

# Research on architectural planning of reconstruction and expansion of old teaching buildings——Taking the building of the Department of architecture of Wuhan University of technology as an example

Luofei Zhang

School of Civil Engineering and Architecture, Wuhan University of Technology, Wuhan, China

luofei\_nine@whut.edu.cn

**Abstract.** Due to the changes of the times, there have been some problems in the use of teaching buildings in the old campuses of many colleges and universities. The Department of Architecture and Regulation of Wuhan University of Technology is a typical case. The purpose of this paper is to investigate the current situation of the building planning department, integrate the existing problems of the building, and on this basis, use the principles and methods of architectural planning to put forward suggestions for the reconstruction and expansion of the department. It is hoped that this research can point out the direction for the reconstruction and expansion of old teaching buildings to a certain extent, and provide scientific and reasonable reconstruction measures.

**Keywords:** Architectural planning; Organic renewal; Old house reconstruction;

## 1. Introduction

Under the background of the expansion of college enrollment and the continuous reform of education across the country, schools with a long history have not kept up with the times in terms of hardware facilities of teaching buildings, causing many problems in education. When renovating and expanding such an educational building, it is necessary to consider both its original cultural quality and its future sustainable development, so it is necessary to carry out architectural planning before the design process.

The building of the Department of Architecture of Wuhan University of Technology is a building that was constructed earlier and in urgent need of renovation. Therefore, this research aims to build a demand-oriented, modern building of the Department of Architecture and to promote the sustainable development of the teaching of the Department of Architecture. Through architectural planning, it will guide the renovation and carry out spatial conception, so as to provide theoretical basis for its renovation and expansion projects. Design advice.

## 2. Research purpose and significance

The architectural planning of the building of the Department of Architecture of Wuhan University of Technology in this paper has the following three purposes:

- Theoretical application: apply the architectural planning method to practice, and obtain the process, method, main links and key points in the architectural planning of the Department of Architecture and Regulations through the study of architectural planning theory.
- Problem discovery: Combined with the actual investigation, the common characteristics of the current old teaching buildings are obtained, the common problems existing in them are discovered, and improvements are made under the existing deficiencies of the old buildings of the Department of Architecture.
- Opinions: Focusing on the investigation of the building qualifications of the Department of Architecture of Wuhan University of Technology, clarify the needs of users for the teaching building and its current problems, and plan and put forward suggestions for renovation based on the

starting point of facing the needs and solving problems. Provide reference for the renovation of other old educational buildings.

### **3. Theories related to architectural planning of the Department of Architecture Museum**

#### **3.1 Architectural planning process**

The architectural planning for the renovation and expansion of old buildings is carried out according to a certain process.

The first step is to understand the project positioning. The preliminary understanding comes from the overall planning of the project, the nature of land use and other construction requirements. The second step is to investigate and analyze the limited conditions, and make corrections and feedback on the positioning of the previous project. The third step is to solve the problem and formulate a project concept, and translate the ideal space requirements of the building planning department into architectural language and present it.

#### **3.2 Method of architectural planning**

The traditional methods of architectural planning include factual investigation, experience absorption, and logical deduction. The three methods coordinate and act on architectural planning.

The actual survey is carried out around the current use and needs of the main users (students) for the space, using field research, questionnaire survey, SD method questionnaire survey and other methods.

In the field investigation, it is found that the analysis content of the current situation of the building space is roughly divided into: scattered functional space distribution, poor spatial accessibility; poor teaching space environment; insufficient public communication space; reference room and other auxiliary spaces are too remote; office space settings It is unreasonable to wait for five major directions(Fig. 1).

Investigation of the site in the target area: A factual survey of vehicle parking in the target area. For the actual investigation of vehicle parking in the target area, the method of measuring points in time is used to quantitatively analyze and calculate the current situation of vehicle parking in the target area. Since there is no standard parking lot inside the site, let alone an underground parking lot, because it is adjacent to the residential area in the north of the west courtyard, the parking capacity is insufficient, and the mixed flow of people and vehicles also brings security risks for teachers and students to walk and park. At the same time, there are some old landscape facilities inside the site, which lost their original function of leisure and rest due to disrepair, and the utilization rate is extremely low(Fig. 2).

