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Exploring the New Space of Education in China in the 21st Century based on the Heuristic Penetration Teaching Method

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ABSTRACT

The rapid development of China in recent decades has led to qualitative changes in people's lives, and they are facing new ways of living and thinking. In this context, this study will explore what kinds of buildings and spaces and urban states are changing with these changes, what will change, what architects can do about these changes, and what attitudes they should have towards these changes. This study comes from the open architecture design course of the author's Chang'an University School of Architecture 2021, which is taught by architect Mao Lei, a graduate of Belgrade, and draws on the classic heuristic and penetrating teaching methods of the Belgrade School of Architecture to train students in the comprehensive ability to identify and solve problems in the design process. Cram school space is an important part of Chinese educational space, a spatial product born in the special political and economic environment of China since the 2nd1 century. This study summarizes in detail the origin, current composition and development of Chinese tutorial spaces in the current historical environment, and describes their spatial characteristics using rigorous engineering cartography. Through systematic comparison and analysis of research results, a comprehensive understanding of the scale and characteristics of this type of space complements and completes the design architecture of existing educational spaces in China, and is of great significance in promoting architectural design that is compatible with social development

Keywords: New space in Chinese education, Heuristic permeable teaching methods, Typology

INTRODUCTION

Since the reform and opening up at the end of the century and the resumption of the college entrance examination system, China's education system has been further developed and improved, and the positive correlation between education and employment has led people to devote themselves to the pursuit of better qualifications. Cram schools only formally appeared in the 21st century, and their emergence implies the demand for education beyond school education and the society's demand for diversity of talents. This study focuses on the origins of educational spaces and classifies them according to the types of extracurricular educational spaces available today.

The scale of space, human activities and architectural design theories are changing with the development of society. Studying the current changes in

society and the new activities and spaces can help us to supplement the existing theoretical system and thus promote the development of social productivity. The author attempts to summarize, analyze and deconstruct the urban living space under this phenomenon through the method of "design-research", while comparing the standardized educational space horizontally, summarizing the similarities and differences between the two, and based on the results of the research and analysis based on the results of the research and analysis, the reconstruction of the space for remedial education is realized by means of architectural design.

RESEARCH PATH

Identifying the Study Population

First, the architectural environment space of cram school was identified as the research theme. The theme of the course is "New Life, New Space, New City: China in the 21st Century", which requires a search for new architectural spaces that emerged in the second1 century, when cram schools emerged in the early second1 century and have grown rapidly in the last decade.

Framing the Study

In this phase, the authors will conduct a research framework on the history and typology of cram school space, based on which information collection and spatial internal scale research will be conducted. In terms of historical tracing, a systematic summary and study of educational spaces in China is needed. Cram schools emphasize not only their educational nature but also their profitable nature, and there are more types, which need to be classified and compared in detail.

Research and Information Gathering

After completing the construction of the framework, according to the classification content in the existing framework, the author researched and studied the tutorial space through channels such as online collection of information and offline actual visits and research.

Spatial Feature Generalization and Analysis

After completing the research, the author summarized the results of the research and used CAD to draw engineering drawings such as floor plans and axonometric drawings, thus expressing its spatial characteristics and scale. Based on the results of this phase, the tutorial space is summarized in terms of its scale and spatial characteristics.

Design and Drawing Representation

The design of the building is based on the preliminary study, and at this stage the emphasis is no longer on the connection between the building and the outside, but on the organization of the internal space of the building, and the design may not consider the landing of the design. The design theme is highlighted through the emphasis on the space of the tutorials.

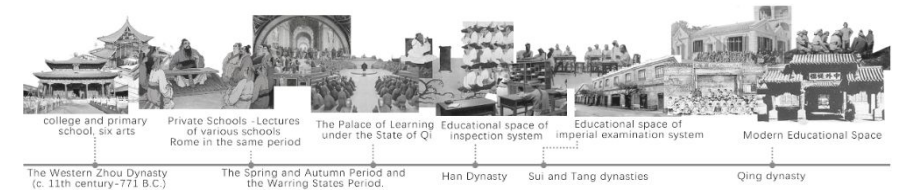


Figure 1: History of China's education space development.

