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Exploration of the Cultivation of Innovative Talents in Intelligent Construction in Application-oriented Universities

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Abstract: Relying on the first-class construction discipline platform, the field research was conducted on the application-oriented colleges and universities that have opened the intelligent construction major, and the necessity of the establishment of the intelligent building major, talent training, professional construction, practice base construction, and teacher construction were discussed. The new generation of information technology, such as BIM technology, 3D printing, assembly, unmanned aerial vehicles, smart construction site sand tables etc., optimizes and adjusts the training program and curriculum system of civil engineering professionals, and integrates them into the corresponding courses. Combine smart construction site and virtual simulation technology with practical courses to explore the cultivation of innovative talents in application-oriented universities. The exploration of the cultivation of innovative talents in intelligent construction in application-oriented colleges and universities pays more attention to application-oriented training, explores new modes of practical teaching, and constructs a smart construction site simulation practice teaching system and virtual simulation practice teaching project group from practice, so as to provide reference for colleges in the later stage of intelligent construction professional declaration and construction, and application-oriented talent training.

Keywords: New Information Technology; Intelligent Construction; Talent Development.

1. Introduction

Under the background of new engineering, a new round of information technology revolution represented by the Internet of Things, artificial intelligence, cloud computing and big data is producing profound and extensive changes to the world, and the transformation and upgrading of the traditional construction industry is unstoppable.

Intelligent construction is based on traditional civil engineering, integrating a new generation of information technology, through standardized modeling, visual cognition, network interaction, efficient computing and intelligent decision-making, to achieve a new generation of intelligent engineering construction driven by digital intelligent planning and design, intelligent equipment and construction, intelligent operation and maintenance and management. At present, there is a large demand for talents in intelligent construction, and there is a shortage of about 300,000 innovative talents in intelligent construction every year. At present, there are still relatively few colleges and universities that offer intelligent construction majors, and the demand for intelligent construction talents is much greater than the actual number of talents cultivated by current universities. There are still many problems in the education model, curriculum system, interdisciplinary, entrepreneurship and entrepreneurship education, institutional mechanisms, etc., how to better, faster and more intelligent construction innovative talents to adapt to the high-quality development of the future construction industry is of great significance for China to realize the transformation from a large construction country to a construction power.

2. Problems in the Cultivation of Intelligent Construction Talents

The research on the cultivation of domestic intelligent construction talents focuses on the construction of curriculum system, laboratory construction, faculty construction, teaching reform of a certain course, and the transformation of engineering management major. The practical teaching content of civil engineering majors is small, the practical teaching process is out of touch with the production process, there is no intersection and penetration between different disciplines, the students' practical ability and innovation ability have not been effectively improved, and the ability to deal with practical engineering problems is insufficient. There is a corresponding curriculum design for theoretical courses, but the systematic design of practical courses is insufficient, and the practice lacks hierarchy. Practical teaching resources are relatively scarce, and some teachers lack practical experience. The teaching facilities are outdated, and the practical teaching equipment cannot be updated in time, resulting in the talent training cannot meet the economic development needs of the modern market.

The research on smart construction sites at home and abroad is mainly reflected in the integrated application of BIM technology, the integration and data sharing of platforms, the informatization and intelligent management of construction sites, and the application and decision-making of actual projects. Simulation teaching in foreign countries started early, mainly focusing on construction management, virtual simulation experiment teaching and the application of VR technology in the field of education. The research on virtual simulation experiment teaching in China started late, but it developed rapidly, and the research mainly focused on experimental teaching and teaching reform. With the sustained and rapid development of China's construction

industry, intelligent construction has accelerated the transformation of traditional construction methods and promoted the industrialization, digitalization and intelligent transformation and upgrading of the construction industry. The society's requirements for civil engineering professionals are getting higher and higher, and the demand for innovative engineering and technological talents is becoming more and more urgent.

