

Application of Virtual Simulation Technology in Course Reform of Rice Wine Brewing Process*

Yuefan Dong
Zhejiang University City College
Hangzhou, China

Wujian Yang**
Zhejiang University City College
Hangzhou, China
**Corresponding Author

Abstract—With the emergence and development of virtual reality technology, it gradually penetrates various fields of society and explores a new model for experimental teaching. Based on the construction concept of virtual simulation teaching platform, this paper combines the course of rice wine brewing technology, mainly elaborates on the application and current status of domestic virtual simulation teaching platform, the construction, and design of virtual simulation teaching platform of rice wine brewing course, and the implementation method of virtual simulation teaching platform system, thereby promote the application of simulation teaching in such technology courses and explore the reform of the teaching model of the rice wine brewing course to improve the quality of teaching.

Keywords: *virtual simulation teaching, rice wine brewing, teaching reform, gamification*

I. INTRODUCTION

Undergraduate education is the key to cultivating talents in colleges and universities, and it is also the focus of higher education reform. With the development of the world's scientific and technological level, economic globalization, the transformation of China's economic structure and the gradual generalization of China's higher education, the teaching environment and teaching equipment of higher undergraduate colleges in China have gradually improved and developed, internationalized and globalized educational concepts and The integration of advanced ideas and mutual promotion will promote the reform of the concept and model of talent cultivation in colleges and universities. The rapid development of science and technology requires education models and methods to keep pace with the times in order to promote the optimization of the education system and the cultivation of relatively comprehensive talents. Traditional college teaching is usually carried out in the form of class teaching. The teacher-led organization teaches in the form of teachers listening to students. The form is more rigorous. In the case of teachers with rich knowledge reserves, the knowledge is passed to the students with specific details. However, knowledge transfer is limited in a limited time,

and students have limited knowledge intake in a boring atmosphere. Driven by modern technology, China's current college teaching continues to develop, and the integration of information technology and curriculum has gradually become a new era of education.

The modern teaching advocates the form of students' self-learning teachers as a supplement and uses the information-based teaching mode to enrich and activate the teaching status quo with the help of diversified network information technologies such as distance education, micro-courses, and virtual simulation teaching. The original boring curriculum becomes interesting. To a certain extent, it lays the foundation for students to learn independently by adjusting the teaching time and practice time effectively.

Such a relatively demanding course in the rice wine brewing process, for beginners with professional knowledge, due to the lack of opportunities and time to contact the real scene production process, there is no basic understanding of the process and related equipment of the rice wine brewing technology. If the traditional teaching method is adopted, even if the teacher invests a lot of energy and time to explain the process flow and equipment sketch, the students still feel abstract and boring, and the degree of mastery of the students in their practice process is still weak. Using modern teaching techniques to optimize the teaching process and make the teaching content more vivid, students have boldly simulated the technology that they want to master through relevant multimedia software, and deeply explored this knowledge through the massive data of the Internet.

Based on the above considerations, virtual simulation teaching as a modern teaching technology, its scientific and systematic model combines educational theory and educational practice will apply to most universities, which establishes and develops this platform to promote the reform and development of the rice wine brewing curriculum.

II. APPLICATION AND CURRENT STATUS OF DOMESTIC VIRTUAL SIMULATION TEACHING PLATFORM

To strengthen the information construction of higher education, promote the deep integration of disciplines and information technology, and build information-based experimental teaching resources, the Ministry of Education

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has set up a national-level simulation experiment teaching center, according to the "2015 National Virtual Simulation Experiment Teaching Center" The Notice of Construction Work requires that, after being recommended by the provincial education administrative department and the military education department, the Chinese Higher Education Institute will review the organizational form, network review, and conference review, and select 100 selected units.

