Exploration on Training Mode of Professional Master Degree in Architecture and Civil Engineering

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Abstract. At present, many colleges and universities adopt the operation model of jointly training master's degree in architecture and civil engineering with enterprises. The usual enterprises and institutions are social production or service departments, which are different from ordinary colleges and universities. They have no experience in cultivating students, and colleges and universities emphasize teaching and scientific research. Being unfamiliar with the production practices and social services of enterprises and public institutions has led to a poor joint training path. This paper discusses the training model for postgraduates majoring in architecture and civil engineering, and proposes the establishment of a joint training base between universities and enterprises, the “dual tutor” system between universities and enterprises, and the establishment of research projects for students by the university-enterprise cooperation. In the assessment system, a three-point evaluation system of "credits-thesis-external tutors" is adopted. This study will provide a reference for improving the quality of professional master's training.

1. Summarize

With the rapid development of China's economy and the upgrading and transformation of industries, there is a growing demand for high-end technical talents in all walks of life. In order to better cultivate practical technical talents, China has begun to recruit full-time professional master degree students, including those majoring in architecture and civil engineering, since 2009. At the same time, the state also encourages cooperation between schools and enterprises to cultivate talents. For engineering master's degree, practical link is particularly important. Taking the master of architecture and Civil Engineering as an example, this paper discusses the training mode of master of architecture and civil engineering.

2. Training Modes for Professional Master Degree Students at Home and Abroad

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2.1. Training Plan

The length of schooling for professional degree graduate students in domestic colleges and universities is generally three years. Relevant courses stipulated by the university should be completed according to the requirements. For example, the courses are classified into public degree courses, basic degree courses, professional degree courses, professional elective courses, literature reading and professional practice. After completing the relevant courses, the graduation thesis and relevant papers should be written and published according to the obtained experimental data. At present, the training mode of professional master degree is roughly the same as that of bachelor degree master degree in China, which does not well reflect the practical ability of professional master degree. Especially, architecture and civil engineering is a discipline that attaches great importance to students' practical ability. However, at present, universities mainly focus on scientific research and teaching work, which cannot provide enough practical opportunities for professional postgraduate students. Many universities for graduate study in school period also required to participate in certain courses learning activities, such as the literature [1] of graduate students should be at least four academic activities, combined with the dissertation task, read at least 30 piece of research in the field of literature at home and abroad, understanding, the latest progress in the field of study, and on the basis of literature review report writing no less than 8000 words. But these extra-curricular activities are based on scientific research.

Abroad, take the United States. The length of schooling of graduate student of professional degree of the United States is 2 years or so, the credit that graduation asks is about 40 minutes, do not ask a student to write the dissertation of graduation. After completing the required courses, I was sent to various internship positions to learn professional knowledge in the front line and improve my ability to solve problems. Therefore, the students cultivated by this training mode have stronger hands-on ability, and they can start to work directly out of school. In terms of learning technology, the United States gives each graduate student greater autonomy, they can choose courses through their own interests and hobbies, or they can engage in scientific research. Therefore, in such a model, sometimes professional and academic graduate students can be converted to each other [2].

2.2. In Terms of Teachers

Some colleges and universities in China put forward the "double tutor" system in the establishment of professional degree tutors. The system of "double tutor" means "giving priority to the guidance of on-campus tutors, while out-of-school tutors participate in the guidance of practice process, project research, courses and papers" [3]. There are still some colleges and universities adopt the guidance mode of “teacher-student-to-many”, which is relatively closed and stable.

Foreign colleges and universities pay attention to the participation of application-oriented graduate tutors in terms of teachers. For example, American colleges and universities can set their own training objectives according to their own conditions and actual conditions. And the allocation of teachers is flexible. The tutor team is usually composed of 3-4 teachers with cultural and educational backgrounds [4]. To be specific, in addition to the main supervisor, there are several steering committees composed of several professors of related disciplines of different numbers to provide assistance for the guidance of a graduate student. The main supervisor's responsibility is to help students broaden their horizons, cultivate their research interest, find research objectives, and more importantly, guide students to learn and apply scientific research methods. However, such guidance relationship must be clarified after admission [5].