Suggestion: There is a height difference in the site, and the underground space can be developed by using the height difference and used as a parking space, and the total capacity should not be less than 50 vehicles. At the same time, there is ground parking near the exit of the site, accounting for about 1/3 of the total number of parking spaces. Or set up parking spaces centrally within the venue without hindering the movement of people, with no less than 25 small and medium-sized motor vehicles (including 20 teaching staff vehicles) and no less than 50 non-motor vehicles. The landscape sketches in the site should be refurbished to make full use of the space in the site.



Figure 1. Site Analysis.



Figure 2. Traffic Analysis.

In the questionnaire survey, the question setting of the questionnaire revolves around the students' use of the teaching building space, and specific questions are raised in combination with the specific space of the teaching building(Fig. 3). This questionnaire survey adopts the method of online anonymous questionnaire to investigate the students of the Department of Architecture of our school, and obtains 57 valid samples, including 2 samples for the first year, 9 samples for the second year, 37 samples for the third year, and 7 samples for the fourth year, 2 copies of the senior year.

1、Your grade : ( )  
 A、 The first year B、 The second year C、 The third year D、 The forth year E、 The senior year

2、 Approximate number of days per week that you go to the building of the Department of Architecture: ( )  
 A、 1-2                                      B、 3-5                                      C、 over 5 days

3、 Where do you generally choose to study: ( )  
 A、 Professional classroom      B、 Library      C、 Bedroom      D、 Others

4、 The most used space in your building under construction: ( )  
 A、 Professional classroom      B、 Amphitheatre      C、 Exhibition space      D、 Others

6、 Do you think the building can currently meet your requirements?: ( )  
 A、 Can not satisfy      B、 not satisfied      C、 Middle      D、 basically satisfied      E、 satisfied

Figure 3. Survey design.

Finally, a pie chart is used to represent the results of the questionnaire survey (Fig. 4), and the frequency ratio of students' use of the building space is analyzed through the proportional relationship of the pie chart, so as to explore the current situation of space use that needs to be dealt with by the architectural planning of the Department of Architecture and Planning: Specialized Teaching The co-located classrooms are the most frequently used in all department and library spaces, and the public activity space has not played its due function of rest and communication. At the same time, through the questionnaire survey, it can also be concluded that "most students think

that the current students are inconvenient to use the building, and that the building cannot meet the learning needs at present".

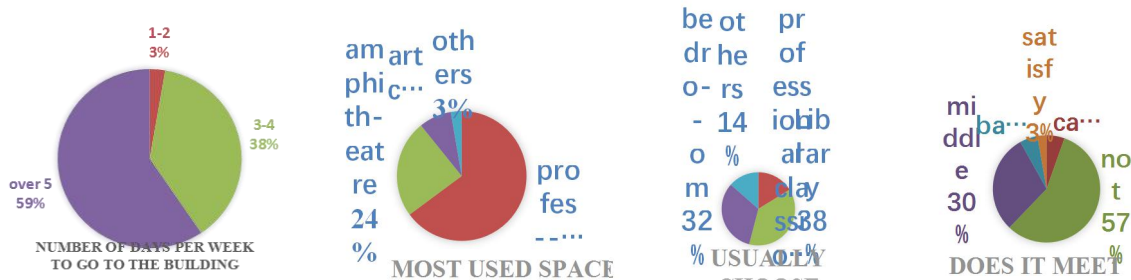


Figure 4. Questionnaire results.

