ISSN 2663-1563 Vol. 7, Issue 2: 57-64, DOI: 10.25236/AJAGE.2025.070208

Exploration of Interactive Activities in Ambiguous Spaces within Tropical Universities: A Case study of Hainan University

Chen Zhenchen

Gold Mantis School of Architecture, Soochow University, Suzhou, China
3255712929@qq.com

Abstract: *The study investigates the role of ambiguous spaces in facilitating social interactions within tropical university campuses, using Hainan University as a case study. Drawing on environmental psychology and spatial theory, the research analyzes interactive behaviors—categorized as necessary, optional, and social activities—and examines how individual spatial preferences (peripheral orientation), group spatial dynamics (central clustering), and boundary perception influence behavioral patterns. The study clarifies the theoretical foundation of ambiguous spaces, tracing their origins to postmodern architectural discourse. These spaces are characterized by blurred boundaries and functional hybridity, with three primary typologies: introverted, extroverted, and independent. Their key functions include transitional connectivity, spatial emphasis, interaction stimulation, and functional adaptability. Empirical findings reveal distinct activity patterns among Hainan University students, highlighting a particular shortage of spaces for small-group interactions. Case studies of ambiguous spaces in libraries, teaching buildings, and concert halls demonstrate how vertical spatial sequencing, boundary softening, and functional blending effectively address tropical climatic conditions (high temperatures, strong solar radiation) while accommodating diverse social needs.*

Keywords: *Ambiguous Space; Tropical University; Social Interaction; Spatial Behavior*

1. Introduction

Since ancient times, humans have been a predominantly communal species, with extensive and frequent social activities permeating the entire history of human development. From early collective hunting behaviors to essential societal activities, interaction has played a significant role throughout. As society progresses, the demand for social interaction continues to grow, leading to higher expectations for the spaces that facilitate such activities.

In today's universities, where diversity and freedom are emphasized, the construction of public spaces has become increasingly important. Based on previous research and university infrastructure development, this study analyzes and categorizes ambiguous spaces, examining their role in higher education institutions—particularly in tropical universities.

Additionally, considering the regional climatic characteristics of Hainan, this research analyzes the types of public spaces at Hainan University, aiming to derive theoretical findings that can guide architectural practice. The ultimate goal is to meet students' diverse spatial needs for various forms of social interaction.With strong national support for cultural development, research on the construction of cultural buildings in universities is particularly crucial. Compared to ordinary buildings, campus cultural structures typically occupy larger areas, require significant funding, and demand considerable manpower and time for management. Therefore, thorough theoretical research is essential before construction.

Based on this, the study aims to achieve the following objectives:1) Theoretical Analysis and Design Guidance:through extensive case studies and comparisons of ambiguous spaces , this research seeks to summarize general methodologies, providing a foundational basis for future designs.The study will analyze student interaction activities at Hainan University and explore the integration of diverse public spaces. Additionally, it will attempt to incorporate public spaces into the traditional layout of concert halls, enhancing vibrancy and utilization efficiency.2) Practical Investigation and Functional Innovation:by conducting field research, this study aims to identify university students' needs regarding campus public spaces. Building on existing frameworks, it will explore functional improvements and innovations to better meet user demands.

ISSN 2663-1563 Vol. 7, Issue 2: 57-64, DOI: 10.25236/AJAGE.2025.070208

2. Analysis of Ambiguous Space

2.1 The Concept of Ambiguous Space

The term "ambiguous" implies indistinct contours, difficulty in identification, and lack of clarity. As the Tang Dynasty poet Cui Jue wrote in his poem Daolin Temple: “Where lies the city walls of Tanzhou? To the east, a stretch of hazy green” When something cannot be clearly discerned or accurately described, “ambiguity” becomes an apt characterization. The concept of ambiguity originates from postmodernist architect Robert Venturi's slogan “prefer ambiguity to clarity” [1]. In spatial design, architectural meaning is not exclusively conveyed through clearly defined functions or distinct forms; sometimes, ambiguous spatial experiences can evoke richer imagination. The ideal architecture precisely introduces this sense of ambiguity to mediate between indoor and outdoor spaces - blurring the boundaries between what appears to be interior yet is exterior, or vice versa - thereby creating an integrated spatial environment where transitions become seamless [2].