The simulation teaching platform is very "Internet +" teaching characteristics, and it needs to use Internet thinking [1] and the ability of modern information technology to learn. This kind of simulation teaching uses computers to simulate real natural phenomena or social phenomena, and students simulate playing a role in vocational skills training. First of all, it can largely compensate for the lack of objective conditions, provide a relatively real environment, and help students learn and understand professional knowledge more effectively. Secondly, it is also a positive attempt and challenge for people to adopt new technologies to explore education reform. The advent of the information age must be accompanied by new changes in the education model and environment. Education information can effectively promote the modernization of education, break the traditional teaching mode and educational environment of the school, and enable teachers and students to accept challenges and grow harmoniously in the new environment. The simulation teaching platform is different from the national boutique online courses (MOOCs) that have emerged in recent years. It is not limited to video viewing and learning, after-school testing, online communication with teachers, and its virtual simulation operation is a platform. Highlights, based on the unity 3d engine interface design and application is very attractive, using a computer to generate a realistic virtual environment, interacting with the environment through the operation of the keyboard, an experiment in the virtual environment, to achieve the cognitive practice of teaching. Since VR equipment is not currently popularized in universities across the country, the immersive and realistic effects of virtual simulation technology have not achieved the desired results. This teaching platform can become a practical and operative learning tool.

"Rice Wine Brewing" is a theoretical and practical course. It is also the core course of the enology. Since rice wine is one of the oldest wines in the world and wine with a long history and cultural background, this course is also very attractive to other non-professional students. The course covers a wide range of topics, including basic knowledge of organic chemistry, biochemistry, microbiology, fermentation engineering process principles, fermentation analysis, and fermentation equipment, and is closely integrated with the production practice of rice wine. However, for most schools, it is limited to venues, equipment, and other conditions, and the actual brewing cycle of rice wine is too long, and the teaching links are difficult to match. The "Rice Wine Brewing" course is difficult to carry out in reality, which will hurt the development of the rice wine industry and the cultivation of talents.

III. DESIGN OF VIRTUAL SIMULATION TEACHING PLATFORM FOR RICE WINE BREWING COURSE

A. *The overall goal of the teaching reform program for the rice wine brewing curriculum*

The virtual simulation teaching system overcomes the existing difficulties through the combination of traditional teaching and multimedia and combines the virtual and the real to make the students interact with the experiment, so as to achieve the purpose of improving the quality of teaching [2]. The construction of digital virtual teaching platform will reduce the hardware requirements to a certain extent, and support more schools to open this course so that more interested students can inherit the process of rice wine brewing and inherit traditional culture; hardware condition reduction and digital virtual teaching platform The support can allow more non-professional students to participate in the course study, understand the history and brewing of rice wine, and greatly expand the scope and number of students. The platform uses text, image, video and other methods to carry out the teaching of rice wine brewing equipment, raw materials, process flow, etc., making the course teaching more vivid and full, and enhancing the students' interest and motivation with multi-angle sensory. Create a digital model of winemaking, simulate the actual brewing process and process on the platform, and solve the problem of difficult matching of the wine brewing cycle and teaching. At the same time, students can learn and interact on the platform, simulate the actual brewing process, track results, and check feedback, thereby enhancing student interest, facilitating communication and learning, and improving the overall teaching effect while conducting interactive training experience anytime and anywhere. The "virtual scene" and "virtual environment" constructed by applying virtual reality technology enable students to experience the changes of real environment, operation process and operating state "in person" and achieve unprecedented teaching effects [3].

B. *Basic ideas for teaching reform of rice wine brewing course*

The basic design idea is to change the traditional teaching mode in the past, use modern teaching technology, and adopt the method of teaching through the virtual simulation teaching platform for students to learn and operate. The traditional teaching method of the rice wine brewing course is single and boring. Some virtual teachings using multimedia teaching still have problems with the teacher's interface operation, which leads to a lack of students' independent inquiry. Virtual experiment gamification increases the immersion of the learner's virtual experiment, stimulates the interest of learning, and improves the effect of virtual experiment learning. The teacher displays and tells content according to the teaching needs. The students complete the corresponding virtual operations during and after the class. The course can be chosen as an elective course or a compulsory course and the assessment method is a virtual operation on the computer.

The virtual simulation teaching platform of rice wine brewing is divided into two parts, one is the visual digital virtual teaching platform, the other is the course teaching content and the game-based virtual experiment design combined with the platform. The website platform involves introduction to the platform, course introduction, and user login. The teaching content is based on the order of the rice wine brewing. The corresponding chapters are accompanied by relevant practical links, including platform questions and answers, related appreciation and simulation operations.