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2.3. Professional Practice

According to the documents issued by the Ministry of Education in China, "Professional degree graduate students must guarantee at least half a year of practical teaching during their study period. Centralized practice can be combined with segmented practice. In principle, the practical teaching time of fresh graduates should not be less than 1 year" [3]. Due to the lack of practical platforms and engineering projects in large universities, especially for disciplines with strong practicality such as master degree in architecture and civil engineering, it is difficult for general universities to provide practical technical activities such as real engineering design, construction, supervision and survey. Some universities also require graduate students with degrees in architecture and civil engineering to find companies to conduct professional practice activities on their own, but the result is often that students find a symbolic unit to practice for a few days, and then fill out a form and seal it.

Foreign countries pay special attention to the training of practical links. For example, in Japan, the requirement of professional practice must be guaranteed not less than this year's practical teaching; It is necessary to provide and guarantee the conditions for carrying out practice and establish practice bases in various forms. Pay attention to the use of social resources, the establishment of joint training base, joint training of professional degree graduate students; Promote the close connection between professional degree graduate students and the actual needs of employers, etc. [6]. In France, professional masters pay more attention to practice. During the course study, they begin to have internships in enterprises or related departments or industries, and participate in engineering research to help enterprises solve practical problems. The graduation thesis is also written around the content of engineering practice [7].

3. Discussion on the Training Mode of Master Degree in Architecture and Civil Engineering

3.1. Schools and Enterprises to Establish a Joint Training Base

Civil engineering specialty has strong practicality, which requires the training of field practice in design, construction and supervision. Usually in undergraduate education, the school will provide students with a platform for more internships, so that students can enrich themselves on the engineering site and combine the theoretical knowledge of classroom learning. Therefore, the cultivation of professional masters degree requires a lot of engineering practice time and substantial practical content to ensure the demand of professional master’s degree in training professional skills, so it is necessary for schools and enterprises to set up a joint training base for graduate students. This measure is a pioneering and systematic work to strengthen graduate education during the eleventh Five-Year Plan period, which is of great significance to comprehensively improve the quality of graduate education and increase the efficiency of training high-level talents. At the same time, the postgraduate joint training base is also a platform of scientific research cooperation between universities and enterprises and institutions, which is of great significance to realize that national higher education should serve the economic construction. The enterprise not only serves as the practice base of the school, but also participates in the research and formulation of training objectives, teaching plans, teaching contents and training methods, thus establishing a close relationship with the school.

3.2. Adopt "Double Tutor" System

The tutor is the first person in charge of postgraduate students, so it is very important to implement
the "double tutor" system. With the tutor on campus as the first tutor, the tutor on campus is also endowed with certain rights, responsibilities and benefits. At present, most full-time professional degree tutor to guide academic graduate student at the same time, and the theory of knowledge learning is the key of the teacher guidance, many teachers do not have enough experience in practice production, often will guide the academic degree graduate student model directly transplanted to the guidance of professional degree graduate students, make students feel the particularity of professional degree and harvest [8]. The guidance and help given in the vocational ability cultivation of students are not timely and sufficient. In contrast, students will gain more from practice activities conducted by external mentors [9]. At the same time, the research topics and dissertations of master degree students majoring in architecture and civil engineering are mainly guided by enterprise tutors, so that the research contents of students are closer to the engineering reality and enrich the preparation for master degree students majoring in architecture and civil engineering to enter the workplace in the future.

3.3. School-enterprise Joint Scientific Research to Provide Students with Research Topics

Graduate students carry out professional practice in enterprises. Under the guidance of double tutors, they select topics according to engineering problems in engineering practice and carry out corresponding research work. On-campus tutors focus on theoretical and experimental guidance, while part-time tutors focus on engineering practice and experimental process guidance. It solves the problems of students' poor operational ability and their unfamiliarity with practical operation. In universities, there are some tutors with strong engineering practice ability who are entrusted by enterprises to undertake horizontal projects. Graduate students can select topics according to their tutors' horizontal projects and participate in the research work of horizontal projects. Generally speaking, there are technical personnel from enterprises among the research members of the tutor's horizontal project, and graduate students can choose these technical personnel as external tutors. Graduate students need about a year to complete practical and experimental research work, and then return to school to write a thesis. Graduate students participate in engineering practice and refine them into dissertations, which significantly improve their ability to find, analyze, solve problems and communicate with others, and lay a good foundation for future engineers [1].

