HUC)

The HUC (Table 2) focuses on the unit's facilities combined with levels of governance and usage, in order to create a new taxonomy of housing units. The HUC builds on the ACUHO-I classification combined with Hierarchy of Isolation and Privacy in Architecture Tool (HIPAT) (McCartney & Rosenvasser, 2022), a visual instrument that reflects the control by agents of the built environment. The HIPAT functions as a tool for measuring and analyzing levels of governance and their impact in the spaces of student university housing, that when embedded on a taxonomy of units, through the HUC, provides researchers with a way of measuring spatial analysis that can be applied across many disciplines and connect this research directly to professional practice, social science research and connecting disciplines in the student housing literature. Although the HUC was developed using student residences, it can be applied to most co-living and shared housing living situations.

4.1 Hierarchy of Isolation and privacy in architecture tool (HIPAT)

HIPAT is a visual tool—that defines agent control by levels of governance (i.e., territoriality, control by agents), and usage (i.e., density, number of agents) (McCartney & Rosenvasser, 2022). The number of agents controlling each space impacts each individual differently, and this affects their level of social interaction and potentially their student experience.

Altman's three-part classification of primary, secondary, and public territories (1975) reflects the possibility of governance over the built space: who controls the space, and how much of it. Each territory reflects the levels of control and engagement, and the combination of these spatial territories gives students a range of levels of socialization and privacy. When Altman's classification is applied to university student housing, however, it does not include the nuances between the different numbers of

		Type of living unit	Definition
Housin	g Unit Clas	sification (HUC)	
1	s	Single Traditional Rooms	Designed as a single occupancy room with community bathrooms, lounges, kitchens and dining areas. Includes rooms with sinks, no bath
	q	Double Traditional Rooms	Designed as a double occupancy room with community bathrooms, lounges, kitchens and dining areas. Includes rooms with sinks, no bath
	Е	Multiple Traditional Rooms	Designed as small group occupancy rooms with community bathrooms, lounges, kitchens and dining areas. Includes rooms with sinks, no bath
7	S	Single Modified Traditional Rooms	Designed as a single room with a private bath facility in each unit (i.e., not shared with an adjoining room), with community lounges, kitchen and dining areas
	q	Double Modified Traditional Rooms	Designed as a double occupancy room with a shared bath facility between the two people living in the bedroom (i.e., not shared with an adjoining room), with community lounges, kitchens and dining areas
	Е	Multiple Modified Traditional Rooms	Designed as small group occupancy rooms with a shared bath facility between the people living in the bed- room (i.e., not shared with an adjoining room), with community lounges, kitchens and dining areas
60	q	Adjoining Suites	Designed as adjoining two single occupancy rooms connected by a bathroom, with community lounges, kitchens and dining areas
	Е	Multiple Adjoining Suites	Designed as adjoining two or more rooms connected by a bathroom, with at least one double or multiple occupancy room (i.e., a small group sharing the bathroom) with community lounges, kitchens and dining areas
4	s	Single Super Suites	Designed as a single occupancy room with a private bathroom and lounge/study area contained within the suite, with community kitchens and dining areas
	q	Double Super Suites	Designed as a double occupancy room or two single occupancy rooms with individual or shared bathrooms; and a shared lounge/study area contained within the suite (i.e., two people sharing the lounge/study), with community kitchens and dining areas
	Е	Multiple Super Suites	Designed as a multiple occupancy room or combination of single, double or multiple occupancy rooms with shared or individual bathrooms; and shared lounge/study area contained within the suite (i.e., a small group sharing the lounge/study), with community kitchens and dining areas

 Table 2
 Housing Unit Classification (HUC). Source: Authors

		(1)	
		Type of living unit	Definition
5	s	Single Apartments	Designed as a single occupancy room with bathroom, lounge/study area and full kitchen within the unit
	q	Double Apartments	Designed as a double occupancy room or two single occupancy rooms with shared or individual bathrooms, lounge/study area and full kitchen within the unit (i.e., two people sharing the lounge/study and kitchen)
	Ε	Multiple Apartments	Designed as a multiple occupancy room or combination of single, double or multiple occupancy rooms with individual or shared bathrooms; and shared lounge/study area and full kitchen within the unit (i.e., a small group sharing the lounge/study and kitchen)

agents—students—that govern each space. To build on Altman's three-part classification of territories (1975) and include the nuances between different numbers of agents in each space, the HIPAT can be used to differentiate the agents in primary and secondary territories, as it is the interactions between these agents that are positively linked to student performance and well-being (McCartney & Rosenvasser, 2022).

