



The Study of Educational Spaces in Chinese University Residential Colleges from a "Human-Environment" Interaction Perspective

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Abstract

The university residential college system represents a reform of traditional dormitory functions. The construction of physical and spiritual educational spaces within residential colleges can be linked to the development of students' comprehensive qualities. This paper, based on the concept of "human-environment" interaction, and drawing on the principles of campus creative design, explores how to design and revitalize the static, dynamic, intermediary, and spiritual spaces of university residential colleges.

Keywords: University Residential Colleges, Educational Spaces, Creativity, Design.

1. Under the Wave of Globalization: Redesigning Dormitories into University Residential Colleges

With the intensification of global competition, society's expectations for high-quality talent have shifted. University students are now required not only to possess specialized knowledge but also to exhibit qualities such as good character, critical thinking skills, teamwork, self-confidence, and creativity. These attributes and skills cannot be fully developed through professional education alone; instead, they can be cultivated during students' extracurricular time through cultural activities, teacher-student interactions, and peer interactions. However, the facilitation of such activities heavily depends on spatial design. Dormitories, where students spend the majority of their post-class time, primarily provide living facilities but lack sufficient learning spaces. The single-function dormitory model no longer meets the needs of contemporary university students. As a result, it is necessary to reevaluate and expand dormitory functions. The university residential college system represents a reform of traditional dormitory functions and an innovative model for student development. By creating both physical and spiritual educational spaces, residential colleges meet the demand for dormitory-based learning spaces and provide a platform for fostering students' comprehensive development. Therefore, the creative design of educational spaces within residential colleges is a subject worthy of in-depth exploration. This paper seeks to investigate how to design and revitalize the educational spaces of university residential colleges by applying the "human-environment" interaction framework (Tang, 2001) and referencing the principles of campus creative design (Tang, 1999), aiming to achieve optimal educational outcomes.

2. What is the University Residential College System?

The residential college is a unique educational organization in China's feudal society, serving as a center for lectures, research, and book collections. Originating in the mid-Tang Dynasty, flourishing during the Song Dynasty, and abolished in the late Qing Dynasty, residential colleges have a history spanning over a thousand years and represent an outstanding model of traditional Chinese education. While the concept of the residential college itself is not an innovation, the university residential college system is an innovative model for student development. It complements the traditional departmental system and is based on the construction of student living communities and the promotion of students' autonomous development (He, 2013). Modern university residential colleges are established by drawing on the traditions of ancient residential colleges and Western university residential systems. One key distinction between ancient Chinese residential colleges, Western residential colleges, and modern university residential colleges lies in their origin. Ancient Chinese residential colleges and foreign residential colleges developed organically, while modern university residential

colleges were designed post-establishment of the university. Consequently, modern university residential colleges often employ an "embedded" strategy, integrating residential colleges into existing spaces, systems, or organizations, including the embedding of "physical spaces", "organizational functions", and "general education courses" (Yu & Peng, 2019). Universities should build distinctive residential college systems aligned with their historical context and institutional traditions to foster development.

In recent years, an increasing number of universities have been exploring the residential college system. For example, Fudan University established four residential colleges—Zhide, Tengfei, Keqing, and Renzhong—in 2005. Xi'an Jiaotong University initiated residential college reforms in 2006 and subsequently established eight residential colleges: Pengkang, Wenzhi, Zonglian, Qide, Zhongying, Lizhi, Chongshi, and Nanyang. Shantou University began piloting residential colleges in 2008, creating Zhicheng, Hongyi, Zhixing, Siyuan, and Shude Colleges. These universities' explorations and achievements have provided valuable insights and references for other institutions, including Southern University of Science and Technology, East China Normal University, Wenzhou University, and Zhaoqing University, which have all adopted residential college models to enrich their educational systems (Fan & Peng, 2014).

Universities in Taiwan, Hong Kong, and Macau have also implemented residential colleges. The Chinese University of Hong Kong (CUHK) boasts the longest history of residential colleges in the region. Founded in 1963 by merging New Asia College, Chung Chi College, and United College, these three colleges predate the university itself. Over the past half-century, CUHK has expanded to include nine residential colleges. Following its relocation to the Hengqin campus, the University of Macau fully adopted the residential college system, now encompassing eight colleges. In Taiwan, notable early examples include Chengchi College, Tsinghua College, and Tunghai College of Liberal Arts. To foster better interaction among residential colleges, the Residential College Alliance was established in 2014, initiated by Zhixing College of Beihang University and joined by institutions such as East China Normal University, Fudan University, Xi'an Jiaotong University, CUHK, National Tsing Hua University, and National Chengchi University. By 2024, 93 residential colleges from 52 universities have become members of the Residential College Alliance, providing an effective platform for interaction, resource sharing, and academic research among colleges.

