Research on the Perception of University Students' Urban Environment Based on Cognitive Maps——Take Jinan City as an Example

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Abstract. This article takes the university students’ spatial cognition information of the city where the school is located as the research object, and takes time development as the cut-in angle. Through the classification study of the cognitive map, the analysis of the characteristics of the university students’ cognition of urban environment and the causes of their influence are found. In the process of transforming from the tourist perspective to the local perspective, the frequency of cognitive elements changes, that is, the cognitive characteristics from scattered to structural, and finally proposes urban environment development planning recommendations based on readability.

1 Introduction

The concept of urban image originated in the 1960s. Kevin Lynch [1] introduced the concept of image in psychology into urban space research, that is, residents form a direct or indirect empirical cognitive space for the city, and cognitive maps serve as An important research method of urban imagery, which specifically visualizes the subjective image of people’s perception of space, and becomes an object that can be measured and analyzed. The rationality of urban spatial layout is discussed from the user-human perception of space as a starting point for research. An effective means of urban space perception.

In the early stage of China’s urbanization construction, the urban spatial structure is in a perfect period, and the imageability of the urban spatial structure is of great significance to citizens’ perception of the city. Early domestic research on urban space perception mainly used the five elements of urban image as a classification method, focusing on large cities, and studied the urban image of residents, starting from the structural urban image, emphasizing the fixed, clear and feasible urban spatial structure. Follow. For example, Li Yun et al. [2] (1993), Lin Yu-lian [3] (1999), Gu Chao-lin et al. [4] (2001) studied the spatial structure of cities such as Guangzhou, Wuhan, and Beijing.

Different groups of people have different social attributes in the city and are located in different geographical locations. They will have different perceptions of the city, and accordingly have different interpretations and needs of the city. Therefore, the people who perceive the city space should be targeted. The city is in a process of dynamic change. People’s perception of the city’s imagery is constantly improving and changing. Especially in the context of the increase of the floating population in contemporary cities, the city can enable citizens to form a clearer and continuous image of the city is of great significance for citizens to have a sense of security and belonging in urban life. Generally speaking, although domestic research on urban space perception has been continuously advancing in recent years, there are still shortcomings: 1. In recent years, research on urban space
perception has mostly come from the perspectives of tourism and geography, and in urban planning. Research has stagnated; 2. Research on urban imagery is mostly based on Kevin Lynch’s classification of the five elements of urban imagery, analyzing the structure of urban space, and lack of thinking about the significance of urban space; 3. In previous studies, the selection of the research object is relatively random. Although there is a research on the college student group afterwards, it ignores the impact of the psychological change of the college student group on the perception of urban space. In view of this, this article takes the special group of college students as the research object and takes the time series as the perspective to explore the characteristics of college students' perception of urban space, and analyze the influence of the subject population and the object city factors on the perception of urban space.

2. Research objects and data collection

2.1 Research subject
The main campus of the University of Jinan is located in Shizhong District Administrative District, Jinan City. The research object of this survey is the freshman to the third year of Jinan University. Their spatial perception of the city shows a certain degree of particularity relative to urban citizens and tourists: 1. College students are generally between 18 and 22 years old. At the same time, the cognition of self and society is in the stage of growth and improvement, and there is a strong desire to explore the outside world; 2. Most of the urban migrant population, there are students of different age groups from freshmen to seniors and graduate students. Spatial perception is in the process of first getting to know it; 3. A university campus can also be regarded as a micro city, college students can meet their various life needs inside the school, so the purpose of travel is relatively single; 4. The social attributes of college students are relatively single. The characteristics of the group are obvious, and the differences within the group can be followed.

2.2 Research object
Jinan, also known as Spring City, is the capital of Shandong Province, a sub-provincial city, and a megacity. According to the seven-population data, as of 0:00 on November 1, 2020, Jinan has a permanent population of 9.202432 million. As of 2019, the built-up area is 760.6 square kilometres, Jinan is a tourist city with unique features of "mountains, springs, lakes, rivers and cities" due to its numerous springs. It is a national historical and cultural city and the first batch of excellent tourist cities in China.

