

Research on the Application of VR Panorama Technology in Online Excellent Open Course Teaching

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Abstract: *The construction of large-scale open online courses (MOOC) has made great progress, but the rapid development of MOOC has brought about the problems of "difficult to create realistic teaching scenes, difficult to display detailed teaching points, and difficult to construct three-dimensional teaching supports". In the teaching design of large-scale online high-quality courses, VR panorama technology can be integrated into different teaching modes and curriculum development systems. The demonstration of a course shows that VR panorama technology has obvious effects in creating teaching situations, comparing standards, guiding students to ask questions, etc. From the analysis of the application data of a single course, it shows that the participation and interaction of students have increased significantly, indicating that the attraction of the course has improved significantly.*

Keywords: *VR, Panorama, Online Course, MOOC*

1. Introduction

Compared with offline teaching, the education form of online quality courses can break the constraints of time and space, and also make the time and scene of learning more flexible, which is conducive to students building a learning path of lifelong education. Students can repeatedly review the knowledge they do not understand through the platform. However, high-quality online open courses also have problems such as less communication between teachers and students, limited interaction, lack of on-site guidance and teaching, and high requirements for students' autonomy and learning ability. The development of VR panorama technology has become increasingly mature, which can solve the problems of "difficult to create realistic teaching scenes, difficult to display detailed teaching points, and difficult to build three-dimensional teaching brackets" in teaching, and has achieved certain results in teaching applications. However, traditional VR technology is difficult to develop, and the threshold for invisible technology is high. It is not universal to use it with the help of hardware equipment. This makes the teaching application of VR technology still in the stage of exploration and small-scale application, which has become the biggest obstacle to large-scale use of VR panoramic technology, and not conducive to the application and development of VR technology in teaching. This study explored the design integration points of VR panorama technology in different teaching modes such as OBE, PBL, MES, CBE and action oriented teaching methods. Taking a course as an example, VR panorama technology was applied to online courses, and the empirical results of application results were obtained by comparing the data of the last two periods that were not applied.

2. Problems and challenges: the predicament of the current online excellent open courses

At present, the construction of large-scale open online courses (MOOC) has made great progress. The number of online courses in Chinese universities has exceeded 50000, and the number of students has reached 540 million. According to the data of the Ministry of Education, during the epidemic, all colleges and universities nationwide implemented online teaching, 1.08 million teachers offered 1.1 million courses, a total of 17.19 million courses, and 22.59 million students participated, a total of 3.5 billion people. In March 2022, the national smart education public service platform was officially launched, and the first batch of 26000 quality courses were launched in universities. In the same month, Hunan Province issued the Notice on Implementing the Action Plan of Informatization Innovation and Development of Hunan Vocational Education, which will identify and build 2000 provincial quality online courses. In the social environment of epidemic normalization, the construction of large open online courses (MOOC)

has become a general trend, but at the same time, MOOC learners are expected to complete self-study without supervision, and assume greater learning responsibility with minimal guidance and support. At the same time, in the actual learning process, the consistency between learning and the real work scene is not strong, leading to a longer feedback mechanism and abstract technical points that cannot be displayed in real time. The learning process has become boring, and the fixed synchronous teaching mode has hindered the development of students' personalized learning, which is not conducive to different learners' independent construction of three-dimensional knowledge scaffolding, leading to a very serious MOOC "drop out" phenomenon. The construction and implementation of MOOC are faced with the practical dilemma of slow knowledge updating, difficult application and promotion, and low class completion rate. At the same time, MOOC online teaching has not set up a training site related to it. The training conditions are insufficient, and the learning technology environment cannot be created. As a result, students have insufficient understanding of the curriculum. However, in terms of work needs, basic knowledge in this area is very important. In the face of this dilemma, many courses that need to practice often use local pictures and videos to show the details of teaching content and carry out fixed-point teaching. This interactive form of classroom teaching is inefficient and still in a two-dimensional plane education state. Today, with the rapid development of Internet information technology, the traditional simple text and picture display, video interpretation, etc. cannot be short of a comprehensive description of the complex engineering process, reflecting the process of joint operation of multiple parts. Single content display can no longer stand in the era of knowledge explosion. The upgrading of teaching display means is an inevitable trend of education development.

