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Exploration on the Construction of Practical Teaching System for Engineering Management Major

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Abstract: With the rapid development of the economy and continuous technological progress, the teaching quality of engineering management majors needs to be continuously improved. Practical teaching, as an important component of undergraduate education, is an important way to improve the quality of undergraduate talent cultivation. Optimizing practical teaching can help undergraduate education cultivate excellent talents. In the process of cultivating engineering management majors, from the perspective of student employment, emphasis is placed on shaping students' basic knowledge application ability, practical ability, and technological innovation ability to meet the demand of enterprises for engineering management talents. This article takes the requirements for the cultivation of engineering management professionals stipulated by the Ministry of Education as the standard, clarifies the elements of engineering management talent cultivation, and the importance of engineering management practical teaching in talent cultivation. It constructs a practical teaching system for engineering management professionals from the aspects of teaching content, practical links, teaching methods and means, and teaching evaluation.

Keywords: Engineering Management; Practical Teaching; Personnel Training.

1. Introduction

The engineering construction industry has crossed the stage of talent demand for large-scale, traditional professional technologies, and urgently needs comprehensive innovative talents with expertise in green, industrialization, and informatization to cope with various challenges in the development process. Top innovative engineering management talents are the key to promoting the innovative development of the construction industry, forming new quality productivity, and promoting the overall innovation level of the construction industry. They are an important driving force for accelerating China's transition from a "construction power" to a "construction powerhouse". As the main battlefield for talent cultivation, higher education institutions attach increasing importance to the cultivation of students' innovative abilities, and have taken various measures such as restructuring the curriculum system, designing teaching objectives, and building experimental platforms in order to achieve high-quality and innovative engineering management talent cultivation [1]. The degree of matching between practical teaching and industry demand directly affects the quality of training engineering management talents. On the one hand, industry demand leads talent cultivation. Only by deeply understanding the current situation of the industry can we discover problems and opportunities in the field of engineering construction, propose innovative solutions, and meet the development needs of the industry; On the other hand, practical teaching is an important way to cultivate engineering management talents. Practical teaching enables students to have a deeper understanding of the actual situation in the field of engineering construction, thereby innovating the learned theories and serving practical scenarios. However, due to the strong practical characteristics of engineering management majors, universities should not only focus on cultivating innovative talents, but also pay attention to the integration of talent cultivation with social development and market changes, effectively adapt to the actual development of the industry, stimulate students' interest in learning, and enhance their practical skills. At present, the teaching practice of engineering management majors in some universities is still stuck in imparting traditional course knowledge, which is not closely related to industry demand and hinders students' mastery of cutting-edge knowledge and improvement of innovation ability in the field, resulting in talent development lagging behind industry development requirements [2].

2. Elements of Talent Cultivation in Engineering Management

(1) Knowledge reserve elements

Interdisciplinary integration is one of the characteristics of the construction of engineering management majors. Engineering management majors are comprehensive management majors that integrate engineering technology methods, engineering economic development, construction management plans, and building laws and regulations. Civil engineering, big data statistical analysis, industrial production and other industries and related skills are the inevitable direction of the development of the construction industry. It is necessary to enhance the spirit of innovation, big data statistical analysis, and basic knowledge of social sciences on the premise of existing professional skills, so that engineers understand both engineering technology, economics and law, and realize the practical application of learning. The cultivation of engineering management professionals should focus on diversified knowledge and skills, emphasizing the combination of theory and practice, and emphasizing the cultivation of students' analytical abilities from multiple perspectives, across the industry, with high and deep levels.

(2) Innovation capability elements

The goal of independent innovation ability for engineering management professionals is to discover new problems in the construction process of engineering projects from a unique perspective based on accumulated multi-disciplinary knowledge, apply advanced professional skills and new technological concepts to clearly propose new solutions and

means, handle problems with creative thinking, and promote the achievement of scientific and technological innovation in engineering projects. Universities should attach importance to shaping students' innovative thinking ability, innovative spirit, and innovative literacy, and provide students with a platform for independent innovation practice services. Innovative thinking ability should accumulate rich and diverse interdisciplinary professional knowledge, and innovative spirit should be integrated into various stages of in class and out of class education, shaping the innovative spirit of technical majors. Building an independent innovation practice system and sharing platform is beneficial for students to comprehensively understand the professional skills of independent innovation and possess the professional ethics of innovation leadership.