3. The Significance of Constructing Educational Spaces in University Residential Colleges

Dormitories, as one of the places where university students spend the majority of their time, serve as a crucial educational platform. Examining ancient Chinese residential colleges and Western university residential systems, students in these settings lived and studied alongside peers and interacted closely with teachers, fostering high moral character through daily exposure. In Western residential colleges, this model functions alongside professional education, complementing each other in shaping students' development. These residential colleges, rich in resources and diverse in activities, offer guidance through mentors, inspiring critical thinking and cultivating well-rounded individuals. In contrast, most university dormitories today are designed merely as living spaces, devoid of sufficient learning facilities and resources. If dormitories are developed solely for accommodation without actively facilitating student learning and engagement within residential areas, the broader goals of university education risk being undermined (Chen, 2013). Modern dormitory life often traps students in activities such as gaming or binge-watching, confined to computer screens, reluctant to step outside. This behavior may stem from what has been termed "spatially induced leadership resistance" (Chen, 2008), where students perceive learning or participation in activities as physically inconvenient due to the lack of nearby comfortable and quiet study spaces or engaging events within dormitory buildings. To address this resistance, it is both necessary and feasible to increase and improve learning spaces within dormitories. This necessitates a reevaluation of the traditional dormitory's function. For dormitories to fulfill their educational potential, appropriate educational spaces must be created. Residential colleges extend the function of traditional dormitories, transforming them from mere "physical spaces" into venues capable of generating "chemical reactions". They become environments where the sparks of intellectual discourse and the vibrancy of hands-on activities thrive most vividly.

The construction of educational spaces in residential colleges holds particular significance for university students, primarily by fostering interactions and exchanges between teachers and students, as well as among peers. Interaction between teachers and students is a fundamental characteristic of educational activities. The process of teaching and learning forms an integrated entity in which these two parties mutually stimulate, complement, and extend each other to achieve optimal educational outcomes (Pan et al., 2006). In universities, teacher-student interactions are often confined to the classroom and are typically limited to academic knowledge. Once classes end, platforms for such exchanges are rare. Similarly, peer interactions, while facilitated to some extent by assigning students from different disciplines to the same dormitories, are constrained by the lack of dedicated platforms within traditional dormitories. Both teacher-student and peer interactions play a crucial role in inspiring and motivating students. Research has shown that these interactions significantly influence the psychosocial development of university students (Huang, 2000). The educational spaces within residential colleges provide platforms where such interactions can take place. Through these spaces, teachers and students, as well as students and their peers, can engage in extensive exchanges, broaden their horizons, stimulate intellectual growth, refine character, and enhance critical thinking and creativity.

Secondly, the construction of educational spaces in residential colleges can expand students' opportunities for diverse learning experiences. Modern society demands well-rounded individuals who not only excel in professional knowledge but also possess strong character, sound ethical values, and skills such as innovation, collaboration, and critical thinking. The balanced development of students' knowledge, character, and skills cannot be fully achieved through academic education alone. Intervention during students' extracurricular time is necessary, accomplished through exposure to and participation in various activities. The diversification of educational spaces in residential colleges supports the development of various cultural and practical activities, such as general education courses, lectures, workshops, competitions, salons, book clubs, and community service events. Students can choose activities based on their interests and needs. These diverse learning opportunities foster exploration, critical thinking, organizational skills, planning, communication, and creativity. They also enhance students' vitality, energy, spirit, and self-confidence—qualities and abilities that are often beyond the reach of traditional academic education. The multifunctionality of residential college spaces ensures that cultural and practical activities have a foundation, allowing for the comprehensive development of students' multifaceted intelligence.

4. Creative Design of Educational Spaces in University Residential Colleges

The design of the environment is closely tied to human needs, and the construction of educational environments in schools should follow the same principle, focusing on the users (Tang, 2001). Therefore, in creating educational spaces within residential colleges, the design and arrangement should center on students, considering their psychological characteristics, behaviors, and interpersonal dynamics. The goal is to enable learning at any time and facilitate discussions everywhere. Since modern university residential colleges are developed post-establishment, their implementation strategies are often "embedded" within existing spaces, systems, or organizations (Yu & Peng, 2019). As such, most residential colleges, aside from newly constructed dormitory areas, are created by transforming existing dormitories.

