

# Exploration on the Cultivation of Undergraduates of Civil Engineering Major in Private Colleges and Universities

Taking Nantong Institute of Technology as an Example\*

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**Abstract**—Based on the current status and characteristics of private undergraduate colleges and universities, this paper analyzes the challenges faced by undergraduate talents training in civil engineering, and puts forward the ways and methods of undergraduate training of civil engineering majors in private universities. The school-running effect of Nantong Institute of Technology shows that the methods are effective and feasible, and have certain practical significance and reference value for similar universities and majors.

**Keywords**—private colleges; undergraduate; civil engineering; talent training

## I. INTRODUCTION

In recent years, with the rapid development of China's national economy, the construction industry has made great progress. Many construction enterprises have developed rapidly in terms of scale and efficiency. At the same time, competition among enterprises has further intensified. The level of talents in enterprises and the level of applied technology content directly affect the position of enterprises in the competition. Enterprises have higher and higher requirements for the comprehensive quality of employees, and they are required to have better technical application and innovation capabilities. It is especially urgent to train high-quality talents of civil engineering major to meet the needs of the market.

How to cultivate high-quality talents in civil engineering to meet the needs of the market is a hot topic in the field of industry in recent years. At present, some universities in China have carried out pilot and reforms, and have achieved

certain results. However, there are still some misunderstandings in terms of professional positioning, development direction, and educational concepts. The effect of talent training is not satisfactory.

Based on the carrier of private colleges and universities, this paper explores and studies how to cultivate high-quality talents of civil engineering major that meet market needs.

## II. CURRENT SITUATION AND CHARACTERISTICS OF PRIVATE UNDERGRADUATE COLLEGES AND UNIVERSITIES

Private undergraduate colleges are an important part of China's higher education. Like public universities, it cultivates a large number of urgently needed talents for the society. However, it is undeniable that the current status and characteristics of private colleges and universities are:

### A. Small Quantity

According to the official universities list published by the Ministry of Education's official website in 2015, up to May 21, 2015, there were 2,845 colleges and universities in the two major types (general institutions of higher learning and adult higher schools), and the number of general institutes of higher education is 2,553, accounting for 90%. Among them: there are 447 independent private colleges and universities, accounting for 17.5%; 275 independent colleges, accounting for 10.8%. Compared with the large number of private colleges and universities and famous universities in foreign countries, China's private colleges and universities are on the contrary. The number is small and there are few famous schools.

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### B. Social Recognition Is Not High

After analyzing the reasons, it is found that on the one hand, most of the private undergraduate colleges have just started, and most of them are just upgraded from the junior college, so the hardware and software aspects of the school are still not perfect; on the other hand, people are bound by the traditional concept of "public school are the best" [1], and this viewpoint will exist in people's minds for a long time.

### C. The Research Competitiveness Is Poor

Scientific research competitiveness is an important indicator reflecting the comprehensive level of colleges and universities. From statistical analysis of the research competition of 141 independent private colleges and 275 independent colleges in China made by the relevant literature [2] based on the four dimensions of topics, papers, invention patents and scientific research achievements, it can be seen that the gap of scientific research strength between the private colleges and universities in China is relatively large, and the overall level of scientific research is low.

### D. The Students Teachers Ratio is Far More Than That of Public Universities

Although the management and operation mechanism of private colleges and universities is flexible, it is subject to the pressure of survival and development, and limited by the input mechanism and the ability of "hemopoiesis". Most of them focus on economies of scale in the initial stage, resulting in a large number of enrollments on the one hand and insufficient investment in running schools on the other. The number of fixed teachers employed is relatively small compared to that of public universities, and the age structure of the teaching staff presents a "dumbbell" shape, which means there are many old teachers and young teachers but fewer middle-aged teachers.

## III. THE CHALLENGES FACED BY UNDERGRADUATES TRAINING OF CIVIL ENGINEERING MAJOR

Civil engineering major is one of the most popular majors in undergraduate colleges and universities. It is also one of the highly recognized majors of the society and parents for many years. The same is true for private undergraduate colleges and universities, and most of the declared undergraduate majors include this major. For example, our school has upgraded from a junior college to a bachelor's degree. Among the five undergraduate majors that were first declared, the civil engineering major is the first one, and the number of enrolled students is 240.