Spatial analysis is fundamental to understanding the link between social encounters and the built environment. In practical terms, a graphic tool such as a map or a plan can record the social patterns in the space and how they influence each other. In this study, we focus on control, and how human interactions can be modified by different control mechanisms. McCartney and Rosenvasser's (2022) HIPAT creates a visual medium for understanding governance by the amount of control different agents have over each space in a student housing development (Fig. 2). HIPAT defines territories and creates a bridge for social science researchers and architects to have more precise conversations when pursuing studies on student success and well-being. Private territories are defined as spaces controlled by one person; semi-private ones by two, and a group of two or more. Since agents of all of these categories can exert control over the space, they may need to either negotiate with one person or a small group to do this, meaning that their interactions develop with a small circle of people. Secondary territories are divided by floor and building, where control is limited and varies between the students. To exert control over these spaces, students will need to interact and negotiate with groups of up to 20 and then approximately 100 people depending on the number of people that live on the floor in their residence and in the residence as a whole. Public territories are the ones connected directly to the street and are monitored by the university—ones everyone has access to. They are usually retail spaces and are monitored and regulated by university security forces. The university has ultimate control over the public spaces, but the spaces can still be used by students who do not live-in a given student housing building, as well as by people outside of the university community.

Student housing architecture has a direct impact on the relationship's students foster, but because the current taxonomies used in student housing literature are defined by the facilities provided in each unit, not by how many students live in them, they're insufficient to describe the nuances in the studies undertaken in the social science research. HIPAT makes this issue visible and broadens the lexicon of the terms used to describe types of university student housing in a way that has not been attempted before, the HUC further expands the lexicon by systematically classifying living unit forms into heterogeneous types. As this demand for increased privacy for students has risen, researchers have begun to understand the repercussions of these new paradigms



Fig.2 Privacy Levels in the Hierarchy of Isolation and Privacy in Architecture Tool (HIPAT). Source: McCartney & Rosenvasser, 2022

of student housing unit typologies on the students themselves, as such current unit types classifications available in student housing literature fall short to address these issues.

4.2 Expanding existing classification for student housing typologies

The HUC internalizes a design-, construction-, finance-, and social-oriented typological classification framework to bring greater understanding to the built environment of co-living and shared housing, student housing, by documenting social interaction and the role that universities can play in increasing student success and well-being. Rather than develop a new taxonomy from the ground up, the HUC builds on the existing standard of the ACUHO-I classification, merging economic measures of average costs and types of preferences for construction and renovation with social measures that are necessary for student well-being. Allowing for the existing rate-per-bed and construction costs to be compared and contrasted while also expanding the classification to provide the ability to analyze and understand privacy and human interactions. The HUC taxonomy of units adds to the objective of the ACUHO-I Construction and Renovation Survey classification to consider design and socially oriented functions. It internalizes governance, which agent controls each living space, discerning both unit and residence floor spaces, as well as different varieties of living unit types—from traditional shared rooms with common floor lounges, washrooms, and kitchens, to completely private apartments with all-private hygiene, cooking, and lounge facilities internal to the unit. The HUC addresses the living space in the primary housing unit and secondary territories of student living as they relate to the primary unit. The HUC does not differentiate between different levels of secondary territories outside of the unit and public spaces; it establishes a comprehensive picture of the typological living situation of the students.