The key to designing educational spaces in residential colleges lies in shifting from the traditional single-function dormitory model to one based on "human-environment" interaction. This approach involves addressing three key aspects: users, space requirements, and behaviors (Tang, 2001), outlined as follows (see Figure 1):

(1). Who are the users of residential college educational spaces?

Traditional dormitories primarily serve students, categorized by gender (male or female). In contrast, residential colleges accommodate a more diverse range of users, including individual students, faculty members, student organizations, and mixed-gender groups.

(2). What are the users' space requirements?

Traditional dormitories focus solely on providing accommodation. Residential colleges, however, meet a broader array of needs, including spaces for courses, learning, interaction, and communication.

(3). What behaviors are reflected in user interactions?*

Traditional dormitories primarily function as general living spaces, addressing students' basic residential needs, with user behavior largely limited to daily life activities. In contrast, residential colleges foster behaviors that integrate "teaching and learning as mutual growth", "interactive exchange", and "gender equality".

By addressing these considerations, the creative design of educational spaces in residential colleges aims to transform them into dynamic environments that actively support learning, collaboration, and personal development.

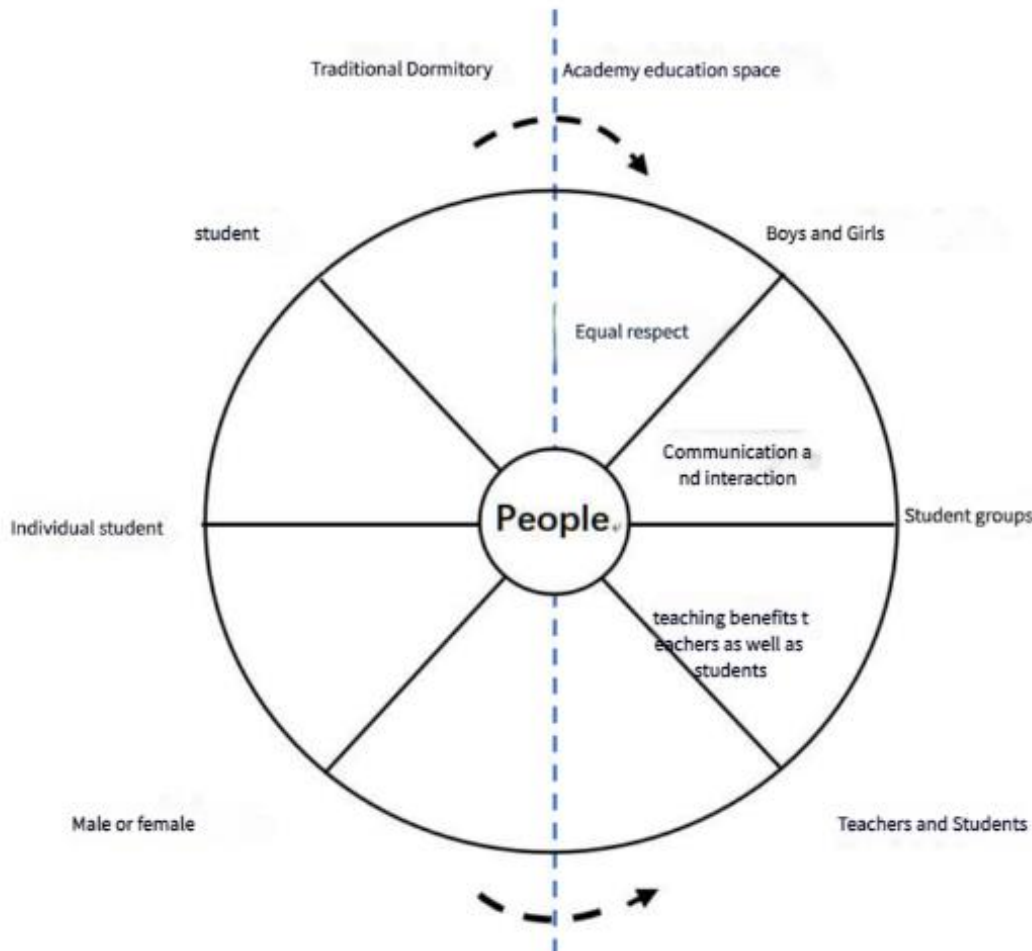


Figure 1: Indicating the Shift at the User Level with Arrows

Before discussing the creative design of spaces, it is essential to classify the types of spaces in residential colleges. Space can be divided into two categories: a narrow definition and a broad definition. Narrowly defined space refers to physical spaces—tangible or material structures or geographical features. Broadly defined space includes humans as the central subject, encompassing both physical and spiritual spaces (Chen, 2008). Physical spaces promote the frequency of "human-environment" interaction, while spiritual spaces enhance the quality of such interactions. The physical spaces in residential colleges are those constructed through architectural or landscape design, while the spiritual spaces are the shared cultural ethos and values collaboratively built by faculty and students. Since the functions of physical spaces often overlap—a single space might serve as a classroom, teaching space, or study area—it is impractical to classify these spaces solely by function. Instead, referring to the most common categorization of school spaces (Tang, 2010), residential college educational spaces are divided into static spaces, dynamic spaces, and intermediary spaces. Static spaces are primarily used for courses, lectures, and cultural activities. Examples include student activity rooms and lecture halls. Intermediary spaces serve leisure, social, and service functions, such as counseling rooms, seminar rooms, libraries, and broadcasting rooms. Dynamic spaces are designated for sports and physical activities.

The creative design of spaces in residential colleges can draw on Tang's (1999) six principles of campus creative design: novelty, adaptability, refinement, advancement, transformation, and ingenuity. Novelty involves using unique shapes, colors, or materials to craft innovative styles, while adaptability focuses on modifying or extending space functions to meet diverse needs. Refinement enhances space quality, and advancement enriches spaces by integrating new content across dimensions such as point, line, surface, and volume. Transformation addresses inherent spatial disadvantages, converting weaknesses into strengths, and ingenuity introduces unexpected features and functions, creating value from seemingly limited resources. By aligning these principles with the "residential college philosophy" and its distinct characteristics, the design of educational spaces becomes not only innovative and multifunctional but also tailored to the identity of the college and the needs of its students.

4.1 Creative Design of Static Educational Spaces in University Residential Colleges