Under the situation that there are many students with poor foundations, few teachers and weak engineering experience in private undergraduate colleges, there will be many problems in the process of talent cultivation, such as the difficulty of small class teaching, the difficulty of centralized production practice, and the insufficient graduation design instructor. In the face of many unfavorable factors in the talents training of civil

engineering major in the private undergraduate universities, and the challenges of increasing employment pressure for students in the building industry in the future, how to fully exploit and utilize various school resources to research the training mode for civil engineering majors in private colleges with "more students and fewer teachers" is a problem that must be explored. Otherwise, the school quality and level can hardly meet the training standards of civil engineering majors at the undergraduate level.

## IV. THE EXPLORATION OF EFFECTIVE WAYS AND METHODS OF TALENT TRAINING

### A. The Organic Combination of "First Class" and "Second Class"

The first class of civil engineering major is mainly based on the professional norms [3], so its general education module, professional basic modules, professional modules and cognition practice, curriculum design, production practice, graduation internships, and graduation design (thesis), etc. need to basically abide by the professional norms; the second class refers to the auxiliary education closely related to the major, which is the expansion and supplement of the first class education.

In view of the characteristics of the large enrollment of civil engineering major in the first term in our school, we analyzed the employment positions of most students after graduation, and started the second class of "Intensive Courses for Project Managers" for civil engineering major, and formulated the training programs from enrollment qualification, training plan and content, assessment and dynamic management mechanism of the students and guided the whole program with key point by promoting the academic progress of the general students by cultivating outstanding students. The training mode and main content of the intensive course of project manager are:

1) *Enrollment qualification focuses on students' academic situation of "first class"*: The first class is the school work that every civil engineering major must complete, and it is also the main threshold for determining whether a student can enter the second class of the intensive course of project manager. Therefore, based on the fact that the students voluntarily want to join the second class of the intensive class of the project manager, the enrollment qualification first examine students' learning situation of the first class, and carry out dynamic management. It changes once every school year to ensure that the students in the intensive class of project manager in the second class have plenty of energy to learn and are excellent students in the entire major grade, so as to be model students who can influence and drive other students.

2) *The training plan and content of "second class" is closely related to that of "first class"*: The training program and content of the second class Intensive Course of Project Manager are not only closely related to the civil engineering major, but also related to the future employment of most students. Therefore, the training plan and content of the

second class — Intensive Course of the project manager of our school mainly focus on the job responsibilities of the project manager at the construction site. The excellent project managers of the school-enterprise cooperation company are invited to carry out a series of lectures and trainings on the job manager's job responsibilities in school to teach advanced technology and management knowledge; at the same time, we organize students in intensive class to practice at the project site in the summer. Through the practice at the site, the trainees can better understand the building construction technology and organization management operation mode and usage and management methods of advanced equipment to improve the students' ability to monitor the project quality and safety management and organize and manage the construction site.

3) *The training program and content of "Second Class" are related to the main "practicing qualifications" of the major:* The training program and content of "second class" intensive course of project manager are related to the main "practicing qualifications" of the major, which will make the second class richer and the training objectives clearer, so that the learning motivation and enthusiasm of the students can be guaranteed. Although in the first class, our school has generally strengthened the corresponding course teaching to be related to the content of the national certificate examination. For example, the course content of the "Construction Law" is related to the certificate subject "Construction Engineering Regulations and Related Knowledge", and the course content of "Civil Engineering Construction Technology" and "Construction Management of Civil Engineering" is related to the certificate subject of "Construction Engineering Management" and "Professional Engineering Management and Practice". However, in the training of the second class intensive course of project manager, our school also chooses a training institution with good reputation and good reputation to cooperate, of which the training content is directly aimed at the national "Associate Constructor" examination, in order to make a certain number of students obtain the qualification of the national "Associate Constructor" in school period. Through the training for certificate examination, the students' application knowledge of civil engineering has been greatly enhanced, laying a solid professional foundation for future work.

For most other students who are not part of the intensive course of the project manager, the training content of the second class in our school is mainly related to the "constructor" and "BIM" test content in the civil engineering major, and it is regulated that the civil engineering students who can't obtain "Associate Constructor" certificate at school must pass one of the certificate examinations "constructor" and "BIM" before graduation. This is to strengthen the relevance between the talent training of civil engineering major and national and industry-recognized qualifications. Based on the "first class" training, students can meet the requirements of modern civil

engineering construction enterprises for post qualifications through the intensive training in "second class".

### *B. Strengthening the Training of Practical Applied Talents*

Most of civil engineering undergraduates in private universities will choose employment after graduation, and mainly chooses to work in various construction enterprises. Only a few students will choose to take the postgraduate examination, civil servants examination or further study abroad. How to strengthen the practical training link of down to earth civil engineering undergraduates in private colleges and universities, and make students possess more engineering practice knowledge during school to meet the needs of employment after graduation and personal development is the key point that colleges and universities need to consider.