In the mid-20th century, Japanese architects proposed the theory of Grey Tone Culture, which included the concept of Engawa (edge space). This refers to an in-between space that mediates between indoors and outdoors, or public and private realms. It is neither fully interior (despite having overhead shelter) nor purely exterior (lacking clear boundaries). Due to its indeterminate nature—much like the grey tones between black and white in a sketch—it is also called dark space. Such spaces facilitate smoother integration between indoor and outdoor environments while their inherent ambiguity fosters spatial diversity, creating unique atmospheres that attract people[3].Conversely, if design focuses solely on functional zoning without considering spatial continuity, the result is a collection of isolated, rigidly partitioned spaces—each mechanically assigned a single purpose. This approach risks falling into a metaphysical fallacy, as human activities are inherently complex and multifaceted (e.g.drinking coffee while listening to music) [4].

Ambiguous spaces are characterized by the absence of clear boundaries or distinct contours separating them from other spaces. Their essence lies in their hybridity—between solid and void, indoors and outdoors, natural and artificial—producing an interlaced, dynamic effect.

2.2 The Evolution of Ambiguous Space

In traditional Chinese architecture, characterized by its timber-framed structures with the notable feature of "walls collapsing while the house stands intact," the non-load-bearing enclosures could be freely modified as long as the load-bearing framework remained sound. This unique structural characteristic allowed for significant development of ambiguous spaces throughout its architectural evolution.

In contrast, Western architecture witnessed the development of ambiguous spaces during ancient Greek and Roman periods. However, for an extended subsequent era, indoor and outdoor spaces became strictly demarcated. It was not until the advent of Modernism that ambiguous spaces regained momentum in Western architectural development[1].

Ambiguous spaces can be categorized based on their spatial orientation into three types: interior-oriented ambiguous spaces, exterior-oriented ambiguous spaces, and independent ambiguous spaces.

1) Interior-oriented ambiguous spaces:These spaces serve as extensions or complements to adjacent interior functional spaces. By eliminating clear boundaries with the interior, they effectively draw indoor spaces outward into the outdoor environment. A representative example is the main hall in Huizhou traditional dwellings, such as the JuAn Hall. While connecting various functional spaces within the dwelling, its open boundary facing the courtyard creates strong continuity with outdoor space, serving multiple purposes including receiving guests, hosting banquets, and family gatherings(fig 1-a).

2) Exterior-oriented ambiguous spaces:Unlike the first type, these spaces are not functionally dependent on adjacent interior spaces. Instead, they introduce outdoor elements indoors, creating new spatial relationships. Le Corbusier's Villa Savoye demonstrates this through its pilotis ground floor, where the incorporation of outdoor grassland makes the space distinctly exterior-oriented(fig 1-b).

3) Independent ambiguous spaces:These self-contained spaces develop their own unique functions. Traditional Chinese architecture offers two characteristic examples: the "surrounding auxiliary eaves" (as seen in the Hall of Holy Mother at Jinci Temple) that naturally mediate between indoor and outdoor environments while providing shelter; and the pavilions (ting) and waterside pavilions (xie) in Suzhou

ISSN 2663-1563 Vol. 7, Issue 2: 57-64, DOI: 10.25236/AJAGE.2025.070208

gardens, which accommodate specific functions like performances and landscape viewing(fig 1-c).

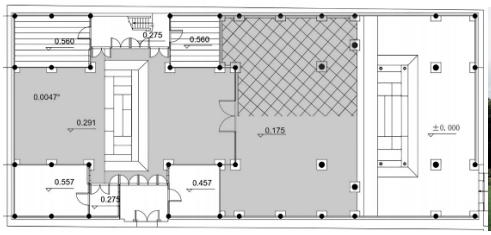

Figure 1-a Interior-oriented

Figure 1-b Exterior-oriented

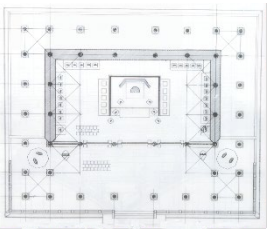

Figure 1-c Independent

2.3 The Functions of Ambiguous Space

2.3.1 Transitional Connection

The primary role of ambiguous space is to mediate and connect different functional spaces. Whether between physical and virtual spaces, indoor and outdoor environments, or between buildings themselves, these transitional zones not only facilitate functional transformation but also enrich spatial layers, modulate environmental atmosphere, and enhance spatial interest[5]. A typical example in tropical universities is the outdoor corridor, which bridges interior and exterior spaces while adding dimensional complexity.