The SD method is the semantic analysis method. It is used in architectural planning to collect students' preferences for the spatial environment and atmosphere. Combined with the description parameters on the factor axis, the questionnaire information is summarized and analyzed to obtain the concept and description of the architectural space of the Department of Architecture and Planning. The SD method experiment is divided into a preparation stage and an operation stage. The preparation stage determines the amount of spatial environment information and the factor axis, determines the value of the evaluation scale, and the corresponding value of each factor axis. The analysis part is carried out by computer, and conclusions are drawn after data collection and analysis.

Due to the limited scope and time of the survey, only the first stage of the survey was conducted in this live survey (Fig. 5). Eight pairs of psychological and physical factors were summarized in this survey, and it was found that some students had obvious tendencies. Among the factors, they hoped that the public space of the building would be more open, the classrooms would be centralized and convenient, and the space would be bright and warm. These are some of the qualities that are currently lacking in the building space.

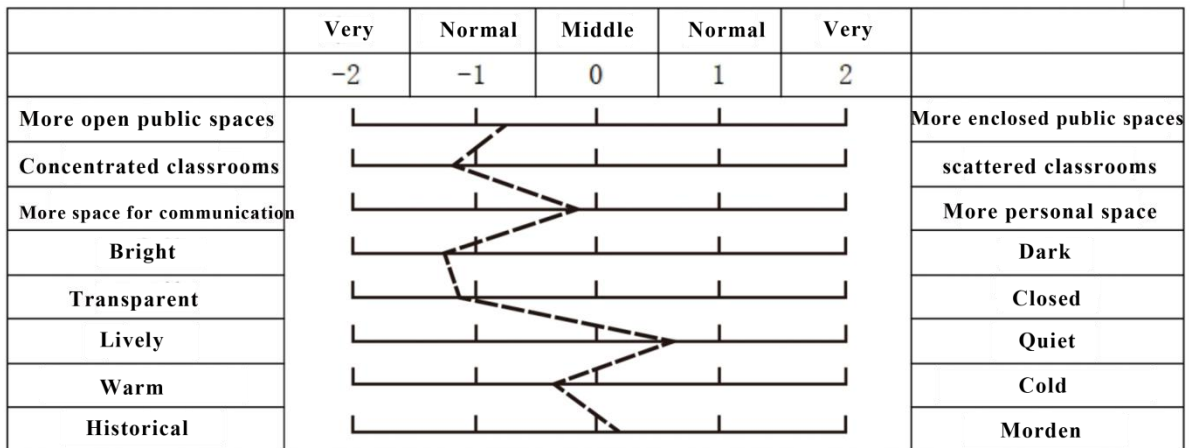


Figure 4. SD method survey results.

## 4. Goal Setting and Space Conception

### 4.1 The spatial content of the building of the Department of Architecture is determined

In order to ensure the normal development of the teaching function, the necessary space content is divided into four categories: teaching space, office space, public activity space and transportation space (see the task book for specific divisions and scales). The teaching space includes: professional classroom, art classroom, still life warehouse, model room, public classroom, teacher and student

research room. The public activity space includes: lecture hall, multi-function hall, map evaluation hall, and reference room. Office space includes: fifteen faculty offices.

According to the questionnaire survey, users generally believe that it is necessary to increase the public activity space and exhibition space in the department museum to stimulate the vitality of the building. Therefore, it is necessary to pay attention to the expression of public activity space in the design, increase the display part and the exhibition part, and choose to open these parts and arrange them together to increase the permeability of the space. It is also possible to make full use of corridors to link indoor and outdoor landscapes with different spaces to create a comfortable communication space.

#### 4.2 Department Museum Space Concept

Since there are many functional spaces and complex activities in the department hall, the functional spaces with similar functions can be integrated into group layouts, and public activity spaces or corridors can be inserted in the spaces with large functional differences to divide them(Fig. 5).

