Exploration on the Teaching Method for Surveying and Mapping Practice in Ancient Architecture

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Abstract Since the introduction of the architecture course, the practice of surveying and mapping of ancient architecture has always been an important compulsory course in the professional course of architecture in colleges and universities in China. Against the background of the new era, the teaching methods used so far can no longer fully meet the needs of the development of the times and the construction of "Double First-Class" initiative. This paper explores deeply from the aspects of organizational planning, technical support and achievement transformation, in order to enrich the teaching methods for ancient architecture surveying and mapping practice course in architecture major, and finally improve the teaching level and improve the teaching effect.

Key words Ancient architecture, Surveying and mapping, Teaching, Teaching reform

1 Introduction

Surveying and Mapping Practice of Ancient Architecture is a course generally set up for Chinese architecture majors, and it aims to enable students to understand ancient architecture and master surveying and mapping methods. The practice of surveying and mapping of ancient architecture is a practical process for the undergraduates majoring in architecture to confirm, consolidate and improve the theoretical knowledge learned in the classroom through on-the-spot investigation, surveying and mapping of the actual architectural objects after completing the course of Chinese Architectural History in order to deepen understanding of the group combination, design techniques, engineering practices and decorative characteristics of ancient architecture.

At present, the course of Surveying and Mapping Practice of Ancient Architecture in colleges and universities is mainly divided into three processes; first, the teachers impart the theory and methods of surveying and mapping, then the on-the-spot survey and mapping of the ancient architecture is carried out, and finally the corresponding drawing work is completed. In most cases, because of the lack of practical experience and professional technology, students only treat ancient architecture surveying and mapping practice as a general course, lacking in long-term consideration of surveying and mapping results. They do not have enough knowledge of the key nodes of surveying and mapping, not to mention the practical consideration of historical connotation, long-term protection, repair and long-term development and utilization of ancient architecture. Against the background of this teaching method, the enthusiasm and initiative of students have been squeezed, and the sense of mission of carrying forward the traditional culture has been reduced, which is very disadvantageous to the inheritance of the traditional architectural culture. And the backwardness of the traditional surveying and mapping tools and the surveying and mapping technology, makes it difficult to match the modern fast pace, so that the surveying and mapping drawings of ancient architecture are not accurate or even wrong. In general, the course ends when the course is finished and the results are submitted. Drawings, which cost considerable time and effort, have not played a more effective role in scientific research. With the improvement of the emphasis on scientific research, we should pay attention to the role of the transformation of the research results of ancient architecture surveying and mapping practice. In view of the above situation, through the previous teaching practice and related excellent cases, this paper sums up three levels of teaching improvement methods, in order to enrich the teaching methods of ancient architecture surveying and mapping practice course for architecture majors, and finally, improve the teaching level and improve the teaching effect.

2 Organizational planning level; working together with relevant professional institutions

At the beginning of 2012, the School of Architecture of Southwest Jiaotong University joined hands with the Institute of Ancient Architecture and Design of Chengdu Institute of Cultural Heritage and Archaeology (hereinafter referred to as the Archaeological Institute) and reached a consensus. This organization has Grade A qualification of ancient building repair and design issued by the State Administration of Cultural Heritage, and is one of the few professional institutions in the province with the mission of ancient building protection and research. The Archaeological Institute has a young team, excellent equipment, advanced technology and modern ideas. Since the summer vacation of 2012, the two sides have conducted their first joint surveying and mapping internship.
In the process of teaching cooperation, various attempts have been made, such as the introduction of financial support from professional institutions, personnel guidance and technology sharing. As for the practice of surveying and mapping in ancient architecture, professional institutions have played a very important role, which has brought new vitality and inspiration to the traditional school education. The cooperation with professional institutions makes teachers and students better aware of the modern advanced instruments and technical methods of ancient building surveying and mapping, and improves the accuracy of students’ surveying and mapping results. More importantly, by professional means, such as three-dimensional laser scanning, it can reduce the security risks and the difficulty of surveying and mapping in time and space.

At the same time, some students complete the practice of surveying and mapping of ancient architecture by receiving professional training in the Archaeological Institute. Taking one of the groups as an example, the three-member group is required to use the drawings accurately and strictly to make the SketchUp model of Ya’an Guanyin Pavilion. The production of brackets is one of its key points. Then, in addition to completing the presentation drawings of the two A1 view frames, the team also used model to produce videos to reveal the process of building generation. These results have been transformed into electronic archives preserved in Archaeological Institute under excellent production.

"In the Archaeological Institute, we discussed with the teachers the components, age, details, characteristics and cultural space of the ancient architecture, so that we have a deeper understanding of the surveying and mapping of ancient buildings. Through the construction of the building model, we understand the construction mode of the building and know some very specific building details. We learned to compare photos to build detailed models and restore reality. We have hardly been exposed to video production before, and through this project we have also gained exercise and mastered a new skill. More importantly, we have a comprehensive understanding of the domestic and Japanese ancient buildings related to this architectural era, and we also have a certain understanding of the protection of ancient buildings," the group of students said.