3. Solution: it is possible to integrate panoramic technology into high-quality online open courses

Yu Aibing, Wang Jiawei and others used virtual simulation technology to establish a virtual simulation aided teaching system to solve the problem that theory and practice cannot be effectively combined in reaming teaching [1]; Zhang Renjie, Zhang Huaqing and others used 3D printing model to solve the application problem in the teaching of lumbar nail placement [2]; Ma Luping, Li Chen, Liu Zhili and others used 3D printing technology and PBL teaching method to solve the problems in urological practice teaching [3]; Wu Huan and others used VR technology to solve the problems in the failure teaching of automatic weather stations [4]; Re Hemailjiang and others solved the problems in the teaching of Mathematical Physics Equations with Python technology [5]; Xu Kun and others used BIM technology to solve the problems in the teaching of Safety Prevention Technology [6]; Xing Xue and others used VR technology and CBL and PBL mixed teaching mode to solve problems in clinical medical teaching [7]; Yu Xiaowen et al. believed that courses using augmented reality (AR), virtual reality (VR) and other technologies were more attractive, and few literature studies used certain technologies to solve teaching problems in online quality courses.

VR panorama technology is used to display teaching resources in real or virtual form, so that students can experience reality and virtual anytime and anywhere, and stimulate students' brain to promote their interest in active learning. With the powerful display function of panoramic technology. In the teaching process, teachers can purposefully introduce courseware made with panoramic technology and multimedia teaching as auxiliary materials for teaching according to different teaching contents, which can enable students to come out of the boring classroom teaching, display teaching models and concepts in an all-round way, make abstract concepts concrete, and fuzzy models instantiate, in order to let the students watch and participate in the classroom if they are in the scene, which strengthens the interest and initiative of the classroom and makes the classroom teaching achieve twice the result with half the effort.

With the continuous advancement of information technology, teachers' computer application foundation has been constantly improved, and they have certain ability in the production of PPT, micro lesson production and other fields. However, VR panorama technology is still a strange technology for teachers. Most teachers do not have such skills. Generally, professional company technicians are studying VR and AR technology, and the production price of such companies is generally expensive. In fact, these technicians do not know much about the content of education, which causes the problem of disconnection between teachers and VR technology professionals.

It is feasible to apply VR panoramic technology to teaching to solve the problems of "difficult to create realistic teaching scenes, difficult to display detailed teaching points, and difficult to construct three-dimensional teaching scaffolding" in teaching.

4. Design concept: integrating VR panoramic technology into different teaching modes

With the rapid development of information technology, many technologies have become more and more popular. How to use information technology to solve practical problems in teaching requires teachers to be proficient in using information technology, and at the same time, to reasonably integrate this technology into all aspects of teaching. In several online teaching models, the author has considered the idea of integrating VR panoramic technology into various teaching models.

(1) VR panorama technology integrated into learning output based education model (OBE)

In the teaching mode, similar to action oriented teaching and other teaching modes based on learning output, VR panorama technology can be integrated into the definition and use of learning output. For example, when defining the product of image extraction, we can consider using VR panorama technology to display a product, specific results, environment, etc., to give students a concrete knowledge impression, quickly identify the problems to be solved, in order to better realize learning output, evaluate learning output and other links to purposefully learn relevant knowledge, solve relevant problems, stimulate students' creativity, and better use knowledge to solve specific problems in the use of learning output link.

(2) Action oriented teaching Handlungsorientierung

In the field of action oriented teaching, VR panorama technology can be used to create an information environment, so that students can understand the task objectives to be completed, task descriptions, environment, relevant resources, tools, conditions and methods to be used, etc. The creation of a concrete environment makes learning tasks closely related to actual tasks, and helps students better complete plans and decisions; In the execution phase, the execution environment can also be simulated, such as the product manufacturing environment; VR panorama technology can also be used to help solve problems such as whether the product conforms to professional standards in the detection phase, and VR panorama technology can be used in the evaluation phase to make the work compare with the standard scene to complete the result evaluation. As shown in Figure 1:

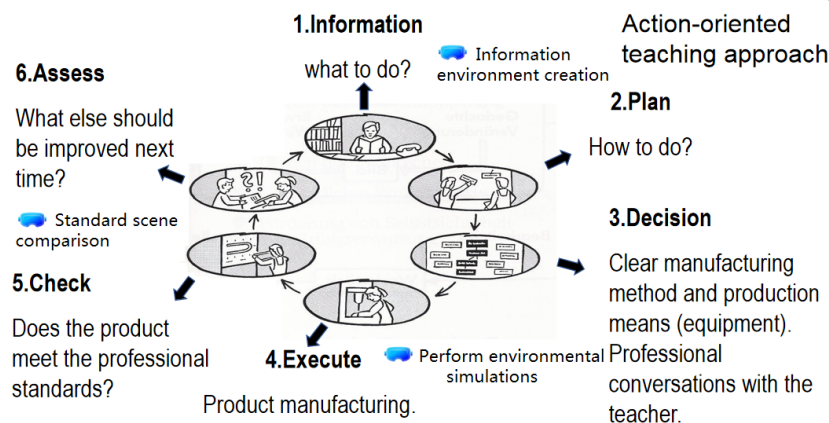


Figure 1: Design of VR panorama integration into action oriented teaching integration point

(3) PBL

In the process of designing the teaching mode of problem oriented teaching, first of all, it is necessary to ask challenging questions. In the process of asking questions, VR panorama can be used to show the questions, or students can ask their own questions in a VR scene in a panoramic interactive message. Second, in the link of continuous inquiry, students can continue to browse in VR panorama, and learn relevant knowledge independently in the form of study tours. To explore the problem, multiple people can also interact to solve the problem together in the form of group inquiry, and propose the solution strategy of the problem. Then, in the process of further verifying the authenticity of the problem, we can also design VR panoramic scenes for in-depth verification. In addition, VR panorama technology can also be used to compare and restore real application scenarios in the evaluation and modification link, public display and sharing link, so as to evaluate the sharing problem solving process. As shown in Figure 2:

(4) Modular courses

MES (Modules of Employable Skills)

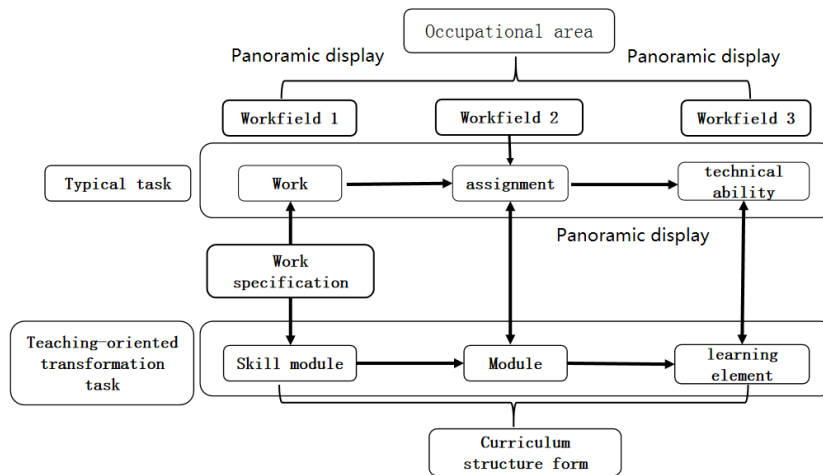


Figure 2: Design of VR panoramic integration into MES curriculum integration point

When reconstructing the modular (MES) course content, we should fully consider the creation of the workplace. Due to the differences between the teaching environment and the workplace to a certain extent, we can create the workplace through VR panorama technology, in which specific work tasks, corresponding work types and corresponding skills will appear. In the task creation link, you can also use the previous method to create different task links, such as task description, task catalog, task list, task requirements, and tools, equipment and machinery that can be used. Related skills are involved in the task to design learning units, forming a teaching reform teaching link based on typical work tasks.

In the modular curriculum content reconstruction of competency based education (CBE), VR panorama technology can be used in the process of building career analysis and job analysis. Problems and tasks to be solved in the process of targeted analysis can be solved by cooperating with the DACUM analysis method. VR panorama technology can also be used in the creation of special skill environment to solve the problem of difficult specification of teaching content. As shown in Figure 3:

CBE (Competency-Based Education)