Bennett highlights that a well-designed classroom environment can enhance the effectiveness and efficiency of learning objectives. Key physical factors contributing to a comfortable learning environment include climatic conditions, the types and arrangement of teaching equipment, spatial layout, the availability and placement of instructional materials, and other human factors (Huang & Ding, 1991, as cited in Tang, 2010). Static spaces serve as the physical carriers for general education and specialized courses in residential colleges and also as venues for student club activities or independent learning. Therefore, the design of static educational spaces must accommodate multiple functions, emphasizing both novelty and adaptability.

The style of static spaces can be tailored to their specific functions or to the distinctive characteristics of the residential college. For instance, styles may draw from traditional Chinese aesthetics, Western pastoral themes, or minimalist designs, aligning with the educational philosophy and developmental goals of the college. Wollin and Montage investigated the impact of classroom environmental design on university class performance. They compared a "monotonous classroom" with white walls, gray carpets, and plastic chairs to a "friendship classroom" featuring bright wall colors, a lively interior, and color-coordinated cushions and wooden benches. Their research revealed that students performed significantly better in the warm and inviting "friendship classroom" than in the "monotonous classroom" (Tang, 2010). Conversely, dull and uninspiring learning environments may negatively impact academic performance. In terms of interior color schemes, to prevent visual fatigue, cold tones should be minimized, with soft, high-reflectance colors being preferred (Tang, 2010). Furniture should be flexibly designed for mobility; options include chairs with writing surfaces or foldable desks and chairs. Teachers and students can rearrange furniture as needed for courses or activities into configurations such as "circles", "clusters", or "rows". Additionally, furniture design can embody "ingenuity" or "creation out of nothing", such as using wooden flooring or soft mats to allow participants to sit on the floor. For example, the Mountain Learning Center at Chengchi College features a multifunctional activity space where the wooden floor acts as seating, reducing the formal pressure often associated with traditional classroom settings (Chen et al., 2014). Such flexible or "out of nothing" arrangements enhance student participation in courses and activities, promote teacher-student interaction, and allow students to learn in a relaxed and comfortable environment, thereby enjoying the learning process. These spaces should also be equipped with essential tools like blackboards/whiteboards, audio systems, computers, projectors, and screens to provide optimal visual and auditory experiences. If the available static space in the residential college is insufficient to meet the needs of students and faculty, nearby spaces can be repurposed or connected to existing static activity spaces to alleviate spatial constraints within the physical limitations of the residential college.

4.2 Creative Design of Intermediary Educational Spaces in University Residential Colleges

Building close relationships with peers allows university students to share personal interests and activities, and to seek support when facing challenges. Establishing strong interpersonal connections is thus essential for university students (Qiu & Lin, 1999). One of the goals of residential colleges is to encourage interaction among students from different grades, disciplines, and genders, facilitating the exchange of diverse experiences and interests. By fostering mutual reliance among peers, students gain positive energy, learning to share, collaborate, accept differences, and manage their emotions effectively (Qiu & Lin, 1999). To promote the development of healthy interpersonal relationships and to meet students' needs for relaxation and social interaction, residential colleges should create intermediary spaces that serve as platforms for interpersonal engagement.

