Research on The Application of Virtual Simulation Practice Teaching in Engineering Cost Specialty

Hou Hong[1]

[1]Xi'an FanYi University Xi'an China

Abstract. The development of virtual simulation technology brings a strong impact on traditional practice teaching. After analyzing the advantages of virtual simulation practice teaching, this paper designs a virtual simulation practice teaching platform, constructs a practical teaching system of "three stages, four levels, five combinations and integration". It can be used for reference for the training of application-oriented and innovative talents in engineering cost specialty.

1 Introduction

With the rapid development of computer technology, virtual simulation technology is gradually perfect and mature. As a new scientific method, virtual simulation technology has been widely used in education and teaching, and has great influence on traditional practice teaching.

In 2012, the ministry of education put forward "the quantity and application satisfaction of virtual training software and the coverage of specialty" and "the connection of virtual simulation training software, training bases with national key industries and strategic emerging industries" as the dimensionality indicators to measure whether the "practical teaching level of vocational education" is improved or not. In 2013, the ministry of education officially launched the construction of the national virtual simulation experimental teaching center, the provincial and municipal education departments and many domestic colleges and universities responded one after another. In June 2016, the ministry of education promulgated the 13th five-year plan for informatization of education, calling for "accelerating and deepening the implementation of informatization of education". In 2017, the ministry of education officially put forward the concept of "new engineering course", emphasizing "the use of virtual reality and simulation technology to reform and innovate the current teaching methods of engineering practice". In 2018, the ministry of education once again proposed "high-quality experimental teaching to help promote the quality of higher education teaching track overtaking, to help build a strong country in higher education".

Nowadays, the structure form of architectural engineering is various, the craft is complex, the operation difficulty is big, the technical content is more and more high. As a key specialty in the field of engineering construction, the society puts forward higher requirements for engineering cost professionals, who not only have solid theoretical knowledge, but also have strong practical ability and management ability.

In this context, the introduction of virtual simulation technology into practice teaching environment is of great significance, which can improve the disadvantages of traditional practice teaching, improve students'operation skills to a great extent, and meet the needs of society.

2 ADVANTAGES OF VIRTUAL SIMULATION PRACTICE TEACHING

The personnel training of Engineering Cost Specialty requires the theoretical knowledge and practical skills of engineering technology, economy, management and law, especially the wide-caliber and thick-base. For a long time, because of various practical reasons, the theoretical teaching and practical teaching of engineering cost specialty are out of touch, and the teaching effect is difficult to guarantee. In this case, based on the characteristics of the whole process, experience and case law of virtual simulation practice teaching, virtual simulation practice teaching will greatly improve the practice quality and effect of engineering cost specialty, to promote the integration of theory teaching and practice teaching, so as to improve students' professional theoretical literacy and engineering practice ability.

2.1 Good Economy

The object of practical training in engineering cost specialty is the construction project. Due to the huge volume of construction projects, the prices of consumables for practical training are on the high side, and most of them can not be reused, while the practical training bases set up inside and outside the school, it is difficult to cover all engineering projects because of the high demand of land occupation and cost, and the update is slow. Compared with the following, the virtual

simulation system occupies less space, can be reused, and has strong practicality and economy.

2.2 High Security

Most of the practical training of construction technology in the major of construction cost needs to be carried out outdoors, because the construction site environment is more complex, the construction personnel and mechanical equipment are more, the danger coefficient is high, and because the students lack work experience and self-restraint ability, site management is more difficult, construction units are not willing to arrange students to enter the construction site for practice, making it difficult for students to participate in practice. The virtual simulation practice teaching platform can simulate the real scene of construction technology and economic management cases, create a safe practice environment, let students and teachers stay indoors, and complete the practice activities safely in the laboratory.

2.3 Full Process Coverage

Construction project is unique and irreversible, and the construction period is long, it is difficult to synchronize with the teaching cycle. Engineering project management involves many parties, but the traditional practice of teaching from a party, it is difficult for students to experience and master the whole process and omni-directional project management. Virtual simulation practice teaching can break through the limitation of time and space, simulate the whole process of engineering project, highlight key points, and let students fully experience the work tasks of the participants in different stages and links of the project, the realization scene reappears, the student may all-weather carry on the practice repeatedly, the popularization is high, the applicability is strong.

2.4 Improve Spatial Imagination

Traditional teaching relies on two-dimensional drawings and models, the teaching effect is general, the students'spatial imagination is poor, it is difficult to make the theoretical knowledge and two-dimensional drawings into three-dimensional, the rules are difficult to understand, and the calculation is easy to make mistakes, especially in the calculation of the total project volume. The virtual simulation platform brings the real engineering scene into the classroom, and uses 3d simulation technology to show the process of building node, space layout and 3D graphics generation, and through virtual demonstration, students can learn about each part of the project, understand its calculation rules, master the calculation of the amount of work between the different components of the deduction, for the correct measurement of pricing to lay a good foundation.

