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Research and Practice on Intelligent Informatization Construction of Architectural Training Base in Vocational Colleges

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***Abstract*—Training base is a necessary condition for vocational colleges to cultivate high-quality skilled talents. The informatization and intellectualization construction of training base is the inevitable trend of teaching reform. Taking training base of Binzhou Polytechnic as an example, this paper analyzes the necessity of intelligent informatization construction of architectural training base, and put forward the ideas and measures of intelligent information construction based on "Reality Architecture + Virtual BIM" in terms of teaching facilities, practical training resources, practical training operation and other aspects.**

Keywords—Architectural training base; Informatization; BIM; Reality Architecture

I. INTRODUCTION

The training base is a necessary condition for higher vocational colleges to cultivate high-quality skilled talents, and it is also a powerful support to promote teaching reform and the construction of "double-qualified" team. The National Department of Education in the "Education Informatization 2.0 Action Plan" document proposed that "continue to promote the deep integration of information technology and education, information technology and intelligent technology into the whole process of education in depth." , However, there are many problems in the integration of traditional training base construction and educational informatization, such as inadequate construction of software and hardware facilities, single training process and method, lack of digital teaching resources and virtual simulation teaching software, etc. Therefore, how to use Internet +, virtual simulation and other modern information technology to build intelligent and informatization training base and deepen the informatization reform of practical training teaching has become an urgent problem to be solved.

Topic: Binzhou Vocational College 2019 Teaching Reform Research Project "Research on Intelligent Information Construction of Architectural Training Base Based on" Reality Architecture + Virtual BIM "(xyjg1905), Shandong Provincial Vocational Education Teaching Reform Project "Research on Intelligent Information Construction of Architectural Training Base Based on" Reality Architecture + Virtual BIM "(2019093).

II. NECESSITY ANALYSIS OF INTELLIGENT INFORMATION CONSTRUCTION IN TRAINING BASE

A. The Inevitable Trend of Teaching Reform

Under the background of the rapid development of information technology and penetration of various disciplines, the introduction of educational informatization has become an inevitable trend. It is urgent and necessary to promote the innovation and development of the training base construction by strengthening the construction of educational informatization.

On the other hand, the development of BIM technology, VR virtual reality, mobile terminal and other information technologies provides strong technical support for the construction of intelligent informatization training base. It has become an inevitable trend to build and upgrade training bases by means of information. Strengthen students' online and offline independent inquiry [2].

B. Improving the Teaching Level of Practical Training

The significance of the informatization construction of the training base to improve the teaching level of architecture specialty is embodied in two aspects. First of all, through constructing the informatization teaching resources platform based on the actual structure and engineering of intelligent virtual simulation training platform for building practical training base of information construction, the combination of situational teaching and virtual reality simulation, collection project, field training, such as virtual reality technology into an organic whole, implementation of interaction and authenticity of a professional, practical, arouse the students learning interest, cracked the construction process of irreversible problems of practice teaching [3].

C. Important Component of Digital Campus Construction

Planning and building a modern training base consisting of training equipment and facilities and modern information means in line with the "current situation and future development trend of campus system". The informatization construction of training base will promote the significant development of digital informatization campus construction, realize the Internet sharing of teaching resources of high-quality core courses, make full use of modern digital simulation technology, cultivate students cognitive practice and simulation operation ability, and improve the application level of students' practical skills.

D. Developing School-Enterprise Cooperation

The information training system of the architectural training base is shared and open and makes use of Internet information technology to connect with enterprises to realize resource sharing. On the one hand, enterprise cases can be introduced to continuously update the training and makes use of Internet information technology to connect with enterprises to realize resource sharing. On the one hand, enterprise cases can be introduced to continuously update the training course resources and content, and to carry out skill training and skill identification for enterprise employees.

III. MEASURES FOR INTELLIGENT AND INFORMATIZATION CONSTRUCTION OF ARCHITECTURAL TRAINING BASE

Through investigation and research, this paper summarizes the problems and shortcomings of the existing training base in information teaching, and formulates the information construction scheme of comprehensive training base, including the information construction of training teaching facilities and the integration of information training resources.