(3) Comprehensive quality elements

The outstanding talents trained by the engineering management specialty should first integrate the "four new" economic development under the influence of high and new technologies such as the Internet and artificial intelligence. Secondly, they should have a strong spirit of innovation and innovation ability, which requires students to have certain comprehensive ability. In fact, the engineering management major is a fusion of multiple professional knowledge systems. In the face of the basic construction of comprehensive courses in these interdisciplinary fields, it is necessary to follow the characteristics of interdisciplinary intersection, focus on building all curriculum settings of the engineering management major, and improve students' comprehensive professional literacy. The establishment of interdisciplinary comprehensive curriculum should attach importance to the cultivation of students' interdisciplinary thinking and the shaping of their comprehensive abilities in various subjects, and build an interdisciplinary comprehensive curriculum system.

(4) Operational skill elements

The rapid development of intelligent construction, new smart cities, and large-scale projects requires technical engineers to have drawing and drafting abilities, professional skills in engineering construction, and organizational management skills. They also need to understand modern construction techniques such as green construction technology, prefabricated building construction technology, big data analysis technology, BIM application technology, 3D printing, and explore effective ways to achieve new project goals in dealing with complex engineering problems. The goal of operational skills is to improve the practical level of new management technologies in enterprises and the goal of new construction technologies in construction projects, based on the existing talent cultivation goals. Explore new methods for construction engineering and innovate to drive the development prospects of the engineering and construction industry.

3. The Importance of Practical Teaching in Engineering Management Major

The practical teaching process plays a crucial role in the cultivation of applied undergraduate engineering management professionals. We should enhance students' sense of responsibility for engineering projects, improve their learning enthusiasm, consolidate their basic knowledge, enhance their spirit of engineering cooperation and innovation, improve their operational ability, and enhance their professional comprehensive literacy [3].

(1) Practical teaching is an important component of engineering management education

In the process of cultivating engineering management professionals, attention should be paid to the integration of theory with practice. In the professional teaching process, practical teaching should be oriented towards specific engineering projects, generate unique engineering thinking in project practice, accumulate engineering experience in work, and form innovative awareness of engineering projects. The crucial stage in cultivating and exercising students' practical ability, independent innovation ability, and comprehensive literacy is the practical teaching process. For applied higher education institutions that aim to cultivate applied professionals with innovative spirit and practical abilities, practical teaching occupies an important position. In the practical teaching of engineering management majors, emphasis is placed on shaping students' practical abilities, quality education, and encouraging them to participate in various club and social activities, such as science and technology innovation competitions, innovation and entrepreneurship competitions, and other subject competitions, in order to acquire new knowledge from subject competitions and effectively improve professional practical abilities.

(2) Practical teaching is an important part of cultivating applied talents in universities

Professional knowledge comes from practice, and abilities also come from practice, which illustrates the importance of practical classroom teaching in cultivating applied talents. Cultivating high-quality applied talents is the core goal of professional talent cultivation in applied universities. To achieve this goal, not only theoretical education but also practical education is needed. In the process of practical teaching, cultivate students' practical and hands-on abilities, and demonstrate the application of knowledge and modern logic. Applied talents should have strong professional knowledge application ability and relatively high comprehensive ability, laying a solid foundation for entering society.

(3) Practical teaching is an important way for students to cultivate a spirit of cooperation and innovation ability

When cultivating students' innovative spirit and ability in the field of engineering management, the focus should be on changing the traditional teaching mode from emphasizing classroom theory over extracurricular practice to combining theory with practice, and improving students' spirit of cooperation, teamwork, and innovation. Based on practical teaching, students can closely integrate classroom theoretical teaching with engineering practice, thereby continuously improving their professional abilities. At the same time, through continuous practical operation and training, students are encouraged to explore the interrelationships and changing trends of things based on their own interests. By using a problem driven approach to inspire students' thinking, guiding them to better understand, master, and discover patterns, and attempting to solve practical engineering problems, we can promote students' active learning and independent thinking, and subtly cultivate their innovative spirit. Practical activities can maximize the development potential of students, cultivate their application of professional skills to participate in social practice, and continuously improve their comprehensive abilities and

innovative spirit.