3.4. Problems Existing in the Joint Training of Graduate Students with Enterprises

Through many years of practical experience, it is effective for colleges and universities to adopt the mode of joint training with enterprises for masters in architecture and civil engineering, but there are many problems in actual operation.

3.4.1. Problem of Teachers and Instructors

The joint training unit is an enterprise attribute, the enterprise mainly focuses on economic benefits, and the joint training of graduate students is only one of its many secondary tasks, which the enterprise does not pay enough attention to. The main responsibility lies in the off-campus tutor. If the off-campus tutor has high quality, strong sense of innovation and strong sense of responsibility, the training effect will be good. If the external tutor just hung a name, its training effect can be imagined, this problem is also common. At the same time, there is also a lack of timely communication between tutors in and out of the school in the face of students' problems, and there is little communication in daily life, so that the "double tutor" system does not play a good role.
3.4.2. Poor Management

The school-enterprise signed relevant agreements before the cooperation, but other problems could not be avoided in the implementation process, thus ignoring the subsequent training details. If the school-enterprise cooperation is relatively loose, there is no special responsible staff, there is a management blind spot, cannot make the professional degree graduate students complete as planned.

3.5. Improve the Mode of Joint Training with Enterprises

3.5.1. Perfect the Corresponding Mechanism

The university sets up a graduate school and enterprise management department. The management personnel are composed of the university and the enterprise, which can better solve the problems existing in the practice of enterprise, practice content and life of graduate students.

3.5.2. Enterprises should Give Lectures at School Regularly

The enterprise regularly sends technicians to the school to give professional lectures to the students who have not yet entered the joint training base, introduce the ongoing work of the enterprise and various advanced technologies in the industry to the students, so that the students can better understand the enterprise and prepare for entering the joint training base in the future. Especially for the construction and civil engineering industry, every region and every enterprise has its own unique technology. Through lectures, graduate students can learn a lot of knowledge that is not available in books. The author's university often invites experts from well-known domestic construction enterprises to give lectures in the university, and the students' response is very good.

3.5.3. According to the Actual Situation of Each Joint Training Graduate Students to Jointly Develop the Training Plan

Between both sides of the tutor according to each graduate student's interests and career planning of the detailed training plan, specialized degree graduate student is different from the academic degree graduate students, the training goal is to become a highly professional skills and be able to solve the problem of complicated engineering high-tech talent, so the training plan is very important. Off-campus mentor itself is enterprise high technology talent, clear enterprise need what kind of technical personnel, so for the master of professional training scheme, more off-campus tutor advice, in addition to the cultivation of the professional master graduate student process is also more platform in the enterprise, enterprise tutor guidance of the work is more, need to enterprises designated training scheme is a mentor as [10].

3.5.4. The Assessment System Adopts the Three-point Evaluation System of "Credit - thesis - score by Tutors Outside Teaching"

That is, the external tutor's evaluation of students also accounts for a certain proportion. The "three-point evaluation" assessment system, in which the credits include course credits and practice credits, accounting for 40%; Dissertation and external tutor evaluation account for 40% and 20% respectively. Increase the weight grade school mentor will be helpful to encourage off-campus tutor more students, actual work ability put forward higher requirements for students, fit "has stronger ability to solve practical problems, to undertake professional or managerial work independently, have good professional quality of high-level talents' cultivation requirements [11].
4. Conclusion

University-enterprise joint construction of training base can promote the graduate cultivation mechanism and model of reform in colleges and universities, the use of social resources to create good atmosphere of study theory with practice, so that the students in the further research and development of practice, improve the comprehensive quality and comprehensive ability, technology, management, system, knowledge innovation and application of the main body, one of the best in the employment competition. We should improve the overall quality of graduate students, strengthen the construction of teachers in colleges and universities, and form an orderly cooperation between tutors in colleges and universities and senior technical talents in enterprises and research institutes, so as to further increase the contribution rate of high-level talents in colleges and universities to social and economic growth.

Through postgraduate joint training base construction, the organic combination of two colleges and the enterprises and institutions subject, give full play to the institutions of higher learning and scientific research institutes and production departments in the academic team, technology, information, experiment equipment and research and other aspects of the comprehensive advantages, to achieve the optimal allocation of innovation resources, cultivate high-level talents social needed.

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