2.3 Data collection
A data collection method combining questionnaires and cognitive maps is adopted. The content of the questionnaire is divided into two parts: personal attribute information and Jinan city image. The city image part stipulates that the respondent shall not refer to the standard map, and hand-paint the Jinan image map based on personal impressions and memories. The questionnaire was divided into two stages. In the first stage, 50 questionnaires were distributed on the campus of Jinan University through random sampling for pre-investigation. Based on the preliminary analysis of the results, the content of the questionnaire and the form of questionnaire distribution were carried out. Adjustments were made to ensure the validity of the results. In the second stage, 224 questionnaires were distributed, with 148 valid questionnaires, of which boys accounted for 52% and girls accounted for 48%, covering more than 40 majors. A total of 18 questionnaires for local college students in Jinan were collected, accounting for 12%, non-Jinan A total of 130 local college student questionnaires were collected, accounting for 88%. In the non-local college student questionnaire, freshmen accounted for 11%, sophomores 24%, juniors 41%, and seniors 17%, graduate students account for 7%. The basic information collection result of the questionnaire is ideal.
3. Analysis on the characteristics of college students' perception of urban space

3.1 Most of the lower grades are scattered, with markers as the dominant element
Through the classification of the cognitive maps of college students and the classification statistics of the five elements of urban imagery, it can be found that in the lower grades from freshman to junior year, the weight of scattered cognitive maps is relatively large, and mixed cognition in the senior year has increased significantly, and the proportion has increased significantly. At the same time, college students mostly use landmarks as the dominant element in the image of Jinan City. Among them, the proportion of scenic spots in the landmarks occupies an absolute position. The total cognitive frequency of all image elements among non-local college students is 7.56 per person, the sum of the cognitive frequency of all image elements in local college students is 8.65 per person, which shows that it is at a low level, indicating that the college students’ perception of space in Jinan is imperfect, and the cognition and memory of the city are fragmented. The perception of structure and meaning is uneven. Especially among non-local college students, they are lazy in cognition of regional types, and their perception of roads is obviously insufficient.

Compared with the results of early domestic scholars’ research on the five elements of urban imagery, the proportion of college students' cognitive frequency of roads in the spatial cognitive map of Jinan is low, and the proportion of cognitive frequency of regions and landmarks is higher. The reason for thinking is that the expansion of modern cities has made the urban space lose the scale of human beings. The construction of road space pays more attention to the efficiency of vehicles instead of human perception needs. In recent years, the emergence and popularization of various information technologies, such as the use of traffic navigation, has enabled citizens to establish indirect ways of cognizing space through electronic devices during spatial movement, resulting in structural lack of knowledge in spatial cognition. The performance is particularly remarkable in the group.

3.2 From area to road
From the change trend of cognitive map types of each grade and the change trend of cognitive frequency of roads and regions, it can be found that the cognition of urban space in the freshman to sophomore stage is mainly based on the regional form. This cognitive model in the sophomore stage reached its peak, presenting the basic embryonic form of the cognitive map of Jinan's administrative divisions. The awareness of road elements has increased significantly since the sophomore year, and has continued to improve, reaching a peak in the senior year. It shows that the college students’ cognition of the urban spatial structure starts from the region, and after the initial establishment of...
structural spatial cognition, the cognition of road elements is increased to enrich and superimpose the image of the city, forming a deeper cognition. Region is an important image element for the group who are new to the city to recognize the city, so as to establish the spatial structure and boundary of the city, and the road is the important city image for people to further refine the urban space and form a more complete and rich urban image. Elements.