RESEARCH CONTENT

History (Figure 1)

As one of the four ancient civilizations, China's education system has evolved over thousands of years, and thus has developed its own unique form of space.

A system of talent training was established from the time of the Emperor of the Zhou Dynasty (B.C.1046 – B.C256). The early education system was biased toward noble education, and the official academies were mainly for the nobles to study. During the Spring and Autumn and Warring States Periods (B.C770.-B.C221), ideas were further opened up and a hundred schools of thought emerged, with Confucius starting a style of private lectures and advocating benevolence, righteousness, propriety, wisdom and faith. He had 3,000 disciples, of whom 72 were sages. Confucius spread the Confucian idea of teaching without discrimination and promoted the popularization of education. During the first year of Emperor Wu's reign (B.C134), the recommendatory system was established, and during the Sui and Tang dynasties (A.D581-A.D907), the imperial examination system emerged, making the education system more complete and the path to higher education clearer, while the selection of talents was related to the examination system. In modern times and after the founding of New China (A.D1900-present), the domestic educational environment has been influenced by the outside world and has taken on a richer form.

During the long evolution of China's educational environment, the form of learning and communication has also changed, and the form of space has slowly evolved to form today's educational space. Early education was more oriented to the collision of ideas between people, in the form of lectures and discussions, and the educational space had a certain centripetal nature, with the speaker as the starting point radiating the space of the listener as the main feature. As the path to higher education became clearer, the correlation between the level of education and one's career increased, and the authority of teachers increased. From the beginning of the imperial examination system of education, test-based education inevitably existed, and this form of education required students to skillfully use their test-taking skills to cope with an examination and needed to improve the efficiency of education, thus strengthening the authority of the teacher, and the educational space evolved into an authoritative teacher's working lecture space to a submissive listening space for students.

Space Research

Modern educational spaces include both on-campus educational spaces and off-campus tutorial spaces, and the authors focus on classifying and studying tutorial spaces. After the classification we will compare them horizontally and study the placement of their internal furniture and spatial scale, so as to discover the commonalities between them and discuss their possible future development.

Education Space (Figure 2)

Brief Description of the Type

This part mainly refers to the teaching and learning space, and the scale and internal environment of the educational space varies in different stages.

In the early education stage, we need to provide targeted guidance and training according to the characteristics of children's physical and psychological development and the developmental characteristics of sensitive periods, so as to lay a good foundation for the cultivation of children's multiple intelligences and healthy personalities.

The Chinese education system is 9 years of compulsory education (elementary and junior high school) and high school (in China, after the end of 9 years of compulsory education in junior high school, higher educational institutions, generally 3 years), the concept is close to K12, so K12 education is used as a proxy for the educational stage of the educational object from elementary school to the high school entrance examination. This stage is very important for the education target, and the educational space can be roughly summarized as test-taking educational space, literary (quality training) educational space, physical education educational space and scientific and creative educational space.

As people enter adulthood in college, they also attend remedial classes in order to keep up with the development of social knowledge. At this stage, people go for in-depth study more voluntarily, so most of the spaces in cram schools are more of study rooms with attached discussion rooms, lounges, and other spaces.

After retirement, some seniors choose to go to a university for seniors to learn to socialize because they are too lonely living apart from their children and need to socialize, or out of a desire to learn a certain skill. The educational space at this stage takes on a social function.

Fractal Study

The classroom is the prototype for the development of K12 exam-oriented education space, K12 research-oriented education space, and part of the lecture space of the senior university. Due to the scarcity of excellent educational resources and other reasons, exam-oriented education spaces often need to accommodate more students in the same scale space, so the furniture is relatively fixed and the space is highly private. Research-oriented education spaces, on the other hand, emphasize the mobilization of students' hands-on skills and communication, and have a high degree of freedom in furniture and a larger scale. The lecture space of the senior university has both lecture