4. Construction of Practical Teaching System for Engineering Management Major

In the process of building a practical teaching system for engineering management majors, it is necessary to focus on personalized training of students based on industry characteristics. Firstly, interdisciplinary integration should be the main means of project execution, and efforts should be made to enhance students' views on engineering education, engineering literacy, and innovative practical abilities; Secondly, based on the existing practical teaching system, we will continue to deepen our understanding and reform, and reconstruct a new engineering practical teaching system with multiple stages, levels, elements, and links.

4.1. Improvement and Integration of Practical Teaching Content

Adjust the proportion of theoretical and practical teaching hours appropriately to enhance the teaching effectiveness of course design and practical training courses; Based on the characteristics of different courses, form a three-level tiered practical teaching system consisting of basic practice, technical professional practice, and social production practice; Integrate the characteristics of the curriculum, achieve diversified practical teaching methods, ensure teaching effectiveness, and adopt various teaching practices including engineering knowledge internships, process operation internships, enterprise production internships, curriculum design, experimental courses, and case studies; Course design is based on actual engineering projects, and different types of courses are planned according to their characteristics and teaching objectives. Reasonable practical teaching examination outlines and teaching designs are formulated, and the same knowledge points that appear in different courses are planned as a whole into a certain course to prevent knowledge point repetition; Based on the characteristics of engineering projects, flexibly utilize existing laboratory simulation models for practical training to enhance students' understanding and grasp of construction procedures; Based on actual engineering, closely linking different courses together enables students to grasp the role of different courses in engineering and fully understand that each course does not appear independently, but rather forms a knowledge structure through each course. For example, the practical training of courses such as "Surveying", "Civil Engineering Drawing and Recognition", "Architectural CAD", "Construction Technology and Organization", and "Engineering Valuation" in basic professional courses can adopt a specific engineering example to carry out campus map measurement, then manually draw, and then use CAD drawing, combined with construction organization design, to form a closed-loop engineering practice training circle for engineering cost formation.

4.2. Optimization of Three Link Teaching: Basic Practice, Professional Practice, Professional Internship, and Graduation Internship

The basic practical activities in the teaching process of engineering management mainly include four aspects: practical application of basic engineering knowledge, practical application of basic professional knowledge, professional internship, and graduation internship.

(1) The basic practice mainly focuses on understanding internships, course design in building architecture, process operation internships, and measurement internships, cultivating students' basic engineering practice abilities and the ability to apply modern technological methods, laying the foundation for future participation in interdisciplinary integrated engineering practices. In the original practical teaching process, virtual engineering simulation is applied, and school engineering virtual simulation technology equipment is utilized to actively carry out the application of BIM technology in classroom teaching [4]. In the teaching process, 3D simulation technology for engineering architecture can be set up to transform 2D classroom teaching into 3D structures. During teaching, students can also be required to use the school's construction case fusion engineering simulation software to simulate the construction steps of the project, in order to master the construction stages and steps of the building project, compare them with actual cases, and solve practical problems.

(2) Professional practice refers to the course design after the completion of theoretical courses, which requires students to design practical cases based on the theoretical course content. In addition, it should also include dispersed extracurricular independent innovation practices, such as students participating in various levels and types of subject competitions outside of class, guiding teachers in scientific research projects and other activities, forming a professional practice of "production teaching research collaboration", allowing students to use engineering management software tools reasonably, design experiments for complex engineering problems, obtain actual data information and analyze problems to draw conclusions, and enhance innovation ability. The course design serves as the backbone of professional practical teaching, cultivating students' mastery of course content and professional knowledge, understanding of relevant guidelines or standards in their field of study, and the ability to read technical materials in their field. Through team collaboration, students can use literature materials and flexibly apply course content and professional knowledge to solve real engineering problems, enabling them to design solutions to complex problems in the field of construction engineering and enhance their professional competence.