3. Reform of Teaching Mode

The reform of teaching mode is also the key to cultivating innovative talents in intelligent construction. Application-oriented colleges and universities should adopt diversified teaching methods, such as case teaching and flipped classrooms, to stimulate students' interest and initiative in learning. At the same time, it strengthens school-enterprise cooperation and introduces enterprise mentors to jointly guide students to conduct practical research and project development. In addition, a scientific evaluation system should be established, focusing on the evaluation of students' comprehensive quality and innovation ability, and promoting the all-round development of students.

The reform of teaching mode is the core link of cultivating innovative talents in intelligent construction. The traditional lecture-based teaching mode can no longer meet the requirements of talent ability in the field of intelligent construction. Therefore, application-oriented universities need to take a series of measures to deepen the reform of teaching mode.

3.1. Introduce Problem-Based Learning

PBL is a teaching method that is centered on solving practical problems. In the Intelligent Construction course, teachers can design real or simulated engineering project problems, and have students work in groups for problem analysis, scheme design and implementation. This approach helps students combine theoretical knowledge with practice and develop their ability to solve practical problems.

3.2. Implement Case Teaching and Industry Mentor System

Case teaching is a method of helping students understand and master theoretical knowledge by analyzing real cases. In the teaching of intelligent construction, teachers can introduce typical intelligent construction cases at home and abroad, so that students can analyze the technical application and management strategies in the cases, so as to deepen their understanding and knowledge of intelligent construction.

Through cooperation with enterprises, industry mentors with rich practical experience are invited into the classroom to share practical engineering experience with students and provide project guidance. Industry mentors can participate in curriculum design, practical teaching and graduation projects to provide students with a more realistic working environment and learning opportunities.

3.3. Use of Information Technology Means and Establish Student Innovation Teams

Using modern information technology means, such as online education platforms, virtual reality technology, etc., to provide students with diversified learning resources and learning methods. At the same time, through big data analysis, students' learning behavior and outcomes are analyzed to provide teachers with a basis for teaching improvement.

Students are encouraged to form innovative teams to participate in the research and development of scientific research projects. The school can provide corresponding funding and venue support to provide students with a platform for innovative practice. Through the research and practice of scientific research projects, students' innovation ability and scientific research literacy are cultivated.

3.4. Strengthen the Experimental Training Link

Increase investment in experimental training facilities, establish intelligent construction laboratories and training bases, and provide students with sufficient opportunities for practice. At the same time, the experimental training is combined with theoretical teaching, so that students can verify and consolidate theoretical knowledge in practice.

3.5. School-enterprise Cooperation and Collaborative Education to Build an Intelligent Construction Industry College

The research on the job demand of enterprise intelligent construction talents, and whether the goal of talent training in application-oriented colleges and universities matches the needs of enterprises, form an investigation and research report. Strengthen school-enterprise cooperation and the combination of industry, education and research, and provide students with more practical opportunities and innovation platforms. This includes cooperating with enterprises to carry out practical engineering projects, establishing training bases, and jointly carrying out scientific research activities. Through school-enterprise cooperation, students can better understand the needs of enterprises and industry practices, and improve their practical ability and innovation ability. Cooperate with enterprises to embed corporate training courses or practical projects into the curriculum system, so that students can better understand the needs of enterprises and industry practices.

The integration and optimization of school-based resources, the use of BIM+ technology, virtual simulation, drones, etc. to form innovative teaching resources, the results of the curriculum model over the years and the works of the BIM completion competition as teaching resources, cycle updating, and finally form an integrated teaching resource. The new teaching resources are used to reconstruct the practical teaching curriculum system, and the teachers combine the new teaching resources, new technologies, and equipment with the corresponding practical courses. Co-development of courses: Co-development of courses with industry experts to ensure that course content is closely aligned with industry needs.

4. Construct a Smart Construction Site Simulation Practice Teaching System and a Virtual Simulation Teaching Practice Project Group

4.1. Construct a Practical Teaching System for Smart Construction Site Simulation

The practical teaching curriculum system includes basic practice, special practice, and comprehensive practice. In the context of intelligent construction, the existing laboratories and practice bases are used to integrate modern technology with practical courses to build a practical teaching system for

smart construction site simulation.