This framework is built from an investigation of student housing residences across Northern America (USA and Canada), which included a deep investigation of one city and all of its affiliated and non-affiliated student housing residences, across seven campuses of four universities totaling 46 residences. Investigations then followed that included 30 residences across 10 cities, 7 states or provinces geographically located across Northern America to test the comprehensiveness of the HUC for living units constructed to date.

In the deep single city investigation, residences were identified across the seven campuses and then the units within them were sorted by types of facilities, using the ACUHO-I unit classification. Then, each unit type had HIPAT diagrams, focused on governance, for each unit type. To complete the HIPAT diagrams for each living unit, each unit was divided spatially into a set of activities typical to students' everyday lives: sleeping, studying, hygiene, eating (cooking and dining), and lounge categories. The resulting HIPAT diagrams visually demonstrated that there were many different social configurations within each ACUHO-I classification type. To address these differences within each ACUHO-I type, new subcategories were added to each type (Fig. 3). To define these subcategories into HUC typologies, a set of typical activities of students' everyday life are subdivided: 1) spatially into sleeping, studying, hygiene, eating (cooking and dining), and lounge categories; 2) by control agent of each space to create sub-classifications using HIPAT agentcontrol classification; and 3) to retain ties to earlier research by expanding Balogh et al. (2005) categories.

4.3 Housing Unit Classification (HUC) as a new framework in research

The primary objective of the HUC is to create a framework for research and practice so that the taxonomy of units used in student housing includes ways of measuring privacy and governance as agent control in a systematic manner. HUC expands existing data sets. Thus, the HUC provides a framework for further research, as well as a common language for addressing challenges associated with privacy, crowding, isolation, and socialization between different academic disciplines.

The HUC was developed using student residences although it can be applied to most coliving and shared housing living situations in housing and community building research. To determine the HUC classification of a unit complete HIPAT analysis of the unit to make the levels of privacy in the unit more visible and then use HUC Typical Typology Diagrams With HIPAT Analysis (Fig. 3) to designate the HUC for the unit.



Fig. 3 Housing Unit Classification (HUC) Typical Typology Living Unit Architectural Plans with HIPAT Diagram Analysis

For example, in Traditional units, 1 s and 1d, students experience similar primary and secondary territories, but the amount of privacy and control offered to students between single- and double-occupancy units is not. The HIPAT visual diagrams when different types of traditional rooms were analyzed revealed that although all other spaces are the same except the bedroom where the HIPAT levels for these spaces range from 1 to 3, which makes the experience of privacy by the inhabitant(s) very different in each of these types of spaces. The HUC in its subcategorization of traditional rooms into 1 s Single Traditional Room, 1d Double Traditional Room and 1 m Multiple Traditional Room, embodies the differences in the ways space is governed in each of those types of living units by classifying them into different levels of agent control, given the impact that control has on students' well-being-and doing so makes it clear that single- and double-occupancy and multiple rooms are distinct from one another. This will enable the literature to distinguish between single-, double- and multiple-occupancy apartments. This lack of distinction has been particularly problematic for student development and broader social science research; although the facilities are the same in each, governance represented in agent control and privacy levels vary significantly, as evidenced through the HIPAT analysis of each space.

In HUC 5 s Single Apartments, basic needs are within primary territories; they are under the control of a single student, and no negotiation is required in the course of everyday life. In HUC 5d Double Apartments, the bedroom is usually controlled by one individual as well—but other areas that support basic needs must be negotiated between the apartment's two occupants. In HUC 5 m Multiple Apartments, control of the areas that support basic needs is negotiated with a group, potentially creating more opportunities for either stress and miscommunication or spontaneous interaction and socialization, depending on the types of relationships that form among the occupants. This 5 m Multiple Apartment typology usually forms a dichotomy with traditional rooms in the literature. But though multiple bedrooms are typically the type of apartment used in the dichotomy of the student development literature, it is 5 s Single and 5d Double Apartments that seem to have increased in student housing construction in recent years. As demonstrated, the existing taxonomy does not allow for consideration between—and thus analysis of—single-, double- and multiple-occupancy apartments. The HUC, however, does provide this ability, allowing for the tracking of these units both by researchers and the development industry.