C. Organizational structure system

The organizational structure of the platform is shown in "Fig. 1". Gamification virtual experiment module: including seven modules, which are divided into rice wine definition and classification, raw and auxiliary materials for rice wine brewing, traditional rice wine production technology, modern rice wine production brewing technology, finished rice wine, bottled rice wine production, and analysis and detection of rice wine. Students complete the entire virtual experiment in the virtual environment following experimental steps. Lab Manual: Introduce the learning background, learning objectives, learning tasks, specific operational steps, and manipulation methods of each virtual experiment project. Brewing equipment model library: fermenter, post-fermenter, press, clarification tank, filter, decanter and other equipment, students can observe the structure of the equipment. Knowledge Base: Students can query the instructional videos and teaching cases on the professional learning website. Student Management Platform: The management of the student's experimental process and the management of the results. The students are monitored and inspected on time through the evaluation feedback function embedded in the platform. Discussion area: teacher-student interaction, teacher Q&A.

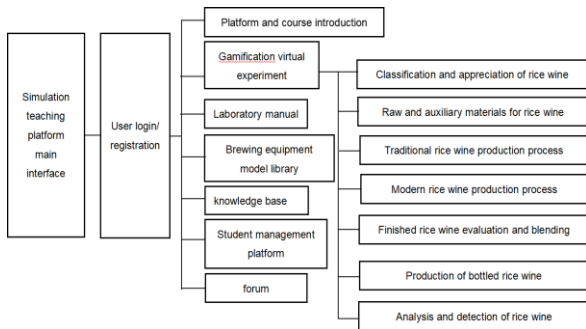


Fig. 1. The organizational framework of rice wine brewing virtual simulation platform.

D. Platform function implementation

The user function module is shown in "Fig. 2".

Student: The student is the end-user. Each user's ID number is unique. You can register with the student number, enter the user name and password to log in to the teaching platform, perform related operations, and save the result submission. Query and view your grades and records, and ask questions in the discussion area. Teacher: The main task

of the teacher is to manage the students, to view the student's learning situation, to publish the experimental content, and to solve the student's problems in the discussion area. Administrator: The highest authority, mainly for the preparation of experimental virtual instruments, content updates, and release.

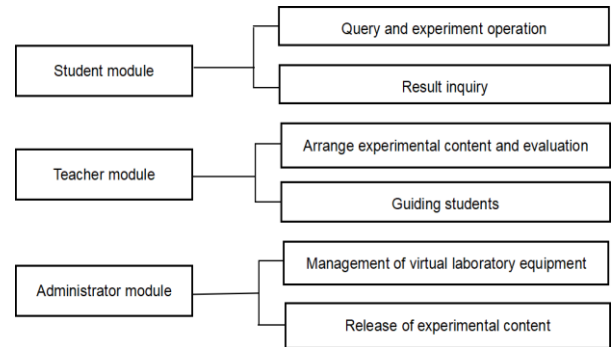


Fig. 2. Rice wine brewing virtual simulation platform function module.

IV. CONSTRUCTION OF VIRTUAL SIMULATION TEACHING PLATFORM SYSTEM FOR RICE WINE BREWING

A. Platform system architecture

As shown in "Fig. 3", the B/S structure is adopted, that is, the browser/server structure. The web server sends a web request to the web server via Http. The web server can automatically coordinate and process requests from multiple clients. The application layer of the application layer is responsible for processing business logic and database access. The application server defines and implements interaction with the database and application logic in the system [4]. In the design question and answer platform, the WebSocket protocol is used to solve real-time communication. This web data communication protocol can better save server resources, communication is two-way, and the server can also send and receive actively.

The client browser is the user's experimental platform. Any terminal experimenter of the distance education network can conveniently enter the virtual platform and enter different experimental projects according to the actual situation to perform online operations. The information database includes experimental plans, principles, outlines, content, steps and other related teaching materials; the scene database contains backgrounds related to the experimental environment, sounds, etc.; the virtual equipment database contains virtual devices that the experimenter can use and operate.

The experimental integration system performs mathematical calculations under the control of the mathematical model of the experimental process according to the request of the client user and transmits the calculation results to the scene scheduling system and the instrument scheduling system respectively, and the scheduling scene database and the virtual instrument database refresh and pass

the experimental scene. The network is passed to remote learners [5].

The system is stored on the Web server, and remote browsing and interaction can be performed as long as the browser is installed.