3.3 Changes in urban spatial perception intensity are related to changes in mental state

3.3.1 The intensity of spatial perception at each stage of the school year is related to the mental state of college students at different stages

Undergraduates are in a period of large fluctuations in their psychological state, and the intensity of urban space perception in each period has a greater correlation with the psychological state at this stage, especially in the changes in the cognitive frequency of the place destination image elements. The freshman to sophomore stage of college students is the exploratory stage, and the desire to obtain external information is stronger, the perception of urban space is stronger, and the frequency of cognition of various image elements of the city has a greater increase; sophomore to junior year The school life of college students has gradually stabilized, and the focus of the student group has begun to develop inward, and their travel frequency is less, so the perception of urban space is weakened, and the cognitive frequency of various elements has shown a trend of decreasing growth rate; The school life of juniors to seniors is relatively stable. The focus of attention develops from the inside to the outside, and the frequency of travel has once again increased. The spatial perception of Jinan is approaching localization, especially in the Yellow River, southern mountainous areas and other Jinan urban areas. Increased awareness of peripheral elements.

3.3.2 The focus of spatial perception at each stage of the school year is related to the mental state of college students at different stages

![Diagram showing differences in cognitive frequency changes of meaningful city image subcategories for each grade](image.png)

**Figure 2:** Differences in cognitive frequency changes of meaningful city image subcategories for each grade (painted by the author.)
The city where the university is located is not necessarily a long-term stable city for university students. Therefore, for university students, the cognition of the city is different in the beginning, middle, and end of the process of studying. By analyzing the changes in the cognitive frequency of each element in each grade and the previous grade, it can be found (Figure 2): In the freshman year, except for the cognitive frequency of image elements that are not obvious and have little significance for natural features and regional features, the frequency of awareness of other elements is more comprehensive; freshman to sophomore years of the third similar elements (commercial and entertainment, other public buildings, areas). The cognitive frequency of image elements of administrative regions and natural features has increased, while the cognitive frequency of similar elements of the first type (spots, traffic nodes, roads) has shown a downward trend; the second to third stage except for natural In addition to the weaker increase in the cognitive frequency of styles and features, the changes in the cognitive frequencies of other elements show the opposite trend from the freshman to sophomore stage; the senior year's changes in the cognitive frequency of each image element appear more comprehensive. Development, the cognitive frequency of each category of image elements has been improved, but for administrative regions has been reduced.

Excluding the particularity of individual changes in special image elements at a certain stage, it can be found that in the freshman and senior year, that is, the beginning and end of the university period, college students have a more comprehensive perception of various image elements in the city; 2. The two stages from sophomore to junior year, and the middle stage of the university period, focus on the perception of various image elements of the city, the freshman to sophomore stage focuses on the perception of the third type of similar elements, sophomore to junior Then the stage focuses on the perception of similar elements of the first category. It can be explained that the psychological changes at the beginning, middle and end stages have a certain influence on the perception of urban space of college students.

3.4 Coordinated development of non-destination image elements and destination image elements, unbalanced cognitive frequency

By categorizing the change trend of urban image elements from freshman to senior year, it can be found that the non-destination image elements of each stage have their own corresponding destination image elements, that is, every structural image element has The meaning-based image elements as a correspondence show similar laws in the process of spatial perception, and the correspondence between non-destination image elements and destination image elements has also changed in different stages. Specifically, the changes in the image elements of roads and traffic node destinations from freshman to senior year show greater similarity; while commercial and entertainment, other public buildings, and regional changes from freshman to junior year and administrative districts The trend is similar, and in the senior stage, it shows a higher similarity with the road.

The non-destination image elements and the destination image elements each represent the structure and meaning of the city image, and the cognitive frequency of the two should be in a relatively balanced state. By comparing the cognitive frequency of the two types of elements between local and non-local college students, it is found that the local college students’ cognitive frequency of the destination is less than that of non-local college students, but this does not conclude that local college students’ cognitive level of destination image elements is weak. For non-local college students, it is the more mature performance of local college students’ perception of the city, which also reflects the excessive dependence of non-local college students on the image elements of destinations in the city.