With HUC we can define the levels of socialization that occur within the units. Defined by its levels of privacy, socialization can be described by HUC typologies. For example, a 1 s Single Traditional Room would significantly increase the possibility of passive encounters as students are required to leave their unit to access hygiene and eating facilities (e.g., bedroom to bathroom); on the other hand, in 1d Double Traditional Room, through its design, could inhibit feelings of balanced privacy within the residence-unless students sought out other ways to attain it via behavioral mechanisms, such as asking the other occupant to leave the room or alternating schedules. 5 s Single Apartments, meanwhile, illustrate the possibility of the complete privatization of the residential space, as you can fulfill all of your everyday needs within the single unit, reducing the number of passive encounters in the residence to those occurring in the hallways and designated common spaces in the building. Sharing spaces with others increases student social development, though, as it requires negotiating how the space will be shared. 5d Double Apartments may create slightly more social interaction between students, but the opportunities for passive encounters are diminished to only those occurring between two people—or to a limited group of people, in case of 5 m Multiple Apartments.

A way to approach this issue is by using HIPAT, which can visually describe dynamics of governance, privacy and agent control in the HUC, and illustrate how HUC typologies are different from one another. For instance, despite having the same facilities, HUC typologies may differ depending on how many students live within the unit, how many agents have control over the unit spaces, and this may consequently alter the unit's effects on student development and socialization.

A one-size-fits-all model of student housing will not solve ongoing issues of privacy, crowding and isolation in student housing as students are all different from one another: personality type, education level, demographic group, and socioeconomic status of students, and they may need different levels of socialization and thus diverse living environments. Providing researchers and administrators with an additional framework for spatial analysis, the HUC, enables an expansion of research beyond the dichotomy to the many more living unit types that exist. Leading to greater understanding and analysis of the territories and the agents that control them in these different types of living units and allow students to be individually best matched with a living environment for them. This framework will assist researchers, administrators, developers, and students themselves to better understand student university housing so that future students are able to access and manage their environment to have the best living unit for themselves, making a positive impact on students' daily lives.

5 Applications for practice

In order to be effective and promote its utilization, a student university housing unit typology must address the economics of providing facilities for hygiene, cooking, and social gatherings, as well as privacy and socialization—which are framed in a governance discussion. The HUC succeeds in this regard, allowing for discussions between administrators, campus planners, developers, and architects to better design and plan university campuses. Using the HUC, these discussions are framed through balancing privacy and optimizing socialization opportunities, with the ultimate goal of improving student well-being and academic success. This, in turn, would provide universities with the ability to plan and better match units to a diverse set of student needs and preferences. Appropriately matching unit types to students' needs would help to optimize their satisfaction, likely leading to greater student retention and academic success.

The multi-level systematized approach of the HUC creates a framework that will enable both quantitative and qualitative methods for mixed-method research. Future studies using the HUC will allow for examinations of privacy and control across many precise gradients. Studies will be able to examine clear typologies related to privacy and be able to move beyond the literature's current dichotomy between apartments (or suites) and traditional units. Furthermore, unlike its predecessors, the HUC enables analyses of levels of privacy and control within each of these typologies and their effects on student success and wellbeing for various populations.

Administrators, campus planners, and developers are currently using the ACUHO-I Construction and Renovation Survey classification document data on the amounts of unit types and discuss campus development. By expanding the ACUHO-I Construction and Renovation Survey classification, which currently focuses on facilities within each student unit and costs to construct facilities, to the full HUC, through the addition of typologies that embody agent levels of control, provides a robust classification framework that integrates seamlessly with existing data processes yet also allows for a more holistic analysis and view of student housing.

The HUC establishes a common language between architects and their clients, which creates a direct link to interdisciplinary research and practice. This critical link enables architects to access important research of the disciplines and systematizes the findings of the literature into the design of the unit typologies. The HUC framework provides a means to go beyond the traditional-apartment residence dichotomy allowing architects to work within a more nuanced classification.