Intermediary spaces can be divided into indoor, semi-indoor, and outdoor categories, each serving specific purposes to support student interaction and well-being. Indoor spaces, such as counseling rooms, seminar rooms, libraries, and social lounges, are designed to facilitate teacher-student interactions, group discussions, independent study, and social activities in a comfortable and adaptable environment. These spaces should feature harmonious color schemes, flexible furniture for various configurations, and tools like whiteboards to support collaborative efforts. Semi-indoor spaces, including halls, corridors, and unused corners, can undergo adaptive transformations to enhance their utility, becoming reading corners, discussion areas, or green zones with appropriate furnishings and decorations. Through thoughtful design and adaptive use, intermediary spaces in residential colleges promote relaxation, meaningful relationships, and opportunities for personal and social growth.

4.3 Creative Design of Dynamic Educational Spaces in University Residential Colleges

Dynamic spaces are areas designed for physical activities, providing students with opportunities for exercise and recreation. Indoor spaces can be developed with equipment such as ping-pong tables, pool tables, and treadmills for students' use. However, in a confined physical space, creating large indoor sports facilities can be challenging. One possible approach is to employ the principle of "transformation", converting small, scattered, and underutilized spaces into functional areas for physical activity. Examples include vacant spaces near the residential college, courtyards, or wide hallways. However, safety regulations, such as fire codes, may restrict the placement of equipment in these areas. If the residential college and its immediate surroundings lack adequate space for sports facilities, alternative solutions

include developing outdoor sports spaces on nearby vacant lots. These external areas can then be linked with the residential college to create a cohesive network of dynamic spaces, collectively enhancing their educational and recreational value.

4.4 Creative Design of Spiritual Educational Spaces in University Residential Colleges

The creation of spiritual spaces enhances the functionality of physical spaces by fostering deeper engagement and interaction, transforming them into dynamic hubs of intellectual and social exchange. While physical spaces provide the infrastructure, spiritual spaces focus on strengthening connections between faculty and students as well as among peers, ensuring the full utilization of the environment. Activating spiritual spaces requires the implementation of supportive systems such as residential systems for governing living arrangements, curriculum systems aligned with the college's ethos, mentorship systems pairing students with faculty advisors, self-governance frameworks promoting student leadership, and cultural activity frameworks for organizing events and traditions. These institutional mechanisms enable residential colleges to support vibrant practical activities and foster meaningful relationships, contributing significantly to holistic student development.

5 Conclusion

This study, from the perspective of "human-environment" interaction, has explored the principles of creative design and the activation of educational spaces in residential colleges, focusing on static, dynamic, intermediary, and spiritual spaces. Static spaces, as the core of residential college education, require designs that accommodate diverse and flexible teaching activities. Modular and movable furniture should be utilized to support different scales and types of teaching needs. Additionally, integrating modern technologies such as smart boards and multimedia equipment can enhance teaching efficiency and engage students more effectively. The decor and layout of static spaces should reflect the cultural characteristics of the residential college, inspiring students' academic curiosity and exploratory spirit.

Dynamic spaces serve as vital areas for students' physical activities and recreational pursuits. Multifunctional sports facilities, including indoor gyms, swimming pools, and fitness centers, can address a variety of student exercise needs. The design of these spaces should prioritize safety and accessibility, ensuring that all students can easily use the facilities. By organizing sports events and wellness activities, dynamic spaces can also provide platforms for fostering teamwork and competitive spirit among students.

Intermediary spaces play a crucial role in residential college education by facilitating social and cultural exchanges. Creating diverse intermediary spaces such as cafés, lounges, and seminar rooms can encourage informal interactions among students. These spaces should be designed to be warm and inviting, promoting relaxation, discussions, and collaboration. Regular cultural events and social gatherings in these spaces can help students build friendships and expand their social networks.

The design of residential college educational spaces goes beyond constructing physical environments—it is also about cultivating culture and spirit. These spaces integrate traditional and modern, Eastern and Western educational philosophies, offering students a multifaceted learning environment. Within this environment, students can delve into academic research in static spaces, develop physical fitness and teamwork skills in dynamic spaces, engage in social and cultural interactions in intermediary spaces, and ultimately achieve self-awareness and social responsibility in spiritual spaces. As educational technology continues to advance and educational philosophies evolve, future efforts can focus on integrating the latest technologies into the design of residential college spaces and exploring how spatial design can further promote students' innovative thinking and lifelong learning capabilities.

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