A. The Informationized Construction of Teaching Facilities

1) The information construction of " Reality Architecture " model

Make use of the "reality architecture " or training room project under construction in the school to set up the exhibition area of building nodes, set up rich nodes for different display areas, and be equipped with relevant teaching resources, including teaching video, construction drawings, simulated animation, etc., and set up resource links through QR code. . Students can connect QR code links with mobile devices, call resources stored on the network cloud, realize network and information autonomous learning, and basically realize the learning mode of "high quality resource sharing and network learning interworking" through the handheld classroom APP intelligent sweep code system.

2) The construction of "Virtual BIM" simulation platform

a) Build the information teaching simulation training platform

Rely on the civil engineering case scene as a whole, take a single node in the process of engineering construction as the training operation task, and realize the modular comprehensive training teaching. Information teaching simulation training cloud platform to support teaching, training, the three modes are evaluated [1]. The training mode adopts immersive experience and carries on the training simulation step by step according to the process. Under the teaching mode, the complete process flow can be played continuously, and the students can watch it in real time through cloud storage at any time.

b) The construction safety VR education platform

Takes the safety experience area in the actual construction as the starting point, and adopts the advanced VR virtual reality technology to let the students experience all kinds of safety problems in the construction process. Construction safety VR education platform includes excavator operation experience, fire protection facilities comprehensive experience, high altitude falling object strike experience, hole fall safety experience, comprehensive electricity safety experience, material hoisting safety body these more than 10 kinds of safety and practical teaching contents.

3) The construction of "Virtual BIM" simulation platform

In the construction practice area, information exchange system is established, and ulti-functional image processing and interactive technology are used. Teachers can observe the video pictures of each training group in the console, locate and contact the training group at any time, and guide students to correct the mistakes in the training operation. At the same time, students can use the question system and interactive technology. Seek help from teachers. In the process of practical operation, multi-channel switching can be carried out in the interactive system, and images of a training group can be pushed for illustration and demonstration. On the other hand, the information exchange system can also record the whole process and omni-directional video as precious information for after-class analysis and identification. At the same time, a network cloud information management platform is built to store the image of teacher's operation demonstration and student's follow-up training operation in the network cloud, which can be displayed on mobile phones, tablets and other mobile terminals anytime and anywhere, so as to facilitate students' review and consolidation.

B. Informatization Construction of Practical Training Teaching Resources

1) Informatization of Digital Resources

Develop and construct the network platform of professional teaching resources, load the teaching resources, relevant knowledge and professional frontier information into the platform, and develop and construct the corresponding building resource database.

Combining with relevant resources such as provincial excellent course group and provincial excellent resource sharing course, which have been built in the specialty of construction engineering technology, further granularization and orderliness of resource nodes are achieved. Through two-dimensional code listing positioning and information-based teaching management, seamless connection between virtual building model and reality building is realized, and students can be autonomous. Enter the virtual building model for cognitive training.

2) Informatization of simulation resources

Relying on the virtual simulation training platform of construction, project management sand table, immersed multi-person collaborative virtual reality system (VR) and other training platforms, three training and teaching modules, BIM modeling and information management module, building life cycle virtual simulation module and virtual reality operation module, are set up for students. In the construction stage, VR and AR technologies are used to train and operate some complex processes, visualize the construction process and watch the project construction process in real time [4].

C. Developing Practical Training Teaching Projects

Relying on the information resources of "Reality Architecture" and the BIM virtual simulation training system, adopting project-based teaching, the contents of the practical training teaching are serialized into seven typical training projects according to the construction procedure and construction progress, including earthwork, foundation, masonry, scaffolding, reinforced concrete, decoration, assembly construction, etc. Following the teaching mode of "Cognition, Learning, Simulation and Practice", this paper adopts the four-step teaching method of "Building Model Display, Construction Node Resource Learning, BIM Virtual Simulation Interactive Teaching and Practice Operation", integrates knowledge and skills, and establishes an information-based training teaching design scheme. At the same time, combined with the "Reality Architecture" and BIM simulation training system, the practical training teaching projects and teaching programs of construction courses are compiled, and the information-based teaching is put into practice [6].

IV. Practice of Informatization Construction of Training Base

A. General Situation of Training Base Construction

The construction site of Binzhou Polytechnic Building Engineering Intelligent Model Training Base is two-story steel building.