6 Conclusions

The HUC is a new taxonomy of university student housing that expands the current taxonomy of units used in the student housing industry and research. This taxonomy of housing extends beyond facilities provided in each unit to include levels of privacy and control within each of these types, using a theoretical framework of agents and hierarchical models of control. This presents researchers with a spatial classification to not only link qualitative and quantitative data of student housing to the architecture being built, but to systematically analyze and visualize socialization in university housing to better understand students' well-being, optimizing built environment conditions that foster their academic success.

A variety of new residence types have been designed and built over the last 20 years, and universities are leveraging the success of their residences in campus plans and—importantly—in business and marketing plans to attract students. Students' demand for privacy has created the privacy-isolation contradiction; increased privacy through more privatized units creates less socialization and more isolation—ultimately, to the detriment of students' well-being and academic performance. Despite this contradiction, providing increased privacy in university student housing has been one of the main focuses of developers, universities, and architects in the planning of these new units for many years now. The HUC is an architectural and development framework that can be used to analyze and visualize isolation and socialization of university housing units in order to better understand the various impacts design can have on student well-being. It does this by identifying governance in each of the typologies so that a balanced level of privacy—which would support student development—can be achieved.

Social science studies have indicated the importance of student social interactions in their housing and how this relates to increased student success (Bronkema & Bowman, 2017; Brown et al., 2019; Terenzini & Pascarella, 1984). The literature also indicates the need to link these studies to spatial analysis, however. Studies on privacy and the built space of university student housing—and their relationship to student success and well-being—have thus far been limited to a dichotomy between apartments (or suites) and traditional units (Baum et al., 1975; Bronkema & Bowman, 2017; Corbett, 1973; Devlin et al., 2008; Rodger & Johnson, 2005). These studies have attributed a discernible impact on levels of student development, overall well-being, attrition and student performance to residence unit designs—yet the important nuances of governance of agent control and privacy between and within these issues have not been conclusively studied yet, due to a lack of spatial analysis. The HUC responds to this need articulated by social science researchers and provides the needed link to spatial analysis through an expanded classification of

unit typologies that depicts the nuances of architectural design. The emergence of HIPAT (Author 1 and Author 2 McCartney & Rosenvasser, forth) allows for an analysis of privacy levels in student residences to take place in a visual and systematized manner. The establishment of the HUC as a set of unit taxonomies, then, is the next step to furthering the discussion of the nuances of the negotiation, isolation, socialization, and facilities that students experience.

Administrators, campus planners, and developers are currently using the ACUHO-I Construction and Renovation Survey to document results and discuss campus development. However, by expanding the ACUHO-I Construction and Renovation Survey classification (Balogh et al., 2005), which currently focuses on facilities within each unit and costs to construct facilities without a greater spatial analysis, the HUC embodies levels of agent control and resultant privacy. Further, it directly relates to previous data from all sectors—so that future data counts of units can be seamlessly amalgamated with historical data.

Every year, new and complex units are being created in student residences to address the demand by incoming university students for increased privacy and amenities, but the lack of a common language to address these issues has prevented researchers from adequately analyzing their impacts on student well-being—and researchers from being able to create units that promote students' well-being. The HUC offers a new framework of typologies that can address students' control over the built space, as well as creating a bridge to multidisciplinary studies on university housing design. In allowing for the design of each unit to be categorized in a systematized manner, the HUC also invites researchers from multiple disciplines to study university housing by providing a framework and a common language.

Currently, multiple apartments are being studied as the norm that defines the apartment type, and the literature outlines the benefits of apartments for introverted students for an increased sense of belonging. Their benefits to students are wide-ranging and important, but in contemporary literature on the subject, the 5 s Single-, 5d Double- and 5 m Multiple-occupancy apartments are being analyzed as though they were equivalent types, despite each one engendering radically different levels of passive socialization, as well as varying levels of agent control. The HUC allows for distinct research into all three types and opens up the possibility for future studies to establish whether more introverted students retain a sense of belonging to their university and experience increased wellness and success when living in 5 s Single Apartment types or 5d Double Apartment types.