In this process, there are also shortcomings, for example, in professional institutions, students are trained for a short period of time, and the personnel relationship is not so intimate that they are too embarrassed to ask questions. As a result, some students have suggested arranging more days of internship in the institute. Other students said that their internship experience at the Archaeological Institute helped them integrate into the working environment quickly after graduation. This shows that, taking the ancient architecture surveying and mapping course as an opportunity, through cooperation with professional institutions, we can not only guide some students to find their own interests, but also directly see a kind of future employment scene.

3 Technical support level: rational combination of various surveying and mapping techniques

The School of Architecture of Nanjing University of Technology has a relatively profound accumulation in the research and restoration of architecture in the Ming Dynasty and in the period of the Republic of China, and has carried out extensive and in-depth surveying and mapping in previous teaching. Based on the above-mentioned universal problems and their own characteristics in the teaching of surveying and mapping of ancient architecture, the rational application of surveying and mapping technology in the teaching of surveying and mapping of ancient architecture has been emphasized since the autumn term of 2017, in order to understand ancient architecture and learn surveying and mapping skills.

After all, the major of architecture is different from that of the protection of historical buildings. We should not overemphasize the technical orientation and ignore the understanding of ancient architecture. As basic education for undergraduates, the two should not be neglected one-sidedly and they can promote each other. The improvement of data accuracy and richness is helpful to better understanding the ancient architecture, and the understanding of the ancient architecture is the guarantee to select the appropriate technology and deal with the survey data accurately.

Instrument measurement should be synchronized with manual measurement. Instrument measurement and manual measurement are reasonable choices under specific objective limitations and subjective requirements. The advantages of instrument measurement are reflected in the surveying and mapping with high precision, wide data type, large scale and high complexity, while manual measurement has irreplaceable advantages in quickly obtaining component size, portability, measuring areas obscured by trees and so on. The emphasis on technology orientation is not to exaggerate the role of instruments, but to pay more attention to the rationality and applicability of technology.

A variety of graphic expression methods should be combined. The optical measurement represented by laser scanning and photogrammetry not only provides the direct results of point cloud model and raster image, which are different from the traditional CAD vector image, but also can be combined with BIM and GIS through data processing to expand the existing forms of achievements in graphic methods. In addition, surveying and mapping results also include 3D printing, virtual roaming and other forms. At the same time, the horizontal profile based on CAD is still an ideal way to express the spatial information of buildings.

From the point of view of teaching effect, emphasizing the rationality of surveying and mapping technology has good effect in three aspects. First of all, it makes the students come into contact with the cutting-edge surveying and mapping technology, and realize the practical significance of surveying and mapping for the protection of architectural heritage, so it lays a preliminary foundation for the related work in the future. Secondly, through the improvement of surveying and mapping accuracy and the expansion of data types, students can have a better understanding of ancient Chinese architecture. Thirdly, the reverse modeling technology involved in this teaching can be used not only in ancient architectural surveying and mapping, but also in architectural design, which is helpful for students to understand the technical interworking of different branches of architecture. As described above for traditional
surveying and mapping methods, with the development of science and the renewal of technology, surveying and mapping technology is increasingly breaking through their own limits, and realizing continuous innovation and development. Although the traditional tools often used in traditional measurement techniques are still often used in the survey of ancient architecture, it is undeniable that with the development and popularization of network information technology, the emergence of modern photography technology, and laser three-dimensional scanning technology has brought great convenience to the surveying and mapping process of ancient architecture. It saves manpower and material resources, and ensures the accuracy of measurement. Moreover, as mentioned above, the use of traditional measurement methods can easily cause damage to ancient architecture and affect the integrity of architectural preservation, and modern surveying and mapping technology avoids the problems existing in this respect.

4 Achievement transformation level: constructing the research-oriented teaching model

In recent years, against the background of the new normal economy, special attention has been paid to the continuous cultivation of students' innovative ability, the achievements of teachers' teaching reform, the creation of "double first-class" discipline and the development of social progress at a higher level, so as to form a "four-in-one" research demand pattern. According to the research subject, the research-oriented teaching model can be divided into many aspects, such as students, teachers, disciplines, and society. Through the establishment of research-oriented architectural education system, while promoting students to master basic professional knowledge and skills, understand the trend of professional development, clarify professional evaluation standards, and carry out targeted rational innovation, it can help teachers to carry out subject research with the help of architectural education, transform architectural education into a research behavior that contributes to the development of the discipline, promote the development of the discipline, and ultimately promote the development and progress of the society. The key to the construction of research-based teaching model is to explore the research hotspots in the teaching process. Students are required to transform the learning results into research results, which can be scientific research papers, research reports, academic topics and so on. On the other hand, teachers need to sum up the experience of guiding the curriculum into the results of teaching reform and enrich the teaching methods. The scientific research results of the initiative transformation of students and teachers can promote the "double first-class" discipline construction and the progress and development of the society.