1) *Establishing the idea that civil engineers should start from the grassroots level:* First of all, to strengthen the professional quality education of the students and cultivate the future civil engineers, we should start from the grassroots level. Students should have the basic professional quality of spirit of bearing hardships and standing hard work, strong operational ability and reliable feature and understand that the needs of social talents are diversified. They not only need graduates who have relatively good theoretical level and relatively good foundation from research-oriented universities, but also need talents who can work hard, have strong application and operational ability, and are more reliable.

2) *Making full use of off-campus resources to enable students to have a better reliable training platform:* There are only two ways for private undergraduate colleges to find the reliable resources: one is that the school itself establishes complete resource, and the other is to find ways to seek down to earth resources outside the school. It is very difficult for private undergraduate universities to build their own complete reliable resources in the development stage. Off-campus reliable resources mainly exist in various construction enterprises. Therefore, private undergraduate colleges must establish a stable off-campus base and practice place, so that students have a better reliable professional training resources and practice platform.

Our school is located in Nantong, Jiangsu Province, a famous "hometown of architecture" in China, which provides us with rich off-campus resources for our civil engineering major. The analysis of the resources outside the school mainly includes abundant human resources of off-campus part-time teachers, such as a certain number of professor-level senior engineers, many senior engineers, numerous A construction divisions and cost engineers, and large number of experienced project managers who have undertaken large and medium-sized construction projects. They are in the same city as our school, so the use of human resources is very convenient, which can effectively supplement and improve the various structures of our faculty and solve the outstanding problems of the lack of instructors in graduation design and production internships;

what's more, these external teachers from the front line of production can ensure the training of students' engineering application ability. Second, the resources of off-campus base are also very rich, which provide more construction sites, construction places and on-site instructors internships for civil engineering students to conduct cognition practice, production internships, summer internships and graduation internships. Third, the practice of relevant courses can be fully guaranteed. The school mainly guarantees the experimental conditions necessary for professional basic courses. As for the practice that reflects modern and advanced construction techniques and methods, we can make full use of large construction companies out of school, construction testing and detection center and other high-quality resources to carry out. The process will not only open up students' horizons, but also enable students to better understand the operation of modern architecture enterprises and advanced construction technology and methods.

3) *Formulating relevant systems to promote students to obtain better engineering practice ability:* Based on providing better training resources and practice platform for students by offering professional quality education and making full use of the external environment, we also need to develop relevant rules and regulations, so as to promote and ensure students to obtain certain engineering practice capabilities. The relevant systems formulated by our school mainly include: (1) the second class education for students and the requirements for obtaining relevant qualification certificates; (2) the management methods for summer engineering practice of civil engineering students; (3) A number of provisions of civil engineering students participating in the expert series lectures; (4) Provisions of cognition practice, production internship, and graduation internships of civil engineering students; (5) management methods for graduate design of civil engineering students. These systems all put forward specific requirements for engineering practice ability, thus ensuring the continuous improvement of students' engineering practice ability at school.

#### V. THE INITIAL RESULTS OF THE TRAINING OF CIVIL ENGINEERING UNDERGRADUATES

After four years of hard work, the training of the first batch of civil engineering undergraduates in our school has achieved certain results. For example, among the 40 students in the intensive class of project managers, 35 passed the national "Associate Constructor" examination; nearly 98% students receive the qualification certificate of construction workers or BIM; more than 20 students are awarded prizes in provincial and above skill competitions; the first employment rate of civil engineering graduates is 95% (20% of students are employed in building enterprises of special grades and first grade); 10 students were admitted to the graduate school (5 of which were admitted to "world-class" universities); on the other hand, the construction of the off-campus base was remarkable. We not only established a relatively stable cooperative relationship with more than 10 special-grade and first-grade construction

enterprises, which played a good supporting role in the professional construction and personnel training during the four years and provided sufficient bases and places for the production internship and graduation internship of civil engineering undergraduate students. At the same time, we selected more than 10 senior engineers with rich engineering experience to participate the graduation design guidance of the students in the whole process, which has made great contributions to improving the training quality of the civil engineering undergraduate students.

#### VI. CONCLUSION

Cultivating high-quality applied professional talents is not only a requirement of social development, but also an inevitable requirement for the development of private undergraduate colleges. Our school's civil engineering majors combine multiple means to organically combine the "first class" with the "second class". Combining with the characteristics and features of schools and students, we strengthen the training of reliable applied talents and explore a road for the cultivation of civil engineering undergraduates in private universities.

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