Understanding how students engage with the built space and what type of residences the university wants to provide can help increase a student's sense of belonging while at university, as well as student development and socialization. Using the HUC, researches can broaden the discussion on space and control through multidisciplinary lenses to explore the impact of student housing on student well-being and satisfaction—as well as on student retention and academic success—while administrators can use the HUC to better understand student dynamics, and put policies in place to encourage socialization, such as minimum and maximum requirements of particular HUC types across the university, or student life programming focused around needs for privacy and socialization based on HUC types within existing and newly built residences. Developers, meanwhile, can better classify their units to appeal to particular types of student personalities, allowing them to create appropriate, appealing and diverse products for universities. The HUC, thus, has the potential to bridge the gap between disciplines by linking social science discussions on privacy, wellbeing, and socialization with concrete spatial analysis, allowing for a better understanding of—and positive impact on—students' daily lives.

Acknowledgements This work was supported by the University President's of Toronto Metropolitan University, University of Toronto, OCAD University and York University; Office of the Dean, Faculty of Community Services at Toronto Metropolitan University; and Office of the Dean, Faculty of Engineering and Architectural Science at Toronto Metropolitan University. The authors wish to acknowledge Thomas Gomez Ospina and Andrew Lee for their research assistance in summarizing articles and completing drawings for the development of the work. The authors wish to thank the greater StudentDwellTO (SDTO) team comprised of the Steering Committee, Advisory Committee and especially the core team members of Amy Campbell, Victoria McCrum, Dr. Luisa Sotomayor, Dr. Marcelo Vieta, Mauricio Quiros, and Jeremy Bowles for their commitment to the SDTO project. The authors with to thank the two anonymous reviewers who helped us to improve the manuscript with excellent comments and suggestions.

References

- Al-Homoud, M., & Abu-Obeid, N. (2003). University outdoor spatial layout effect on perception of students' interaction and group seclusion. *Journal of Architectural and Planning Research*, 20(3), 221–233.
- Altman, I. (1975). The environment and social behavior: Privacy, personal space, territory, crowding. Brooks/Cole Publishing Co.
- Altman, I., & Chemers, M. M. (1993). Culture and environment. Cambridge University Press.
- Anderson, B. (2018). The investment outlook for student housing remains stable. National Real Estate Investor; Atlanta. Sep 11, 2018, 1.
- Association of College and University Housing Officers International. (2020). *Knowledge resources, Research and data, Partner research.* Retrieved from https://www.acuho-i.org/knowledge-resources/ research-and-data/partner-research/construction-survey?portalid=0
- Baum, A., Harpin, R. E., & Valins, S. (1975). The role of group phenomena in the experience of crowding. *Environment and Behavior*, 7, 185–198.
- Balogh, C., Grimm, J., & Hardy, K. (2005). ACUHO-I construction and renovation data: The latest trends in housing construction and renovation. *Journal of College & University Student Housing*, 33(2), 51–56.
- Balogh, C., Price, K., Day, J., & Moser, R. (2010). ACUHO-I construction and renovation data: The latest trends in housing construction and renovation. *Journal of College and University Student Housing*, 36(2), 82–91.
- Bronkema, R., & Bowman, N. (2017). A residential paradox? Residence hall attributes and college student outcomes. *Journal of College Student Development*, 58(4), 624–630.
- Brown, J., Volk, F., & Spratto, E. M. (2019). The hidden structure: The influence of residence hall design on academic outcomes. *Journal of Student Affairs Research and Practice*, 56(3), 267–283.
- Bowman, N. A. (2010). The development of psychological well-being among first-year college students. Journal of College Student Development, 51(2), 180–200.
- Canada Dominion Bureau of Statistics. (1949). Eighth Census of Canada, Vol. IX: Housing. Ottawa, Ontario: King's Printer, 1949, xxxiii.
- Case, F. D. (1981). Dormitory architecture influences: Patterns of student social relations over time. Environment and Behavior, 13(1), 23–41.
- Chambliss, D. F., & Takacs, C. G. (2014). How college works. Harvard University Press.
- Cheng, D. X. (2004). Students' sense of campus community: What it means, and what to do about it. NASPA Journal, 41(2), 216.
- Corbett, J. A. (1973). Are the suites the answer? Environment and Behavior, 5(4), 413.
- Devlin, A., Donovan, S., Nicolov, A., Nold, O., & Zandan, G. (2008). Residence hall architecture and sense of community: Everything old is new again. *Environment and Behavior*, 40(4), 487–521.
- Erb, N. M., Sinclair, M. S., & Braxton, J. M. (2015). Fostering a sense of community in residence halls: A role for housing and residential professionals in increasing college student persistence. *Strategic Enrollment Mgmt Quarterly*, 3, 84–108.
- Evans, G. W., Lepore, S. J., & Schroeder, A. (1996). The role of interior design elements in human responses to crowding. *Journal of Personality and Social Psychology*, 70(1), 41–46.
- Gieryn, T. F. (2000). A space for place in sociology. Annual Review of Sociology, 26(1), 463–496.
- Gieryn, T. F. (2002). What buildings do. Theory and Society, 31(1), 35-74.
- Grant, W. (1974). Humanizing the residence hall environment. In D. DeCoster & T. Mable (Eds.), Student development and education in college residence halls (pp. 71–75). American College Personnel Assoc.