3.5 The student stage basically completes the transformation from the perspective of tourists to locals

Through the comparison of the cognitive frequency proportions of various image elements of freshman and senior year (Figure 3), it can be found that the major types of elements (destination image element, destination image element) of freshman and senior year do not account for basically There is no change; the proportion of functional destination image elements in the medium category has increased, while the proportion of place destination image elements has decreased; in the small
category image elements, the proportion of various elements in the freshman period is relatively unbalanced, and the various elements in the senior period The proportion of elements is more balanced, and the changes are mainly manifested as: the proportion of scenic spots has decreased, and the proportion of image elements commonly present in cities such as natural style, traffic nodes and other public buildings has increased. It can be explained that the urban spatial perception of the freshmen to the seniors has gradually completed the transformation from the perspective of tourists to locals.

Figure 3: Percentage of Cognitive Frequency of Freshman and Senior Four Elements (The author's self-painted)

4. Analysis of influencing factors of urban space perception

4.1 Main population factor analysis
People’s spatial perception of the city is affected by factors such as age, gender, social attributes, geographic location, length of residence, and even psychological state. There are differences in spatial perception capabilities, perception intensity, perception methods, and the focus of urban spatial elements. College students are in their twenties, they have a higher desire to explore the outside world, and their psychological state fluctuates greatly. The change in the cognitive frequency of the image elements of each city is more significant from freshman to senior, and it is more relevant to college students. The cognitive frequency level of large image elements is higher. For example, in other public buildings, the cognitive frequencies of Shandong University, Shandong Normal University, and Shandong Jianzhu University are 8.8%, 5.4%, and 3.4% respectively. In the category of image elements of public buildings, their cognitive frequency levels account for the top three. ; For the category of cultural and sports imagery elements, such as Shandong Museum, Jinan Zoo, Olympic Sports Center, Shandong Art Museum, Quancheng Park, the recognition frequency has increased from freshman to senior year. In addition, as a migrant population in the city, the cognition frequency and other factors of the university student population of various scenic spots in Jinan (Daming Lake, Quancheng Square, Baotu Spring, Qianfo Mountain, Furong Street, Kuanhouli, Quancheng Road Commercial Pedestrian Street, etc.) Compared to show a higher value.

4.2 Analysis of object city factors
The cognitive environment is usually a pictorial, simple, abstract, incomplete, distorted or vague presentation of the objective world. The image of the city is the result of the combined action of the urban spatial form and the inner perception of people. The administrative divisions of Jinan City are relatively clear. The main roads are laid out in a chessboard pattern, divided by latitude and longitude,
and are often distributed across districts. The city center and main tourist attractions are located in the center of the city. In the cognitive map, the cognitive maps of the lower grades mostly rely on administrative divisions to recognize the city. There are cognitive map forms with grid-like composition, and they have a better understanding of administrative regions and roads. Split, different grades show greater differences in the cognitive frequency changes of administrative areas and roads, and the cognition of the city center is relatively complete. It is shown in the cognitive map that there are multiple existing schools and surrounding areas. Cognitive map types of the two major districts in the city center.

5. Conclusion

This paper takes the special group of college students as the research object, and takes the time series as the cut-in point of view. It finds the problems existing in the urban space from the perspective of "people" and puts forward corresponding suggestions: 1. The loss of the humanization of urban road space design makes the roads difficult. Cognition becomes difficult. It is necessary to return to the human perspective in future urban planning and urban design, focusing on optimizing roads at a human-friendly scale; 2. In the context of modern network technology, structural urban imagery has with the aid of information technology. The cognition level of college students has a relatively lower trend, while the cognition level of meaning-type image elements has increased. This requires the balanced development of two types of image elements in urban space design. 3. Scenic spots in the urban space are the first recognized urban image for the migrant population in the city, and they are also the display of the city's regional characteristics. Its experience greatly affects the citizens' evaluation of the urban space environment; 4. Culture and sports category The cognitive frequency of image elements in all stages of college students has shown an upward trend, indicating that college students have continuous needs in social interaction, cultural education, sports activities, etc., and it can be considered to increase this type of building in future urban construction, and the construction of urban public space.

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