5 A preliminary study on the practice scheme of surveying and mapping of ancient architecture

It is necessary to take the initiative to look for social needs and social cooperation, change the original passive teaching, combine the specific surveying and mapping contents with social needs, to solve social problems. It is necessary to refine the direction of scientifc research, combine scientific research objectives with teaching and research objectives, so as to achieve the common development of teaching, learning and research, maximize teachers' scientific research into teaching, optimally match teaching, and form a teaching reform plan. The content and organization process of practice should be optimized. In the later stage, a summary report should be made, and professional institutions should be invited to be judges. Each group of students should produce PPT to report their own results, and professional institutions are invited to make appraisal. It is necessary to exchange and learn with each other, consolidate what students have learned in this practice, and enhance their sense of responsibility. Finally, a survey and mapping exhibition will be held to display the surveying and mapping results of each group in small groups, with real-scene photos (such as a gatehouse drawing for surveying and mapping, which must be accompanied by real-scene photos) and the field surveying and mapping photos of the members of the group and the photos of the group members. This can greatly improve the enthusiasm of student work, and due to the pressure of competition between exhibitions and groups, this will also improve the accuracy of the surveying and mapping results. Practical thinking; to transforming passive teaching into active teaching to improve students' subjective initiative; to connect practical teaching with social needs or practical engineering, so as to improve students' awareness of social responsibility in accurate surveying and mapping; to integrate this surveying and mapping practice with the scientific research direction of teachers, so that "teaching" and "research" complement each other, "research" is useful, and "teaching" is reasonable. Through this scheme, we aim to deepen the practical teaching reform, actively explore an optimal architectural practice teaching model, and explore a new type of practice evaluation model.

6 Conclusions

With the rapid development of China's economy, colleges and universities are faced with how to train high-quality professionals to adapt to the development of modern high technology, which is an important task for us. Through years of accumulation and development, the construction of ancient architecture surveying and mapping practice course is fruitful on the whole. On the one hand, students understand and consolidate and comprehensively apply the theoretical knowledge accumulated before surveying and mapping; on the other hand, it lays a solid foundation for the study of the follow-up main courses through the process of surveying and mapping and the follow-up study of surveying and mapping. The innovation of this teaching mainly lies in the establishment of the whole process model of surveying and mapping research, for expanding the depth and breadth of the research, and paying attention to the cultivation of students' comprehensive ability at the same time. It should be pointed out that the construction of this course needs to be further improved in the following aspects, such as strengthening the accumulation of relevant knowledge before
typical mistakes common to students, teachers should not be busy correcting errors, but think about the root causes of errors, strive to find solutions, and formulate specific methods to avoid mistakes when teaching again. During the reflection of teaching after class, the most important thing is to be timely, to persist, and to pursue persistently. By reviewing the advantages and disadvantages of teaching, we can enhance our strengths and avoid weaknesses in the future teaching. In the process of continuous reflection, teaching experience and skills can be continuously improved, and the teaching quality will be significantly improved.

3.6 Further improving the teacher evaluation and assessment system It is necessary to regard teaching quality as an important basis for teachers’ performance assessment and professional and technical evaluation, so as to make teachers devote themselves to teaching research and be willing to spend a lot of time, energy and enthusiasm on lesson preparation and pay attention to every class. In addition, it is necessary to have fair and reasonable evaluation criteria for the first-rate courses. The courses that students like are not necessarily first-rate, and the courses that students do not like may not be first-rate. Whether it is a first-rate course should be jointly assessed by schools, teachers, students and relevant experts of the curriculum.

3.7 Strengthening the training of teachers In the process of building the first-rate courses, it puts forward higher requirements for teachers in terms of teaching content, teaching skills and so on. In order to meet the needs of the educational development of the times, it is necessary to constantly improve the comprehensive quality of teachers themselves. Different levels of teachers are trained at different levels. Veteran teachers with rich teaching experience mainly learn new teaching skills-modern information technology. It is necessary to implement a strict teaching access system for new teachers, only after the teaching content and teaching ability have been inspected and assessed by the school supervisory experts, can teachers obtain the teaching qualification of the relevant courses.

3.8 Strengthening the support for the construction of first-rate courses The construction of first-rate courses requires a lot of manpower and material resources, and first-class courses should have first-class investment. Not only do teachers need to have enthusiasm, passion and responsibilities, but also the policy mechanism should keep up with it. It is necessary to attract more teachers to participate in the construction of first-rate courses.

4 Conclusion
There is a long way to go to control the nonsensical courses and create the first-rate courses; it requires the joint efforts of educators and students. It is an arduous task for each of our full-time teachers. With down-to-earth and practical actions, we should meticulously create the first-rate courses that are leading, cutting-edge, diverse, and challenging, never forget the original aspiration of being teachers of the people, bear in mind our mission, devote ourselves to building virtues and cultivating students, and strive to be a good teacher to the satisfaction of the Party and the people in the new era.

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surveying and mapping, the diversification of theoretical teaching methods, and organizing a series of lectures, and paying attention to the formation of systematic courses. Based on the comprehensiveness of ancient architecture surveying and mapping, we should strengthen the building of surveying and mapping teachers, consider the cooperative teaching of comprehensive subjects, and suggest the combination of historical theory (garden history and architectural history), ancient construction structure, and so on for teaching.

This paper explores deeply from the aspects of organizational planning, technical support and achievement transformation, in order to enrich the teaching methods of ancient architecture sur-

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