2.3.2 Spatial Emphasis

When inserted into architectural designs, the indeterminate nature of ambiguous spaces creates deliberate contrast with adjacent well-defined areas, thereby accentuating specific spatial features. In public buildings, elements like open lobbies or entrance canopies strategically employ this principle to highlight gateway spaces.

2.3.3 Interactive Engagement

Ambiguous space design often **incorporates** "negative space" techniques. It also **encourages** users to rely on their subjective interpretation to complete spatial narratives. For example, design interventions such as partial walls, lattice screens, or strategic openings **provoke** curiosity. These elements **prompt** people to ask questions like "What lies beyond?" or "Where does this lead?" In this way, they **transform** passive observation into active spatial imagination.

2.3.4 Functional Adaptability

The inherent indeterminacy of ambiguous spaces enables remarkable functional versatility, allowing for continuous spatial reinvention. Tropical university campuses demonstrate this through adaptive reuse of elevated ground floors, which frequently transform into exhibition areas, performance venues, or other collective functions as needed.

3. Analysis of Interaction Activities in Universities

3.1 The Concept of Interaction Activities

Interaction refers to the complex and multifaceted process in which individuals engage in mutual exchanges, joint activities, and the development of physical and psychological connections under certain mental conditions[6]. In essence, social interaction serves as the primary means for people to exchange information, emotions, and material resources, acting as a crucial link and bridge between individuals and groups or among groups themselves.

Through continuous social interaction, individuals acquire and transmit knowledge, experiences, and emotional energy. In university settings, however, insufficient public spaces hinder student-student and student-teacher interactions, whether inside or outside the classroom. This deficiency negatively impacts both academic engagement and cognitive-emotional development. Therefore, regardless of perspective, expanding interactive spaces in universities is imperative.

3.2 Analysis of Behavioral Types

Based on “Livet mellem husene, udeaktiviteter og udemiljøer” [7], public activities of university

ISSN 2663-1563 Vol. 7, Issue 2: 57-64, DOI: 10.25236/AJAGE.2025.070208

students can be categorized into three types:1) Necessary activities:those that occur under all circumstances, such as attending classes.2) Optional activities:those that occur when people have the desire and suitable conditions, such as reading or contemplation.3) Social activities:those that require participation from others, such as conversations or group discussions.

The study primarily focuses on the latter two types (optional and social activities) for research and design considerations.

3.3 The Interrelationship between Environmental Psychology and Behavior

Environmental psychology primarily examines the interaction between external environments and human psychology, ultimately influencing individual or group behavior—studying these two elements as an integrated system. In daily life, it is evident that specific environments often elicit characteristic behaviors.Students frequently stroll, jog, or even fish by the lake during dusk or evening hours.In transitional spaces in Building, spontaneous activities such as group discussions or memorization exercises commonly occur.These observations demonstrate that understanding user psychology is essential when designing student-oriented public spaces.

3.3.1 Personal Space Usage

When individuals occupy a space independently - whether standing, sitting, or crouching - they instinctively maintain a specific interpersonal distance at the micro-level. Maintaining appropriate personal space contributes to comfort, with the required distance being influenced by multiple factors: primarily environmental characteristics such as population density and cultural background; secondly by the nature of the activity itself (for instance, walking generally requires less personal space than reading or contemplation); additionally, sociocultural factors like gender and ethnicity also demonstrate significant influence[8].

Compared to group activity spaces, personal activities exhibit a distinct peripheral spatial preference. This spatial selection pattern stems from both physical space requirements and users' psychological needs. Multiple spaces validate this phenomenon: in the library, reading tables and chairs are predominantly arranged along side walls, while in the north building's entrance hall, seating near the periphery shows noticeably higher utilization than central areas; similarly on the athletic field, individual activities occur more frequently along the edges rather than the center. This edge-preference spatial pattern reveals the underlying need for territoriality and security in personal activities.

3.3.2 Group Space Utilization

Group spaces exhibit distinct spatial patterns due to their inherent nature as accumulations of multiple personal spaces. While constrained by spatial requirements, these collective spaces tend to occupy more central locations in areas where various activities congregate. This fundamental characteristic necessitates special consideration during the design process.