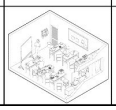
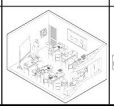
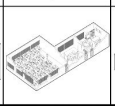
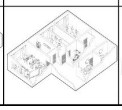
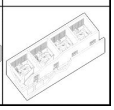
Study on Typology of Educational space						
Space Prototype	The classroom	Early Childhood Education	K12	Adult Education	Old Age Re-education	Live lectures
Spatial Criterion	Rectangle-6×8×3.6	Rectangle/Free form-The floor height is low, generally 2.7m-3m	Rectangl-Close to the scale of the classroom prototype, but on a smaller scale	Rectangle/Free form-The general space scale is large and the storey height is high, between 3.3m and 4.2m	Rectangle/Free form-The space scale is large, the height is unlimited, generally 3.3m to 3.9m	Rectangle-Small space scale, regular layout, low storey height, generally between 3m-3.6m
Ambient Intimacy	▲▲▲	▲▲▲▲	▲▲▲▲▲	▲	▲▲	▲▲▲▲
Degree of Freedom	▽	▽▽▽▽▽	▽▽	▽▽	▽▽▽▽	▽▽▽
Space Characteristics	Accord with the common desk of student body measure, do not change seat position commonly.	There are cushions in the interior and at the sharp angles of each furniture, and the furniture can be changed freely	An ordinary desk in line with students' body size, and a parent's gallery at the back of the classroom. Remedial classes for art are set according to demand	Accord with the common desk of adult working measure, have sound-absorbing device, do not change seat position commonly.	Furniture can move freely, interior and furniture sharp Angle has certain protection and anti-slip measures	The broadcast room is the teacher's private space, so the furniture is arranged according to the teacher's personal needs
Scene Construction						

Figure 2: Educational space typology study and comparison.

and social functions, and the education subjects can choose their own seats, which is more open. Taking the classroom as a prototype, the difference in educational content and approach will lead to different degrees of spatial freedom and openness.

The early education space, K12 physical education space and part of the senior college education space are developed from the activity place as the prototype. In these spaces, the safety and freedom of activities are more emphasized, and the space needs to be equipped with appropriate protection facilities.

Other educational spaces fit with its professional space, such as dance tuition classes in K12 education need larger open space, professional lighting and sound-absorbing recording environment; while the teaching activities in the studio, although relatively static, also need a wider space to place all kinds of painting tools, while the furniture should be easy to move and adapt to the changes in teaching forms. All these space requirements are determined by the professional nature of its activities.

Online lectures have grown rapidly in the context of the epidemic and have changed the traditional way of teaching. The teacher will teach in a separate room with a smaller scale, which needs to meet the needs of live streaming and have sound absorption.

From the above, it is clear that educational spaces can find prototypes in existing space types and develop from them. The traditional campus educational space still focuses on one-way lectures to meet the needs of examinations. In off-campus tutorials, the types and activities are richer, and the spatial forms and interiors become more colorful.

Other Ancillary Spaces (Figure 3)

Brief Description of the Type

Other auxiliary spaces are needed in a cram school facility. Common auxiliary spaces include breakout spaces, front lobby, office space for administration and finance, storage space, etc. As the tutorial time of the taught subjects increases, they need to move between tutorials, and some students

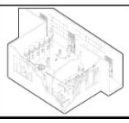
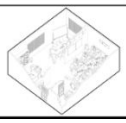
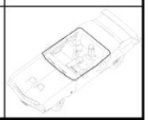
Study on Typology of Accessory Space					
Space prototype	Common rest space	Private rest space	The lobby at the front desk	Administrative financial office	Space on transportation
Spatial Criterion	Rectangle-The storey height is high, generally above 3.6m	Rectangle-The floor height is low, generally 3m-3.6m	Rectangle-The scale is large, but it is divided into multiple use Spaces, and the storey height is above 3.6m	Rectangle-Small space scale, height between 3m-3.6m	Free form-It depends on different modes of transportation
Ambient Intimacy	▲	▲▲▲▲	▲	▲▲▲▲▲	▲▲▲▲▲
Degree of Freedom	▽▽▽▽▽	▽▽▽▽▽	▽▽▽	▽▽	▽
Space Characteristics	Need a bright environment and soothing decoration, less furniture, more types of activities	Need a relative scale, easy to close the distance between people, furniture can be adjusted according to the number of people and activities	The front desk has many functions and complicated streamline, so it needs to make planning and exhibition according to activities, with fixed functions	Accord with the desk of adult working scale, density is higher, do not change seat position commonly.	The spatial scale is determined by the types of transportation
Scene Construction					

Figure 3: Subsidiary spatial typing study and comparison.

read and do practice problems on the transportation in order to catch up on their studies.

