



Application of Virtual Reality Technology in Practical Teaching of Ideological and Political Course in Colleges and Universities

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Abstract. With the rapid development of economy, politics and culture in China, in order to keep up with the pace of social development and progress and cultivate high-quality talents, our country pays more and more attention to students' ideological and political cultivation. The ideological and political course involves a wide range of knowledge. In order to make students better understand and master this course, colleges and universities have reformed the ideological and political practice. However, the ideological and political practice teaching is difficult to carry out due to various restrictions. Therefore, it is necessary to make use of the new internet technology to make the ideological and political course limited to theoretical course teaching can be simulated and practiced in the classroom. In this paper, the design and development of ideological and political practice teaching platform adopts HTML+CSS+JavaScript combined with unity 3D technology and 3DMAX technology, and moves the real scenic spots, historical figures, etc. to webVR platform, creating a vivid virtual scene for students on the premise of saving costs, so that students can deeply understand ideological and political related knowledge on the virtual practice teaching platform, and make them deeply aware of the importance of ideological and political courses in virtual practice. So as to enhance the effectiveness of practical teaching of ideological and political course, give full play to students' subjective initiative, improve students' initiative and enthusiasm in learning ideological and political course, and effectively solve the problems existing in practical teaching of ideological and political course.

Keywords: virtual practice · JavaScript · webVR · unity 3D

1 Introduction

The state has put forward the “eight unified” goal requirements for the teaching reform and innovation of ideological and political courses. As one of the key requirements, “adhering to the combination and unity of ideological and political courses theory and practice” emphasizes that the focus of ideological and political courses in colleges and universities lies in its practice. This requirement provides a new research direction for the reform and innovation of ideological and political practice teaching in colleges and universities. Ideological and political course can unify ideological and political

classroom teaching with social practice teaching by reforming practice teaching mode, adding practice teaching content and innovatively designing practice teaching platform. Guide students to understand the society, go to the society, and face the society, so as to truly “practice the truth” and improve students’ comprehensive quality in practice. Practice is an important way for colleges and universities to realize the teaching goal of “teaching students in accordance with their aptitude” and cultivating high-quality talents. At present, there are many limitations in the implementation of practical teaching. For example, as a required course in universities, the practical teaching of ideological and political course is for all students, and a large number of people participate in practical teaching, which leads to the bottleneck of the practical teaching of ideological and political course in many universities [5]. If the whole school students are organized to go out for practical study, the cost is high and the risk coefficient is high. If the point to outline, each class or even each major to send one or two students to visit scenic spots and other after-school practice, but cannot achieve the real ideological and political practice effect and requirements.

It is found that the combination of virtual reality technology and ideological and political practice teaching can effectively alleviate its limitations. Considering the problems of the number of practitioners and the cost of equipment, the best application mode of VR technology is web VR, which is often referred to as the naked-eye mode. In this mode, users can browse without downloading and installing virtual reality clients or buying expensive VR equipment. It can provide users with a good interactive experience by directly visiting the web page and logging in [7]. The virtual practice platform of ideological and political education designed in this paper applies virtual reality technology to the practical teaching of ideological and political education in colleges and universities, and uses unity3D and other technologies to solve the problems existing in the practical teaching of ideological and political education, such as high cost, high risk and difficulty in development, which makes the practical teaching more vivid and effective, and can bring teachers and students a sense of experience without losing the real scene. The design of this mode enables colleges and universities to carry out ideological and political practice teaching in classrooms and computer rooms on campus, and to carry out ideological and political practice teaching in a novel, relaxed and popular form, which not only saves the cost of purchasing VR equipment, but also can carry out practice teaching well. Teachers and students only need to turn on the computer to enter the browser, and by manipulating external devices, such as mouse and keyboard, they can perform virtual scene roaming, scene reproduction, role playing, virtual character dialogue and other practical tasks. After completing the practice, students can also leave their own feelings on the platform, and teachers can also assign corresponding homework according to the classroom content, so as to know the mastery degree of students’ practice courses in time [2]. The application of virtual reality technology in practice teaching has injected new vitality into ideological and political practice teaching. The author thinks that the virtual practice teaching of ideological and political course can’t completely replace the traditional practice teaching, but as a good aid and supplement. Students’ practice on such a virtual reality practice platform cannot only stimulate their

learning enthusiasm, but also stimulate their imagination, and meet their needs for ideological and political practice. If they explore and study in such a scene, they can fully mobilize their subjective initiative, thus improving their learning efficiency.