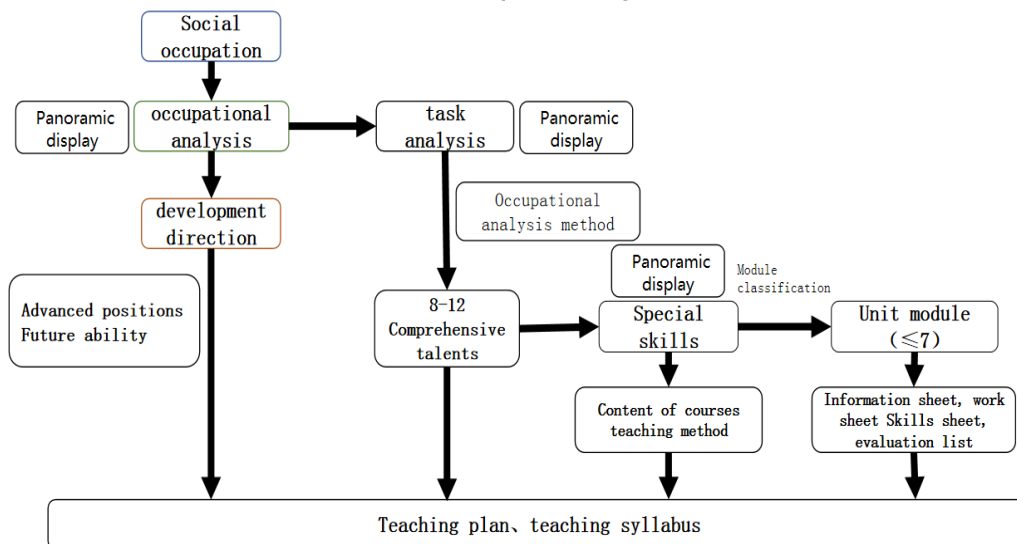


Figure 3: Design of VR Panorama Integration into CBE curriculum Integration point

5. Application realization: application and practice in curriculum

The application of VR panorama technology to the course construction in the process of creating online quality courses is a problem that needs to be explored and solved. Now we take the Construction Engineering Quality Management as an example to explain the applied scenes and design methods. For example, there are some problems in architecture courses, such as abstract teaching scenes, unfocused problems, unsystematic regulations, boring provisions, and students' actual operation cannot be combined with practice. Therefore, in the design of high-quality courses, the problems should be clarified in the problem introduction link, and the quality problems to be checked should be put forward in the panorama in the design of the next link. Then, the cases should be introduced in combination with the problems in the minds of the students, and the common quality problems should be introduced in the cases. In the case, the reasons why the common problems occur and the hazards should be analyzed, and then the norms and standard practices should be introduced, and then the enterprise standards, national standards and high-quality practices should be introduced, so as to further solve high-quality practices in combination with simulation animation, and solve specific practical problems in combination with actual investigation to improve students' application ability. Finally, students can apply their knowledge to practice through independent inspection of problems in VR panorama construction site, which can also test the learning effect. As shown in Table 1:

Table 1: Online course design ideas of Construction Engineering Quality Management

Item	Link	Concrete content	Design intent
1	VR site	Learn about the formwork works in the actual construction site	Understand the construction site in VR cloud construction site and introduce thinking
2	Panoramic scene	Discussion on quality accident of formwork engineer	Guide trainees to find problems online in VR panorama and start from their interests
3	Case introduction	Common quality problems in formwork engineering	Consider and discuss the problems in VR panorama
4	Common quality problems	Quality Disclosure of Formwork Works of China Con	Contact students with problems found by VR panorama and explain common problems (transfer teaching)
5	Enterprise standards	Quality disclosure of formwork works of China Construction Third Engineering Bureau Co., Ltd	Introduce enterprise standards (increase students' professional identity)
6	Specification requirements	Quality specifications related to formwork works	Introduce relevant standard clauses (specify quality requirements)
7	Normative interpretation	Provisions in the Specification for Formwork	Explain the difficult and easy to ignore contents in the articles (answering questions)
8	Quality practices	Setting out of formwork	Introduce enterprise practices (explain the specific application of knowledge)
9	Simulation animation	Quality control of beam and slab formwork	Simulation operation with VR panorama (hands-on operation, familiar with the operation process)
10	Field inspection	On site quality inspection of formwork	On site investigation (understand the actual situation and connect with the work site)
11	Extended learning	Quality management of aluminum formwork works	Expand other knowledge (introduce the latest technology)
12	VR fault finding	Entering the construction site	Enter the new construction site again in VR panorama (really looking for problems)
13	VR fault finding	Unit test	Test learning effect

After using VR technology to design online quality courses, compared with the data of previous periods, it is found that there are obvious changes in the number of course selectors, course selection units, number of people and number of interactive people. As shown in Figure 4:

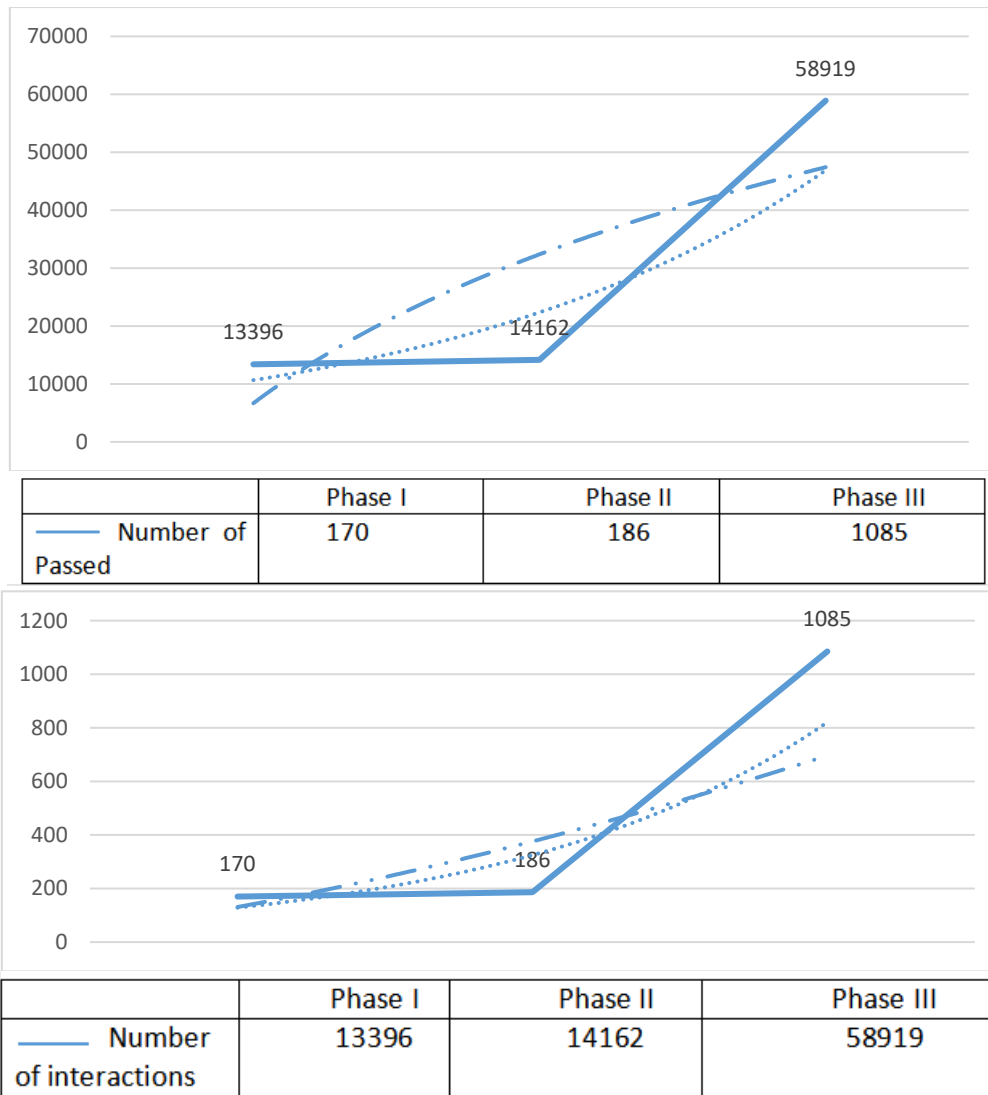


Figure 4: Comparison of the number of students, units and interactions

6. Conclusion

VR panorama technology has a very wide range of application scenarios in teaching. VR panorama technology can be used in any teaching mode and teaching system. It can solve the problems of "creating realistic teaching scenarios, displaying detailed teaching points, and constructing three-dimensional teaching scaffolding" in teaching, and can play a certain role. This kind of technology can also be used in the design of large-scale online boutique open courses (MOOC) to solve the creation of teaching scenes, guide students to put forward thinking questions, and can be deeply applied in application, evaluation, standard comparison, etc. From the running data of a single course, it can be seen that the number of students' participation and interaction has increased significantly, indicating that the attraction of the course has improved significantly.

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