The length of the training base is 48 meters in the East-West direction, 17.5 meters in the North-South direction, 7.3 meters in the eaves on both sides and 8.0 meters in the middle roof. The western half of the training base is equipped with solid models. Through the construction of physical proportional building engineering model and supporting information teaching facilities, students can be provided with a sound three-dimensional basic cognitive and professional teaching environment. The physical model is covered by 360 panoramic camera, and the real scene is integrated into the classroom. The eastern part is the operation area and BIM virtual simulation area, which combines virtual simulation with real training, takes into account the scientific, interesting and practical nature, and improves the learning interest and effect through the "reality-virtual combination" of learning and training.

B. Ways of Informatization Construction of Training Base

1) Development and application of high-quality practical training resources

With the help of information teaching platform construction, further integration of practical teaching resources. We will optimize the resources related to quality courses, quality resource sharing courses, and large-scale online open courses for construction engineering technology majors that have been completed, and expand the types and quantities of information resources., and combing the construction process of " Reality Architecture " as a clue, including foundation engineering, concrete structure, decoration, assembly structure and other sub-projects, more than 200 detailed nodes have been built, and each node is equipped with QR code tag. And students can scan the QR code to obtain node teaching resources, view the list of teaching resources, click node name directly on demand, take special courses. In addition, the resources are regularly updated, and the construction enterprises, industry associations, and institutional alliances are connected, and the resources for practical training courses are continuously enriched, improved, and updated.

2) Application of "BIM+VR" virtual simulation information

Architectural training base as a platform, unite relevant technology enterprises, jointly develop "BIM virtual simulation system and VR virtual reality system". BIM construction process simulation training platform takes the current construction process and construction management commonly used in the construction site as the main line, developed against the background of a reality construction project, human-computer interaction combined with three-dimensional scene, move the entire building project into the training room, students can achieve autonomous control and roam in any path in the virtual environment, keep track of learners' operation information at every steps. Real-time display of the current training operation progress, training operation time, assessment results and other basic information. On the other hand, BIM construction virtual simulation system will seamlessly connect with the user data and resource data of the teaching and training model platform, realize interoperability with other professional virtual resources [5].

3) "Internet + cloud storage" training and teaching information interaction system

A 360°panoramic video recording and broadcasting system is arranged in the practice area, establish information interactive full matrix system, any video signal connected to the matrix can be displayed on the teacher-side monitor, it can also realize the camera with controllable function for students. In the course of practical operation, teachers and students can talk to each other in real time, building an information exchange system, the teacher guides the students in the operation, the students asked the teacher for help, the application of multi-function image processing and interactive means is realized. In addition, the recording and playing system can record the whole operation, and save to the network cloud storage, for students to observe and analyze at any time.

4) Design of practical teaching program based on "four-step teaching method"

Combined with the intelligent information construction of the architectural training base, relying on building information resources and virtual simulation platform, development of practical teaching projects and design of teaching programs for courses such as "construction technology of architectural engineering" and "construction map recognition and structure", develop the four-step teaching method of "cognition, learning, simulation and practical operation". Firstly, the physical scale architectural engineering model provides students with a perfect three-dimensional basic cognition. Secondly, it uses Internet technology and mobile terminal information teaching facilities to build an information teaching environment. Thirdly "construction engineering simulation software" and "construction safety VR education platform" are used to conduct simulation operation and virtual reality experience. Finally, the actual operation task is completed in the construction engineering practice operation area [7].

Through the information construction of " Reality Architecture + Virtual BIM", the architectural training base of Binzhou Polytechnic can meet the needs of practical teaching of architectural specialty, solve the shortcomings of practical teaching of architectural engineering, enhance students' basic skills of practical training, and greatly enhance students' comprehensive ability and innovative ability, and the quality of talent training has been steadily improved.

V. CONCLUSION

Based on the research of informatization construction of architectural training base, this paper makes the construction of intelligent informatization training base an important part of digital campus, and puts forward the way of informatization construction based on " Reality Architecture + Virtual BIM". Which includes the development and construction of an open and shared training and teaching system, the comprehensive upgrading of virtual simulation technology training and teaching platform, the intensification of the development of comprehensive training resources, and the innovation of training and teaching mode. These measures effectively improve the application and radiation of building training resources, and have achieved good results in stimulating students' learning motivation, improving students' participation in practical training and improving teaching quality.

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