2 Technical Overview

2.1 Client Side

The client technology to be used in this paper is the combination of HTML5+CSS3+JavaScript to realize the presentation of webVR effect. HTML5+CSS3 is the most popular and common client development technology at present. HTML5 contains abundant tag resources, and different tags achieve different effects. The system designed in this paper mainly uses Canvas drawing tag, whose function in HTML5 is to present the drawing effect, and its function in this system is to enhance the processing ability of graphics and images. It does not have the method of drawing graphics, and drawing graphics requires the method provided by context tools. JavaScript is a description language used to make dynamic web pages. It can design and develop dynamic, real-time and interactive web pages based on HTML. In the system development of this paper, JavaScript language is also used to write script programs to realize VR technology, and then it is converted into C# script to run in Unity3D [9].

2.2 Server Side

Generally speaking, the first thing that people think of when referring to server-side technology is ASP.NET technology, which can be regarded as a development platform for web programs. In order to facilitate developers to build and develop robust web applications, it provides programming models, basic software programs and various services. In this paper, the ASP.NET program is written in C# language, and the extension of its generated program is .aspx. ASP.NET works on the basis of HTTP stateless network protocol. The two-way interaction between browsers and users in ASP.NET is realized through HTTP commands and policies. The web program code written by ASP.NET is compiled and runs in the .NET framework environment. It provides a large number of control components, and one of its functions is to manipulate the code to create HTML pages. ASP.Net is a technology that works in the framework of .NET, and all functions related to the network are included. Every page of ASP.Net can be regarded as an object, which transforms the page in .aspx format into an instance object of a class at runtime to inherit the page of the basic class of .NET framework. MySQL database is a structural database with high compatibility, which can store the files generated and needed by the server. This paper is also used to store the materials needed by Unity 3D to create scenes and interact with them. As shown in Fig. 1, C# language is used to control the operation of MySQL database.

2.3 Unity 3D

Unity3D is a tool designed by Unity Technologies to realize multi-platform integrated game development, and its appearance has been widely recognized in the industry. It

```
using MySql.Data;
using MySql.Data.MySqlClient;
using System.Data;
public class MysqlConn {
    public MySqlConnection GetSqlConn()
    {
        MySqlConnection sqlConn;
        String connStr = "Database=msgboard;Data Source=127.0.0.1;
        User Id=root;Password=root;port=3306";
        sqlConn = new MySqlConnection (connStr);
        return sqlConn;
    }
    public void OpenSql()
    {
        MySqlConnection sqlConn = GetSqlConn();
        try {
            sqlConn.Open();
        } catch (Exception ex) {
            Console.Write (ex.Message);
            return;
        }
    }
} }
```

Fig. 1. Control database code

allows designers to easily create and develop interactive content such as 3D games, architectural visualization and real-time 3D animation. It is a game engine with strong integrity and high professionalism. Unity3D engine provides game developers with the ability to easily build interactive content, and not only supports multi-format import, Mesh, bone animation and other functions. It also has the advantages of high-quality image rendering ability, good lighting technology, simulated particle system and powerful terrain editor [6]. At present, Unity3D has been used in various development fields because it is favored by game developers. For example, the popular 2D and 3D mobile computer games, such as card games, shooting games and parkour adventures, have basically applied Unity3D, and their engines have shown superior development performance. The architecture and rendering of Unity3D are similar to those of Web3D. Because of its high portability in the field of virtual simulation, Unity 3D is widely used in the design and development of virtual simulation programs and new media applications. Nowadays, more and more VR designers apply this technology to the design of virtual animation system in order to reduce the collision of animation and avoid the high cost of virtual animation. In the design of the system in this paper, Unity3D technology is mainly used to construct the scene and switch the scene perspective. The rotation, translation and zoom of the scene are controlled by the mouse. As shown in Fig. 2, script is written in unity to move, zoom and rotate the mouse.

```

public class Move2 : MonoBehaviour
{
    < void Start()
    {
        Vector3 angels = transform.eulerAngles;
        x = angels.y;
        y = angels.x;
        target = transform;
    }
    void Update()
    {
        if (Input.GetMouseButton(1))
        {
            x += Input.GetAxis("Mouse X") * xSpeed * 0.02f;
            y += Input.GetAxis("Mouse Y") * ySpeed * 0.02f;
        }
        Camera.main.fieldOfView = Camera.main.fieldOfView + Input.GetAxis("Mouse ScrollWheel") * -20;
    }
    IEnumerator OnMouseDown()
    {
        targetScreenpos = Camera.main.WorldToScreenPoint(target.position);
        mouseScreenpos = new Vector3(Input.mousePosition.x, Input.mousePosition.y, targetScreenpos.z);
        offset = target.position - Camera.main.ScreenToWorldPoint(mouseScreenpos);
        while (Input.GetMouseButton(0))
        {
            mouseScreenpos = new Vector3(Input.mousePosition.x, Input.mousePosition.y, targetScreenpos.z);
            targetWorldpos = Camera.main.ScreenToWorldPoint(mouseScreenpos) + offset;
            target.position = targetWorldpos;
            yield return new WaitForFixedUpdate();
        }
    }
    void LateUpdate()
    {
        y = Mathf.Clamp(y, yMinLimit, yMaxLimit);
        Quaternion rotation = Quaternion.Euler(y, -x, 0);
        transform.rotation = rotation;
    }
}