- Heilweil, M. (1973). The influence of dormitory architecture on resident behavior. *Environment and Behavior*, 5(4), 377–412.
- La Roche, C. R., Flanigan, M. A., & Copeland, P. K., Jr. (2010). Student housing: Trends, preferences and needs. *Contemporary Issues in Education Research*, 3(10), 45–50.
- Lauster, N., & Tester, F. (2010). Culture as a Problem in Linking Material Inequality to Health: On residential crowding in the arctic. *Health and Place*, 16, 523–530.
- McCartney, S., & Rosenvasser, X. (2022). Privacy Territories in Student University Housing Design: Introduction of the Hierarchy of Isolation and Privacy in Architecture Tool (HIPAT). SAGE Open. https:// doi.org/10.1177/21582440221089953
- Moore, H. P., Carswell, A. T., Worthy, S., & Nielsen, R. (2019). Residential satisfaction among college students: Examining High-End amenity student housing. *Family and Consumer Sciences Research Jour*nal, 47(3), 260–275.
- Mortgage, C., & Corporation, H. (1991). Core Housing Need in Canada. Ontario.
- Rodger, S., & Johnson, A. W. (2005). The impact of residence design on freshman outcomes: Dormitories versus Suite-Style Residences. *Canadian Journal of Higher Education*, 35(3), 83–99.
- Schroeder, C. C., & Jackson, G. S. (1987). Creating conditions for student development in campus living environments. NASPA Journal, 25(1), 45–53.
- Shook, N. J., Hopkins, P. D., & Koech, J. M. (2016). The effect of intergroup contact on secondary group attitudes and social dominance orientation. *Group Processes & Intergroup Relations*, 19(3), 328–342.
- Sotomayor, L., Tarhan, M. D., Vieta, M., McCartney, S., & Maas, A. (2022). When students are housepoor: Urban universities, student marginality, and the hidden curriculum of student housing. *Cities*, 124, 103572.
- Terenzini, P. T., & Pascarella, E. (1984). Freshman attrition and the residential context. The Review of Higher Education, 7(2), 111–124.
- Thomas, W. L. (1975). Housing Construction Survey. ACUHO News, Vol 14, Nº5, March 1975.
- Valins, S., & Baum, A. (1973). Residential group size, social interaction, and crowding. *Environment and Behavior*, 5(4), 421–439.
- Vinsel, A., Brown, B., Altman, I., & Foss, C. (1980). Privacy regulation, territorial displays, and effectiveness of individual functioning. *Journal of Personality and Social Psychology*, 39(6), 1104–1115.

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.