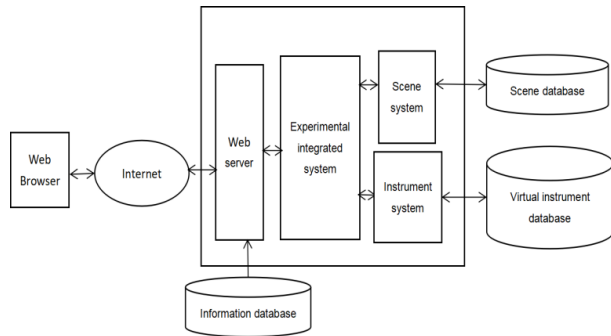


Fig. 3. Virtual Simulation Platform Architecture.

B. Technical means available for the platform system

1) *Cloud computing technology*: In the cloud computing environment, a web-based experimental teaching system is built, and virtual experiment resources are shared. The virtual experiment teaching system in the cloud computing environment is to use cloud computing technology to remotely connect different experimental users and virtual experiment platforms, and share the virtual experiment platform. Resources, users conduct remote experiments and local experiments through the browser. The sharing of these virtual experiments is of great help to schools that lack large precision instruments. The course of the course, the teaching content, the instrument data, and other resources will be used to establish the experimental teaching system resource library and its index directory in the SaaS application layer.

2) *Web3D technology*: For virtual experiment operations, Unity3D's WebGL technology can be used for development. As a multi-platform integrated game development tool, it is a fully integrated professional game engine that allows players to easily create interactive content (such as 3D video games, architectural visualizations, real-time 3D animation, etc.). The tool can be used for terrain editing, setting up scenes, writing scripts to control characters, and Unity has a powerful physics engine that can simulate more realistic scenes, bringing games or animations closer to reality, combining visual simulation capabilities with interactive features, and It is easier to use in terms of geometric data input and output [7]. The simulation production software unity 3d engine software supports WIN, IOS, Android platform, all real-time interactive systems, and functions can be easily realized in a short time, for the primary users, there is no teaching burden. Manufacturing scenes, instruments, etc. are three-dimensionally modeled according to actual size; support real-time interactive functions, users can control user virtual

actions through mouse and keyboard; support multimedia environment, set background music, etc. In the virtual simulation game environment, the game scene design determines the quality of the picture. The reasonable setting and detail implementation of the scene determines the picture effect presented in front of the user, which is often an important indicator that affects the user's first impression of the game and the overall evaluation.

Taking the rice wine brewing course as an example, the gamification virtual experiment scene design is based on the factory. The wall color is mainly grayish white. According to the rice wine brewing process, it is divided into workshops. The circulation pipes in each workshop are arranged in the wall. The model of the device is roughly restored according to the original scale to ensure the realistic and visual sense of the scene. The system mainly completes the following modules: scene construction, model making, character activities, interface rendering, UI design, user management, process flow simulation, material management, score management, and experiment progress management.

3) *Virtual reality technology*: Realistic images, sounds, and virtual environments generated by advanced technologies such as multimedia and rendering technologies combined with modern computers and hardware devices, users immersed in virtual environments through virtual glasses, virtual gloves or other devices to complete the interactive perception of visual elements, auditory elements, and tactile elements in the virtual environment to obtain a real experience [6]. VR uses computer-generated interactive 3D dynamic real-life to realize the realism of the rice wine brewing process, allowing users to immerse themselves in the environment and complete virtual operations.

V. CONCLUSION

Under the background of the rapid development of science and technology, the effective combination of virtual simulation and traditional teaching methods can not only stimulate students' enthusiasm for learning but also cultivate students' ability to learn independently. The content of each stage of the rice wine brewing process is used by the virtual operation and simulation game form for the students who have no physical contact with the factory equipment to learn the process to master the specific methods and solve the problem of stagnation in monotonous theoretical learning due to weak equipment and conditions. In the simulation teaching of rice wine brewing, the platform constructs simple, intuitive and realistic scenes which suit practical content to improve the teaching content and teaching process of the rice wine brewing course, enrich the teaching methods, improve the teaching quality, and enhance the students' practice level to a certain extent. The platform can continuously update relevant teaching content and assessment methods, effectively improve teaching quality, improve students' innovative ability and professional quality, and enable students to have a solid operational foundation such as capabilities of process adjustment and product quality control, also, possess the ability of analyzing and solving a

variety of problems in the actual operation after graduation, which lay the foundation for the students' career development.

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