```

Fig. 2. Create a mouse control script

2.4 3D MAX

3DS MAX is a software tool for 3D modeling, model rendering, and animation. Its software has a wide range of applications, such as advertising design, engineering industry, game making, auxiliary teaching and architectural visualization. Because of its powerful functions, 3DS MAX is frequently used in virtual reality technology, and 3DS MAX plays an absolute advantage in making architectural renderings and architectural animations. For example, the models of 360 panoramic roaming and VR panoramic viewing of the campus we see are all made and rendered by 3DS MAX. According to the application characteristics of different industries, there are different requirements for mastering 3D MAX. Generally, when using virtual reality technology to develop projects, 3dsmax will be used to do the early stage scene and animation modeling. It can be directly integrated with unity3D software used in this system development and automatically converted into FBX format files. Figure 3 shows the workflow of 3DS MAX.

2.5 Development Environment

According to the above key technologies, build the virtual practice system of ideological and political education in this paper. The software tools required to be installed in this

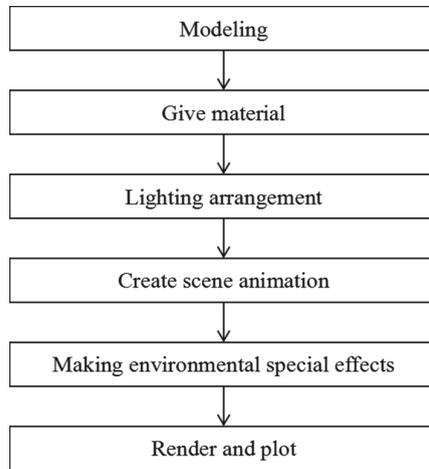


Fig. 3. 3D MAX workflow

technology are all deployed and debugged under the Windows system. First, build the development environment required by the client and server languages: the server downloads and installs the front-end code development tool of Node.js v6.9.2LTS 64-bit version and Sublime Text 3 debugging tool. Asp.net's development environment needs to install IIS version 7.0 server first, then add IIS after installing VS, add `MySql.Data.dll` file in the built project reference, modify the configuration file `Web.config`, and add the local IP address, ID and password to connect to the database. Download MySQL database and create a scene in it. Then download the scene building and image processing tools: the scene building needs to download and install version Unity3D: 2017.2.0f3. In order to better interact with Mysql database, you need to open `SqlAccess` script to modify it, add `MySql.Data.dll`, and add the local IP address of the host machine, the ID and password of MySQL, and the newly created scene name in MySQL. Download and install Cuda Toolkit version 8.0 GA2, download and install CUDNN, choose v6.0 for CUDA 8.0 version 8.0 and configure the environment variables. Download the tensorflow environment installed in it, run another Anaconda window, enter the `D:\program study\ml-agent\ml-agents-master\python` directory under the project file, and enter the command to install `html5lib` library. Download the 3DS MAX 2019 version. The construction and configuration of these environments ensure the feasibility of the development of this virtual practice teaching platform for ideological and political education.