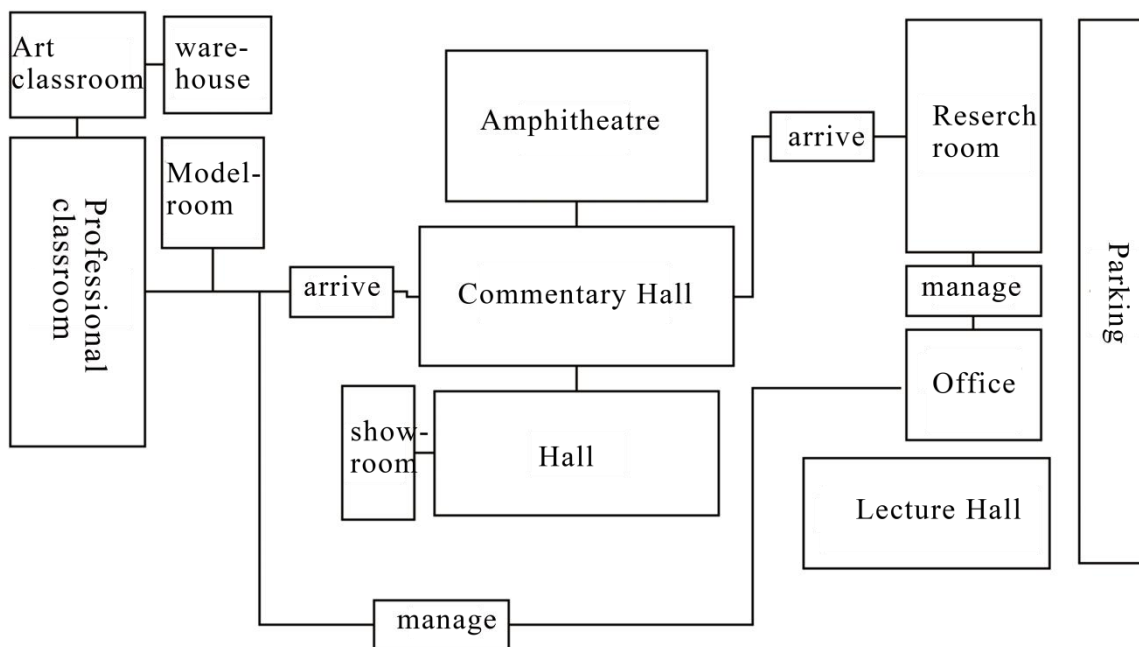


Figure 5. Department hall space.

#### 4.3 Space growth concept

Teaching buildings exist for a long time for teaching, and teaching activities have always presented a posture of development and improvement. As a building with a long history and will continue to develop in the school, in addition to considering the current teaching needs in the design of renovation and expansion, the changes and progress of future teaching activities should also be considered. Therefore, adding the space growth concept to the architectural planning space concept is not only a response to the existing problems, but also a plan for future problems and needs.

The concept of space growth in teaching buildings is mainly reflected in the following two aspects:

##### 4.3.1 Conception of Changes in Teaching Activities.

The teaching activities of each major are different from those of other majors. For example, in the Department of Architecture, there are: group discussion, picture viewing, picture commenting, teacher guidance, etc. There are often different teaching activity modes in different stages of design, so it is particularly important to have variable activity content and multi-functional activity spaces.

A large space or stepped space that can be freely arranged in the image review hall or foyer is used to carry the functions of image review, communication and even speech.

#### 4.3.2 Feasibility of space addition or modification

The architectural planning of teaching buildings in colleges and universities should be considered from the life cycle of each professional teaching. The focus of each period is different. With the development of the times, the development of science and technology and the economy, the activities in the teaching building will respond to the future development of science and technology. , which is reflected in the update of equipment and the increase or decrease of scale, so the previous prediction should be carried out when planning the building.

## 5. Conclusion

Using the principles and methods of architectural planning, this paper conducts actual investigation and architectural planning for the reconstruction and expansion of the buildings of the Department of Architecture of Wuhan University of Technology. At present, there are more and more old teaching buildings in colleges and universities. How to correctly update these old buildings is also one of the important topics of architecture. Architectural planning uses quantitative data to look at buildings, which makes architectural design more scientific and can better coordinate the relationship between old and new buildings.

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