The spatial dynamics of group usage present unique design challenges:The composite nature of group spaces (as aggregations of individual spaces)Their tendency to dominate prime locations in activity hubsThe need to balance spatial efficiency with functional requirements

These factors collectively underscore the importance of prioritizing group space design in campus planning, particularly in tropical university settings where social interaction patterns may differ from temperate regions due to climatic influences on outdoor space utilization.

3.3.3 The Sense of Boundary

The concept of boundary naturally emerges from spatial interactions, serving as a critical element that delineates users' activity ranges. This observation underscores the importance of intentional boundary creation in design practice.Various techniques can be employed to establish effective spatial boundaries:level changes through elevation differences;material transitions and variations;differential ceiling heights;visual markers and thresholds;lighting variations;vegetation screens.

4. Analysis of Ambiguous Spaces in Tropical Universities

This study focuses on Hainan University as a representative case of tropical universities, drawing from the author's undergraduate experience there. Through an examination of various ambiguous spaces across the campus, we explore how these architectural elements facilitate different types of social

ISSN 2663-1563 Vol. 7, Issue 2: 57-64, DOI: 10.25236/AJAGE.2025.070208

interaction.

4.1 Climatic Characteristics of Hainan Island

Situated at the northern edge of the tropical zone, Hainan Island experiences a distinctive tropical monsoon climate marked by consistently high temperatures with long summers and no winter, averaging 22-27°C annually. The region enjoys abundant sunshine, receiving between 1,750 to 2,650 hours of sunlight each year, while persistent sea breezes from regular monsoon patterns significantly influence local environmental conditions. These climatic factors make semi-sheltered ambiguous spaces - those providing shade while permitting airflow - particularly well-suited for the region's resting and gathering needs.

4.2 Analysis of Activity Spaces at Hainan University

4.2.1 Student Activity Patterns

Field research conducted with a sample of students reveals that individual activities significantly outnumber group activities in frequency (Table 1). This observed decline in participation rates as group size increases reflects natural social patterns. The study identifies three categories of campus activities based on spatial requirements: highly flexible activities like walking and sightseeing that can occur in most environments; moderately flexible activities including reading and social gatherings that have adequate dedicated spaces; and structured activities such as group meetings and small lectures that currently lack sufficient appropriate venues.

Table 1 Distribution of Student Activities at Hainan University

Activity Type	Percentage
Individual Activities	62.36%
Small Group Activities (2-7 participants)	30.27%
Medium/Large Group Activities	7.36%

These findings suggest that while individual activity spaces are well-provided for, the campus would benefit from targeted interventions to better support small-group interactions. The data particularly highlights a need for more intentional design of spaces accommodating 3-8 participants, as these currently represent the most underserved activity type. This spatial gap affects both formal academic collaborations and informal social exchanges, suggesting opportunities to enhance the campus's social infrastructure through carefully integrated small-group zones that complement existing facilities(fig 2).

Figure 2 Student Activity Patterns

4.2.2 Analysis of Personal Activity Spaces

Due to their small space requirements and high flexibility, personal activities can utilize various public spaces across campus. Students may choose to read in classroom building study areas, dormitory lounges, or at stone tables around the Origin Lawn. This ubiquity suggests that personal activity spaces are relatively sufficient. Therefore, design strategies should focus on integrating personal spaces within group activity areas to optimize spatial efficiency.

4.2.3 Analysis of Group Activity Spaces

1) Small Group Activities (2-7 participants)

Small group activities demand more space than individual activities but less than large-scale events. Field research revealed that existing large activity spaces are often informally subdivided for small group use, leading to disorganized layouts and inefficient space utilization (Table 2). To address this, small group spaces require intentional design with soft boundaries (e.g., movable partitions, subtle level changes) to create orderly yet adaptable subspaces within larger areas.

ISSN 2663-1563 Vol. 7, Issue 2: 57-64, DOI: 10.25236/AJAGE.2025.070208

Table 2 Types and Locations of Small Group Activities

Activity	Percentage (Multiple Responses)	Typical Locations
Discussions	27.27%	Cafeteria, athletic field, Lawn, classrooms, Tourism College café, etc.
Board Game	81.82%	
Casual Chat	72.73%	
Meetings	27.27%	
Dating	10.65%	
Other Activities	75.65%	

2) Medium/Large Group Activities

These less frequent activities are generally accommodated by existing large spaces on campus. Design improvements should focus on targeted supplements, such as dedicated areas for movie screenings or small lectures, to enhance functionality without major spatial reorganization.