3 Requirement Analysis

3.1 System Requirements Analysis

By applying virtual reality technology in the ideological and political practice teaching environment, this system can realize the reappearance of history across time and space, cross-regional field visits, travel around the world, and feel the magnificence of the famous revolutionary memorial sites of the motherland. Students can visit all patriotic

teaching bases without leaving home, reproduce the stories of heroes and heroines before they died, talk with them, and feel their lofty aspirations of fighting hard for the defense and construction of the motherland. Although the scenes are all virtual through Unity 3D technology, the experiences and feelings that students get in these virtual scenes are all real [10]. Students' practical teaching needs are a form of activity that can arouse their enthusiasm and desire for knowledge in studying ideological and political courses. The traditional practice teaching method has been difficult to meet the students' demand for ideological and political courses. In the virtual reality learning environment, their subjective initiative can play a greater role. Through virtual and vivid scenes, students can leave their own feelings and experiences in the system after browsing a scenic spot, sum up what they have learned in it, and complete the homework assigned by teachers, so as to consolidate what they have learned in practice. According to different virtual practice scenes, teachers give different explanations and assign homework for students to finish, so as to meet the needs of students' ideological and political practice. In this learning process, students can watch novel, varied and vivid scenes through the browser, and combine the teacher's explanation to complete the practice of ideological and political course, so as to help students establish correct three views and better mobilize their learning enthusiasm and subjective initiative.

3.2 Global Design

The virtual practice platform of ideological and political education developed and designed in this paper uses WebGL technology as a standard form to realize Web VR, and uses HTML5+JavaScript+CSS3 technology to develop the client of virtual practice teaching of ideological and political education, which makes the zoom and drag operation smoother and the rendering and playing of animation and images more gorgeous. The server uses ASP.NET framework to realize its functions, and deploys IIS server to solve the problem of access congestion. MySQL database provides the underlying data support for the whole system. Take pictures of real scenes and collect data. The photos of buildings taken by cameras are the main source of materials for later 3D modeling maps [1]. Combine 3DS MAX tools to complete the digital modeling of real scenic spots, and then import the models into Unity3D. Figure 4 shows the process of importing 3DS MAX models into Unity3D. Unity 3D technology uses the established model to construct virtual reality scenes, process materials, add lighting effects and write scripts for interaction and data processing. Finally, the program is published to the web. The process of scenario publishing is as follows: First, add a new website physical path to the folder path of WebGL published by unity in IIS service manager, copy and save the project published by WebGL in this path and add the host address and port number. Read the data of MySQL database with PHP, then unity3D loads the results returned by PHP, passes the parameters to unity3D, and loads PHP from www. Finally, by exporting the simulated virtual scene to WebGL, the 3D virtual scene can be presented in HTML pages, and the functions of scene switching and zooming can be realized by controlling the mouse. 3D scenic spot roaming focuses on the observer's sense of experience. When the experienter just enters the virtual roaming scenic spot page, the scenic spot will be displayed with a fixed angle of view lens. The experienter's perspective in the air enables the experienter to observe the scenic spot 360° above the sky, and to walk and

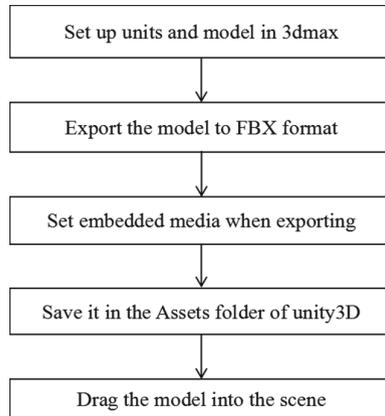


Fig. 4. Import process

visit freely in the virtual scene by switching the perspective and changing the position, as if he were really in the scenic spot [3].

4 Function Implementation

The virtual practice platform of ideological and political education constructed this time is mainly for students and teachers to browse patriotic teaching bases across regions by using computer browsers in schools. The functional module design as shown in Fig. 5.

4.1 Student Module

The functions of the student module include: virtual browsing scenic spots, self-summary, homework.