The reform of the curriculum system is the core link of the cultivation of innovative talents in intelligent construction in application-oriented universities. In order to better adapt to the development trend and market demand of the intelligent construction industry, the reform of the curriculum system needs to be refined and deepened from the following aspects.

Stage 1: Scene Cognition. Semester 1-2 (Carry out enlightenment teaching and understand smart construction sites). Using VR/AR, other equipment and other equipment to develop students' basic cognitive abilities.

Stage 2: Scene Experience. Semester 3-4 (Experiential teaching and learning about new smart devices). Use drones, 3D lasers, scanners, and other equipment to develop core practical skills.

Stage 3: Scene Experience. Semester 5 (Experiential Teaching, Learning New Smart Devices). Using 3D printers and other equipment, we will develop core practical skills.

Stage 4: Scenario competence. Semester 5 (Combined with management courses, learning smart site applications). Relying on the virtual simulation laboratory platform sensors, other equipment, etc., to develop comprehensive practical skills.

4.2. Construct a Virtual Simulation Teaching Practice Project Group

The school and enterprise cooperate to build a virtual simulation platform for engineering teaching, which is applied to the practical teaching process. Integrate the implemented practical courses to form a virtual simulation teaching practice project group.

Case 1.With the help of human-computer interaction simulation technology and the linkage interaction of knowledge points, the visualized three-dimensional model increases the interest of the classroom, carries out experiential teaching applications, enhances students' interest in learning, and sets up virtual simulation practice projects for the application of drawing recognition.

Case 2.Courses such as housing architecture and civil engineering construction combine VR, AR, MR equipment and virtual reality technology, and the construction process of smart construction sites is displayed with VR/AR with the help of virtual simulation laboratories, for which practical projects can be set up for the integration and release of construction physical models and BIM-VR models.

Case 3.Engineering surveying courses, surveying and mapping courses are combined with UAVs to carry out intelligent surveying and earthwork quantity calculation, etc., according to the UAV real-life captured images through professional software processing, reproduce three-dimensional modeling, improve students' intelligent surveying and mapping ability, for which UAV construction site real-world collection, real-world modeling and web page release practice projects can be set up.

Case 4.3D printing technology has been added to the course on the principles and applications of BIM technology. The addition of 3D printing technology and 3D printer teaching elements can allow students to print the model immediately after the design of the model, combine theory and practical teaching, strengthen students' understanding of knowledge, and also improve the students' hands-on practical ability.

Case 5.Design courses such as building structure and structural design principles are integrated into 3D laser scanners. The point cloud data scanned by the 3D laser scanner can provide accurate structural data for the construction project, which is convenient for providing the necessary data support for fine modeling and the comparison between the model and the point cloud in 3D Max and other modeling software, so as to improve the design and construction lean.

Case 6.The project management course integrates BIM technology and smart management, combines intelligent new technology with management knowledge, and carries out intelligent management of engineering projects through the project management sand table training room and smart site training room, improves students' comprehensive management ability, and carries out virtual simulation practice projects of smart site project management.

5. Summary

Under the background of new engineering, a new generation of information technology such as BIM technology, 3D printing, assembly, unmanned aerial vehicles, smart construction site sand tables, etc., is combined with talent training, and the training program and curriculum system of civil engineering professionals are optimized and adjusted, and integrated into the corresponding courses. Combine smart construction site and virtual simulation technology with practical courses to explore the cultivation of innovative talents in application-oriented universities. The practical link is the specific application of multidisciplinary cross-integration knowledge, with more emphasis on practicality, and "moving the intelligent industry into the campus" is an important part of school-enterprise cooperation, with the help of the industrial platform, to build a practical teaching platform. The school and enterprise cooperate to build a virtual simulation platform for engineering teaching, which is applied to the practical teaching process. Integrate the implemented practical courses to form a virtual simulation teaching practice project group.

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