4.3 Analysis of Ambiguous Spaces in Hainan University

4.3.1 Analysis of Ambiguous Spaces in Library

Located on the eastern side of Hainan University adjacent to Dongpo Lake, the library's design incorporates numerous ambiguous spaces that thoughtfully respond to Hainan's windy and hot climate while capitalizing on its lakeside location. The western elevated section serves as a transitional zone connecting the outdoor plaza with the ground-floor open space, creating a versatile area that accommodates multiple functions. This space adapts to various needs - functioning as a student relaxation area complementing the adjacent coffee shop during regular periods, while transforming into an exhibition space for architecture graduation projects during commencement season.

The eastern ground-level section demonstrates particularly effective climate-responsive design. Its position between the lake and central courtyard creates strong natural ventilation (stack effect), making it ideal for outdoor study spaces. These ambiguous spaces utilize microclimate regulation to achieve thermal comfort while maintaining strong visual and physical connections with the natural environment. The design successfully merges passive cooling strategies with functional flexibility, creating areas that are both environmentally responsive and socially vibrant(fig 3).

Figure 3 Ambiguous Spaces in Library

4.3.2 Analysis of Ambiguous Spaces in Teaching Buildings and Dormitories

The teaching buildings and dormitories primarily consist of homogeneous functional spaces, with their ambiguous spaces mainly comprising outdoor corridors and locally enlarged areas. These design elements serve multiple purposes beyond their basic functions.

The outdoor corridors perform dual roles as transitional zones between indoor and outdoor environments while also accommodating display functions. A characteristic example can be found in Building No. 4, where the corridor adjacent to architecture department classrooms has been adaptively used as an exhibition space for outstanding student works. The enlarged terminal spaces at corridor ends have been spontaneously appropriated by students as informal interaction areas for after-class socializing.

In dormitory buildings, while the corridors themselves see limited utilization, the strategically placed enlarged spaces have been effectively repurposed to meet various student needs. These areas naturally

ISSN 2663-1563 Vol. 7, Issue 2: 57-64, DOI: 10.25236/AJAGE.2025.070208

evolved into study corners, relaxation zones, and even makeshift fitness spaces, demonstrating the flexible nature of such ambiguous spaces in residential academic environments(fig 4).

Figure 4 Ambiguous Spaces in Teaching Buildings and Dormitories

4.3.3 Analysis of Ambiguous Spaces in the Concert Hall

The Norwegian architectural theorist Christian Norberg-Schulz's concept of "genius loci" posits that a place is formed through the integrated combination of various tangible elements in space - including form, material, color, and light[9]. The organic integration of these elements creates a distinctive "environmental character," which constitutes the essence of a place. He particularly emphasizes that "character" manifests the atmosphere of space, and the treatment of boundaries is key to shaping spatial character - different boundary design approaches can endow spaces with completely different personalities.

Based on this theoretical understanding, the concert hall design places special emphasis on functional diversity when incorporating public spaces to stimulate place vitality. Simultaneously, considering the practical aspects of long-term operational costs, the design scheme divides the building into northern and southern volumes: the southern volume serves as a professional concert hall that can also open to the public during non-performance times, while the main public functional spaces are concentrated in the northern volume for long-term public operation. Spatially, a vertical sequence layout is adopted, gradually transitioning from larger public areas to smaller private spaces, forming a well-defined activity flow (Fig5-a). This layout not only meets the spatial requirements of different types of interactive activities but also achieves operational efficiency through clear public-private zoning.

The ground floor is designed to accommodate cultural exhibitions during concert hall events while serving as a circulation hub. Its open layout facilitates crowd flow and blurs the boundaries between interior and exterior spaces, seamlessly integrating outdoor views. The vertical connection is achieved through an expanded stairway volume that dissolves the division between the first and second floors, creating an impressive public space (Fig5-b). The area beneath this grand staircase features a 45cm depression that, combined with the stair's elevation, provides a comfortable 2.1m-3.0m clear height suitable for seated student activities.