Virtual browsing scenic spots: Click the virtual browsing scenic spot column, you can view China's famous patriotism teaching base, such as Beijing Tian'anmen Square, Yan'an Revolutionary Memorial site, Jinggangshan, the hometown of successive leaders. Take Yan'an Revolutionary Memorial as an example: Click on Yan'an Revolutionary Base, and you will first see a 360 panoramic view. Click on the sphere to expand the scenic spots, and you will come to the square in front of the memorial hall of Yan'an Revolutionary Memorial Square. First, you will see the bronze statue of Mao Zedong towering in the middle of the square. Zoom and move the scene, and you can see all kinds of precious flowers and plants in the surrounding flower beds and the huge lawn in front of the flower beds. On both sides of the flower beds are the eight characters of "Yan'an Spirit, Shining Forever". Click on the bronze statue of Mao Zedong to have a virtual dialogue with great men. Click the mouse to switch scenes, enter the memorial hall, and you can see six exhibition halls. Click to select different exhibition halls for browsing. Listen to the teacher's explanation while visiting, so as to better absorb what we have seen and learned in the practical course [4]. For example, based on the Yichuan Battle in Yan'an, the teacher can explain the course of the Anti-Japanese War and the spirit of

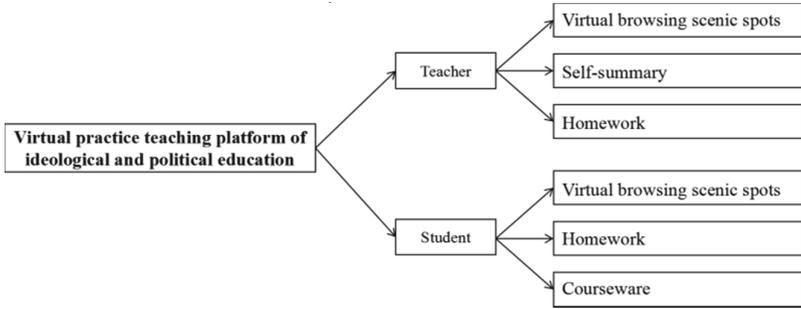


Fig. 5. Function module

the martyrs who worked hard, worked hard and were not afraid of sacrifice. Through the teacher’s explanation, students can realize that peace is hard-won, and make them cherish the present.

Self-summary: Click to enter the self-summary module, and you can edit the sentiment and summary after browsing the scenic spot in three ways: editing text, publishing video and uploading pictures. For example, edit the text to combine what you have browsed with what you have actually learned, and write down your own ideas. These contents can only be seen by oneself, which not only ensures privacy but also mobilizes the initiative of learning.

Homework: After each practice, the teacher will assign related homework, download the homework of the day, combine the content learned in class and self-summary to complete the homework and submit it for uploading. Wait for the teacher to review the feedback before downloading it for viewing.

4.2 Teacher Module

Permissions in the teacher module: virtual browsing scenic spots, homework and courseware.

Virtual browsing scenic spots: After being authenticated, teachers not only have the same browsing rights as students, but also can get some scenic spots that students can’t see, and explain the scenic spots in combination with the actual social background and related policies. The difference from students’ rights is that teacher side can control the browsing interface of student side, share the scenic spots with them and explain them in detail [8].

Homework: After the completion of each ideological and political practice teaching course, students will be assigned homework according to the scenic spots visited by the students on that day and their explanations in class. After editing, they will be uploaded and synchronized to the students’ end. After the students have finished and submitted, they will be consulted and annotated before being sent back to the student end.

Courseware: Teachers can preview the scenic spots in advance, make relevant courseware needed for class, and save it on the platform, which is convenient for reading in class, thus avoiding the trouble of returning to the desktop to read courseware.

5 Conclusions

Nowadays, with the development of virtual reality technology, it has gradually become one of the important means to innovate and reform teaching in colleges and universities. The combination of virtual reality technology and ideological and political practice teaching has ushered in valuable opportunities for practical teaching of ideological and political courses in colleges and universities. The virtual practice platform of ideological and political education designed and implemented in this paper allows students to browse the virtual panorama of patriotic education bases all over the country by using computer browser, which not only meets students' demand for ideological and political practice teaching, but also ensures students' safety, and meets the national requirements for the unification of theoretical practice of ideological and political education. It has played a good role in fostering students' autonomous learning ability, improving students' innovative thinking mode and consolidating their theoretical knowledge of ideological and political education. Teaching reform in colleges and universities should also seize the opportunity in time, combine the operating mechanism of virtual reality technology, the characteristics of students' psychological development and the basic requirements of the state for practical teaching of ideological and political courses in colleges and universities, and gradually innovate and construct the new mode of practical teaching of ideological and political courses in China, so as to achieve the ideological education goal of cultivating moral education in colleges and universities in China.

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