2.5 Significant Immersion

In the traditional practical teaching of engineering cost, the actual participation of students is not high, the practical operation of engineering technology is very few, so it is difficult to have deep experience and feeling. Through the roaming function of the virtual simulation practice teaching platform, the learners can walk in the 3D virtual simulation project environment, observe and be familiar with the working environment and facilities.

To sum up, virtual simulation practice teaching has greatly improved the practice teaching dilemma of traditional engineering cost, and provided a safe, economical and efficient practice environment for learners, the aim of cultivating students'comprehensive application ability, practical ability and innovative ability in practical teaching of engineering cost specialty is realized.

3 APPLICATION of VIRTUAL SIMULATION PRACTICE TEACHING

3.1 Basic Structure of Virtual Simulation Platform

The virtual simulation practice teaching of engineering cost specialty relies on the virtual simulation platform, whose structure is shown in figure 1. The platform can efficiently manage practical teaching resources, realize the sharing of practical teaching resources inside and outside the school, and meet the needs of virtual simulation practice teaching of engineering cost specialty. Through the integration of all kinds of experimental software purchased by the school, the platform realizes the seamless connection between the systems, and then achieves the overall effect of practical training.

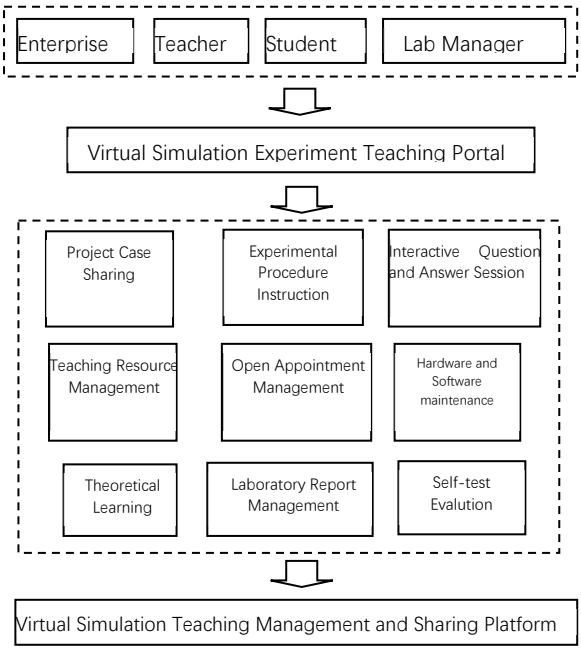

Figure 1. Basic structure of virtual simulation platform

3.2 Construction of Virtual Simulation Practice Teaching System

According to the orientation and goal of engineering cost specialty, this paper constructs the virtual simulation

practice teaching system of "three stages, four levels, five combinations and integration".

3.2.1 The content of practice teaching in three stages

The first stage is the basic class practice teaching stage. The key points of this stage are: VR simulation experiment of engineering drawing, VR simulation experiment of building structure, building structure simulation experiment and building material simulation experiment. With the help of virtual simulation technology, the learners can understand the structure, structure and materials of the building more quickly, and master the skill of map-reading.

The second stage is the practical teaching stage of special subject. The key points of this stage are: virtual simulation training of construction technology, measurement and valuation training of construction engineering, measurement and valuation training of Installation Engineering. This stage is the foundation and core skill of engineering cost professionals. With the help of virtual simulation technology, we can understand the calculation rules of engineering quantity, understand the deduction relationship among the components, and calculate the price correctly.

The third stage is the comprehensive management practice teaching stage. The key points of this stage are: project management sand table simulation training, project cost management training, project bidding sand table simulation training. Sand table simulation training is through the specific project sand table drill, so that students on the project funds flow, material flow and information flow have intuitive feeling, deep understanding of the project team work responsibilities. The project cost management training is based on the virtual project data, students carry out investment control, bid quotation, cost management and other cost management activities, master the core content of cost management. The sand table simulation training of engineering bidding is carried out through the simulation of the eight links of bidding (project establishment, bidding preparation, pre-qualification, bidding, bid opening, bid evaluation, bid setting and contract signing), students have a good command of the entire bidding and tendering process.

3.2.2 The main line of four-level practical teaching

In the construction of the virtual simulation practice teaching system of engineering cost specialty, the practice teaching is carried out on the line of “demonstrate validation class practices-- analyzing design practices-- comprehensive research practice-- innovative practices”

Demonstrate validation class practices, its focus is to supplement and expand practical teaching resources, break the limitations of learning time and space, students can at any time in the virtual simulation platform for operational training.

Analyzing design practices. It focus on the operability and simulability of virtual simulation practice, students can design, construct and internalize their knowledge according to what they have learned.

Comprehensive research practice. It emphasizes the modularity and disassembling of virtual simulation practice teaching, and realizes the integration of knowledge into a whole, focusing on high-cost and high-consumption practice content, which provides convenience for students to carry out scientific research.

Innovative practices, through the establishment of innovative practice base, promote the first classroom and the second classroom cooperation, give full play to the platform advantages, improve the quality of practical teaching.