With the enrichment and development of the industry, the type of accessory space will become more and more abundant and the development of accessory space is worth considering.

Fractal Study

Break spaces can be classified according to publicness and openness. The prototype of a highly public rest space comes from the gray space in the teaching space, such as the corridor outside the classroom, the corner of the stairs, the pantry, etc. The high intensity of tutorials makes students give up their generous dining time to have a simple meal at the public space of the institution. As a public space, it has less privacy and more freedom. The private break space originates from the office communication space on campus. Teachers need to correct assignments, store lesson plans, communicate with teaching subjects and parents about teaching issues, and rest in a quiet space. Such spaces include teachers' offices, lounges, and conversation rooms.

The front lobby space needs to carry out the reception of parents and students, parents need to understand the strength level of the institution, and the institution needs to have a simple mapping of the knowledge level of the students. The design should consider both the high openness as a display area and the privacy to be retained in the communication area.

The administrative and financial office section is more private and often adjacent to storage space, thus facilitating inventory and storage.

The conditions for learning are not present in the space of transportation, so it is also worth exploring further whether certain improvements to transportation are needed in the future to enable it to meet learning needs.

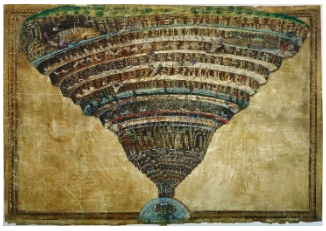


Figure 4: Dante's inferno concept drawing.

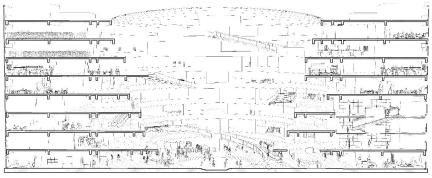


Figure 5: Concept design section.

Summary

It is known from the typological study that the cram school system is mostly developed from the space existing at the moment in the campus space and is a supplement to the existing system of educational spaces. The main reasons for the cram school to become a separate educational system are the contradiction between the needs of social development and the existing fixed educational system and the psychological reasons for a part of the taught subjects and parents to surpass their competitors by improving in extracurricular studies.

Solution Design

In the preliminary research of this project, it was found that the system of tutorial classes is relatively complete, and people will always attend various training and tutorial classes in the process of growing up. Therefore, in the design conception, the author designed all types of tutorial classes in the same building in an orderly manner according to the different educational objects and spatial characteristics.

In the conception of the architectural space, the author was inspired by the archetype of Hell in Dante's Divine Comedy (Figure 4) and designed an inverted conical atrium space, and set up a cyclic traffic space system in the organization of the traffic space to suggest that people's life is constantly cycling in an endless learning environment, and in order to match the social expectations, people keep improving their knowledge through extracurricular tuition, and keep spinning in the tuition class building, but In order to match the social expectations, people are constantly taking extracurricular courses to improve their knowledge, but they cannot break out of the cage of self-fulfillment. The cram school building is not so much an educational building as it is a hell that imprisons people's minds (Figure 5).

CONCLUSION

(1) Architecture and space tend to evolve with the changing times. As a unique product of Chinese society and one of the relatively fair channels for ordinary people to obtain quality educational resources, the competition on this track is fierce. Cram schools are the product of this social phenomenon. The cram school space evolved from traditional educational spaces, and most of the prototypes come from the campus space, but the difference of its activities makes it different from the on-campus educational space.

(2) Intensive cram school buildings are likely to emerge in the future. The relationship between the spatial scale of cram schools, the crowd and the type of activity is discussed in the course, and the possibility of intensive design for cram schools is proposed to complement the existing educational space. It is also hoped that this social context and product will be presented through highly intensive design to draw social attention.

(3) When designing emerging types of spaces, architects can fill and classify the veins by sorting out the historical veins of related spaces, and then analyze the existing strongly related and weakly related space types according to the research needs, and explore the variable and immutable items of such spaces, so as to systematically reconstruct the spaces on this basis to obtain new spatial patterns and spatial forms.

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