(3) Professional internships and graduation internships are mainly based on six-month on-the-job internships, achieving "deep integration of schools and enterprises", which means that universities, enterprises, and production internship enterprises jointly manage according to the Production Internship Management Regulations. Both parties of the school enterprise cooperation shall monitor the students' internship situation and the writing status of internship logs and other materials in real time according to the cooperation mode. Schools and collaborating enterprises regularly assign guidance teachers to visit and investigate students' production and internship situations, and conduct research on the talent training needs of employing companies, dynamically adjusting the training direction according to enterprise needs. This method not only solves the problem of difficult recruitment for enterprises, allowing students to have more than six months of work experience in similar positions when they graduate, but also assists students in achieving seamless integration with the positions [5].

4.3. Optimization of Teaching Methods and Tools

To change the quality of classroom teaching from the source, it is necessary to change traditional teaching methods and approaches. Add moderate teaching content such as videos in classroom teaching, improve students' learning enthusiasm, and adopt a "student-centered teaching strategy".

(1) 3D visualization teaching

Appropriately introducing BIM technology, integrating information elements such as architectural design and modeling, construction and execution, project budgeting and control, project bidding and management data into 3D visualization models, and presenting them to students in real-time, intuitively, and comprehensively. Through the 3D information entity model, students can intuitively experience the construction process and construction of buildings, and then engage in practical exercises such as engineering structure modeling and improvement, project construction period and cost control, engineering project measurement and pricing, and project process control. In the 3D simulation entity model, students can continuously learn, discuss, and practice [6]. BIM practical classroom teaching can not only simulate real-world engineering problems, but also dynamically and intuitively see practical conclusions, resulting in significant improvement in practical abilities [7].

(2) Flipped Classroom Teaching

In the implementation of "flipped classroom" or group training and course design, a student-centered teaching approach should be emphasized. Emphasize the consistency of teaching processes, the diversity of teaching forms, the fun of learning processes, the collaboration of learning behaviors, and the integrity of evaluation videos. Flexibly utilizing classroom teaching projects as a medium to design teaching scenarios, enabling students to acquire professional theoretical knowledge and skills through the practice of completing classroom teaching tasks, and thus build their own professional knowledge system.

(3) Inspire autonomous teaching

Teachers should be good at observing the different strengths of students in classroom teaching, inspiring them to fully utilize their strengths, identifying their weaknesses in teamwork and professional abilities, and providing assistance for correction. In addition, at the end of the class, students can use mind maps to self summarize and improve their ability to summarize, analyze, and express themselves. Teachers should gradually adopt a blended learning approach of online and offline teaching when teaching, which can enable students to fully grasp the course content and focus on the introduction of ideological and political education to improve teaching effectiveness. At the same time, the method of phased classroom teaching evaluation is adopted to strengthen the assessment of students' daily performance, evaluate their daily performance and classroom participation.

4.4. Optimization of Teaching Evaluation

Further improve the detailed rules for assessing practical performance, in order to achieve fairness and impartiality, and strictly implement a process based assessment method in practical evaluation. Basic practice and professional practice mainly evaluate students' performance and achievements in practical training. The practical training results are based on teaching requirements, making students highly value the necessity of practical classroom teaching activities, allowing every student to participate in practice on their own and enhance their professional abilities and indispensable skills in future work through practice.

In terms of professional internships and graduation internships, regular management and inspection of the implementation of internships are carried out: the most basic evaluation method for talent cultivation quality is enterprise user evaluation. Professional leaders and guidance teachers should regularly conduct surveys in enterprises, accept feedback and upgrade suggestions from enterprises on graduates' work, and improve and upgrade professional talent cultivation plans.

5. Conclusion

The cultivation of applied talents in engineering management majors in higher education institutions needs to adopt a dual approach of theory and practice, continuously innovate and develop, enhance students' abilities in various aspects, and cultivate applied talents in the field of architecture who have both disciplinary integration advantages and innovative abilities. The cultivation of applied talents in engineering management majors in higher education institutions can increase the driving force for social and industry development. Establish multiple teaching methods including 3D visualization teaching, flipped classroom teaching, and stimulating autonomous teaching. Optimize and form the basic practical links of "virtual simulation and on-site integration", the professional practical links of "industry teaching research collaboration", and the social practical links of "deep integration of schools and enterprises". Cultivate high-quality engineering management professionals who serve the development of local economy.

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