3.2.3 Five combined principles of practical teaching

(a) The combination of teacher-oriented and student-oriented

In the virtual simulation practice teaching, following the educational concept of taking teachers as the leading role and students as the main body, teachers assign learning tasks and students learn autonomously with the help of the virtual simulation platform and complete the corresponding training, the teacher is in charge of answering questions.

(b) The combination of pertinence and applicability

In teaching, we should design teaching contents, methods and means according to students' cognitive characteristics and job requirements of engineering cost specialty, and construct virtual simulation practice project. In addition, we should ensure that the teaching contents, methods and means chosen can be applied to the actual job requirements, so as to better arrange practical projects and help to develop students' innovative ability.

(c) The combination of theory and practice

First of all, with the help of the demonstration function of the virtual simulation practice teaching platform, the abstract problems are concretized and visualized to help students have a deeper understanding of knowledge points. Secondly, through the operation function of the virtual simulation practice platform, students can participate in a specific task, such as the planning of bidding activities, the compilation of bill of quantities, to realize the common promotion of Students' theoretical knowledge and practical skills.

(d) The combination of progressiveness and typicality

Relying on advanced equipment and technology, the virtual simulation practice teaching should select typical cases so that students have a clear and complete understanding of the job requirements, job content and work process, be able to use the knowledge to solve practical problems in the work, and lay a good foundation for future employment.

(e) The combination of virtual simulation practice on campus and practice in off-campus enterprises

With the help of virtual simulation practice platform in school, students can experience the actual working environment and complete various tasks according to the requirements of their jobs. In addition, we should also combine the actual situation of the school, arrange the off-campus practice, on the one hand, let the students understand the similarities and differences between the

virtual and the real, on the other hand, apply the skills learned by the students to the real work, and evaluate the learning effect.

3.2.4 The practice teaching mode of "integration"

The teaching mode of virtual simulation practice should embody "integration", which includes:

The integration of teaching thought: The mastery of theoretical knowledge is as important as the ability of practical application, and the cultivation of creative ability should be paid attention to. In teaching, students are encouraged to take the initiative to learn and think positively.

The integration of teaching content: In each module teaching, the typical project case will run through all the time, which is convenient for students to grasp the key points of every link and every dimension.

The integration of teaching methods: The use of open, personalized teaching methods, always insist on teaching in fun, teaching in travel.

4 CONCLUSION

Macroscopically speaking, in the training of engineering cost talents, the application of virtual simulation practice teaching has realized the education informationization, which meets the needs of industry reform, social reform and teaching practice. From a micro point of view, virtual simulation practice teaching can overcome the shortcomings of traditional practice teaching, let students in a safe practice environment, through personal experience and practical operation, to achieve the internalization of knowledge, practice comprehensive ability. However, the application of virtual simulation practice teaching in engineering cost specialty has not been popularized in the whole country, and it is still a long way to go to realize virtual simulation practice teaching.

Acknowledgment

I would like to express my sincere thanks to the school-level experiment teaching demonstration center and virtual simulation experiment teaching center program of Xi'an FanYi University in 2019, "Engineering Management Experimental Teaching Demonstration Center"(Z1901) and the second batch of collaborative education projects of the ministry of education in 2018,"Chenxi BIM Teaching Practice Base of Xi'an FanYi University" (201802132059) for their financial support for this paper.

*Fund project: school-level experiment teaching demonstration center and virtual simulation experiment teaching center program of Xi'an FanYi University in 2019 "Engineering Management Experimental Teaching Demonstration Center" (Z1901); the second batch of collaborative education projects of the ministry of education in 2018,"Chenxi BIM Teaching Practice Base of Xi'an FanYi University" (201802132059)

References

1. Ye Song, Chen Yin. Exploration on Application of Virtual Simulation Practice Teaching in Engineering Management under 5 G Background[J]. Journal of Hubei Second Normal University,2020,37(02):43-47.(in Chinese)
2. Tang Jie. Exploration on Virtual Simulation Practice Teaching System of Architectural Engineering [J]. Journal of Lishui College, 2020,42(02):117-124. (in Chinese)
3. Xu Hui,Lu Anwen. Research on the application of virtual simulation practice teaching in the training of engineering management professionals [J]. Jiangsu Science and technology information, 2018,35(23):28-30. (in Chinese).
4. Cheng Xu. Application and effect analysis of virtual simulation technology in core course teaching of engineering cost specialty [J]. China's high-tech zone,2018(13):70-71. (in Chinese)
5. Liu Fang, Mo Pinjiang, Liang Chenglong. Application Research on constructing practical teaching link of higher vocational education by virtual simulation technology -- a case study of Architectural Engineering Technology Specialty in higher vocational education [J]. Popular Technology, 2014,16(10):149-151. (in Chinese)
6. Wang Hua, Qiu Xinxin, Song Hongying. Research on virtual simulation practice teaching mode of Engineering Management Talents Training [J]. Outside education in China,2016(36):131+135. (in Chinese)