Figure 5-a Ambiguous Spaces in Concert Halls Figure 5-b Ground Floor Ambiguous Spaces of Concert Halls

The second floor is conceived as an intermediate zone between public and private realms, deliberately designed as a flexible public space with varied boundary treatments that create distinct spatial experiences. The north side features an open glass curtain wall that maintains visual connections to the outdoors while establishing perceptible boundaries, resulting in dynamic spatial atmospheres that naturally accommodate different uses. In contrast, the south side employs dark wood paneling to create

ISSN 2663-1563 Vol. 7, Issue 2: 57-64, DOI: 10.25236/AJAGE.2025.070208

a stronger sense of enclosure and security, making it ideal for more private individual or small group activities. The western side overlooks the double-height space, allowing visual interaction with the ground floor while offering premium views, particularly suitable for open small group gatherings (Fig6-a).

At the third floor, which serves as the elevated entrance to the 200-seat theater, the design provides both gathering space and visual connectivity through a central void that links to the second floor. This configuration generates several medium-sized linear spaces that are perfectly proportioned for small to medium group activities (Figure6-b). Throughout all levels, the architecture successfully balances functional circulation needs with the creation of socially engaging spaces, demonstrating a thoughtful integration of spatial organization and user experience.

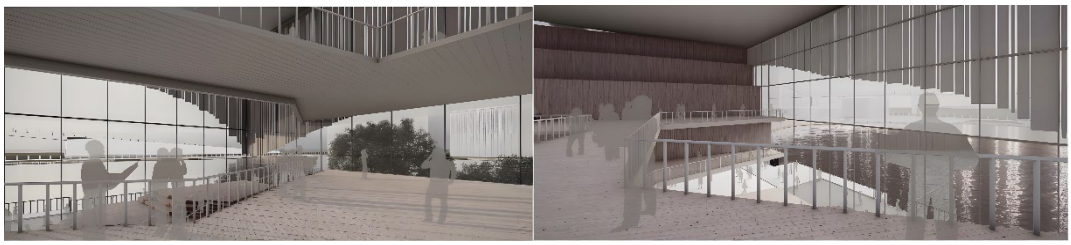

Figure 6-a Second Floor Ambiguous Spaces of Concert Halls Figure 6-b Third Floor Ambiguous Spaces of Concert Halls

5. Conclusions

The study examines the crucial role of ambiguous spaces in facilitating campus social interactions, with a focus on the concert hall at Hainan University as a representative case in tropical higher education institutions. Through analyzing usage patterns of different spatial typologies (individual activity spaces, small group activity spaces, and medium/large group activity spaces) and considering Hainan's unique climatic conditions, the research proposes several design strategies for ambiguous spaces, including transitional connections, functional intensification, creation of engaging environments, and spatial versatility.

The findings demonstrate that ambiguous spaces significantly enhance spatial flexibility and adaptability to meet students' diverse social needs. In the concert hall design, the implementation of vertical sequential organization, blurred boundary treatments, and functional hybridization has not only optimized spatial efficiency but also enriched the vibrancy and interactivity of the place. Furthermore, well-designed ambiguous spaces effectively respond to tropical climate characteristics, creating comfortable and pleasant campus environments that harmonize with their surroundings.

References

[1] Li L, Fan M J. Historical Development and Contemporary Significance of Ambiguous Space[J]. Art and Design (Theory), 2010, 2(05): 113-115.
[2] Fujimoto, Sou. When Architecture Is Born [M]. Translated by Guangxi Normal University Press, 2013.
[3] Kisho K. Japanese Gray Tone Culture[J]. World Architecture, 1984(Special Issue):6.
[4] Lin S J, Fu Z Q. Analysis of the Influence of Ambiguous Space on Modern Art Museum Spaces[J]. Architecture & Culture, 2022(06):55-57.
[5] Zhi Y J, Liu W. Analysis of Spatial Ambiguity in Contemporary Sports Building Complexes[J]. Urbanism and Architecture, 2023, 20(03):199-201.
[6] Hu Q M, Jiang C F, Mei Y. Encyclopedia of China[M]. Beijing: Encyclopedia of China Publishing House, 2007: 23-26.
[7] Gehl, J. Livet mellem husene, udeaktiviteter og udemiljøer. Danish Architectural Press, 1971.
[8] Feng H M. Analysis and Research on Interactive Spaces Inside University Teaching Buildings Based on Human-Environment Behavior[D]. Changsha: Hunan University, 2011: 25-30.
[9] Zhou M Z. Research on Museum Space Design Based on Architectural Phenomenology[D]. Xuzhou: China University of Mining and Technology, 2021.