The Design and Application of College Ideological and Political Practice Teaching Models under Virtual Reality Technology

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Abstract. In response to the challenges faced in the teaching of ideological and political theory courses in higher education, this study employs methods such as literature analysis and survey statistics to design an immersive teaching model based on VR (Virtual Reality) technology. The research demonstrates that VR technology can enhance the fidelity of scene reproduction and interactivity by creating highly realistic historical virtual environments, thereby stimulating active student engagement through situational simulations. The developed VR course demo effectively aligns with the resources of ideological and political education courses. Experimental results show that VR teaching can enhance students' learning interest and classroom effectiveness. This study confirms that VR technology provides a new avenue for advancing the reform of ideological and political education courses and holds promise for future applications. However, it has limitations such as a relatively small sample size, requiring further research with a larger scope. This research is of significant importance for leveraging VR technology to support the reform of ideological and political theory course teaching.

Keywords: VR technology; ideological and political education; teaching model; higher education

1 Introduction

Currently, virtual reality technology is widely applied in the field of education. However, research on VR teaching in higher education ideological and political theory courses is still relatively limited. This study aims to explore the role of VR in advancing the reform of ideological and political education. Unlike traditional research, this study designs and constructs an immersive VR course model. The research's objective is to demonstrate the model's effectiveness in improving student learning outcomes. The article begins by analyzing the core technologies of VR and then elaborates on the design principles of the teaching model. Finally, it validates the practical application of VR courses through case studies. The research findings highlight the significant role of VR teaching in stimulating student interest. This study provides a valuable attempt at innovative applications of VR technology in the ideological and political theory classroom.

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2 Related Technology Analysis

2.1 Principles of Core VR Technology

Virtual reality technology utilizes computer-generated interactive three-dimensional environments to simulate the real world, providing an immersive user experience [1], as outlined in Table 1 below.

Table 1 Key Principles of Core VR Technology

Technical Elements	Description
Display Technology	- High-resolution, high-refresh-rate display effects
	- Display with a wide field of view
Sensors	- Used for tracking user position and body movement
	- Enables natural user interaction
Interaction Devices	- Controllers, data gloves, etc., for detecting user input
	- Enhance user interactivity
Content Production Technology	- 3D modeling, animation, sound effects, etc., to create virtual scenes
	- Essential for content creation

2.2 Digital Construction of Ideological and Political Education Curriculum

The digital construction of ideological and political education curriculum refers to the use of digital technology to build a database of teaching resources and multimedia courseware for ideological and political education, in order to meet the teaching needs in the context of the information age [2]. In terms of resource construction, it involves collecting and organizing textual, image, audio, and video materials related to various topics of ideological and political education courses, and structuring them into a database [3-4]. In terms of multimedia courseware development, it involves creating enriching digital content such as animations and presentation videos, which are integrated into the teaching process of ideological and political education. This not only enhances students' interest in learning but also facilitates teacher demonstrations and case analyses. The construction of digital resource databases and multimedia courseware enriches the teaching methods of ideological and political education, making them more interactive and lively, and driving the reform of ideological and political education teaching [5].

2.3 Integration of VR Technology and Digital Resources in Ideological and Political Education

VR (Virtual Reality) technology can create immersive scenes and situations, providing a strong sense of immersion and experience. On the other hand, digital resources in ideological and political education offer abundant learning content and materials. Therefore, deep integration of VR technology with digital resources in ideological and political education can enhance the effectiveness of teaching [6]. In a VR environment, three-dimensional models of historical events, heroic figures, and key scenarios can be loaded, allowing for a firsthand virtual experience to deepen the understanding of ideological and political theories. Problem scenarios can also be set up to train students in critical thinking and problem-solving abilities.

Furthermore, the interactive nature of VR fosters a more equal relationship between teachers and students, making teaching more engaging. The immersive nature of VR combined with the richness of digital resources complement each other and collectively drive the reform of ideological and political education teaching [7].

3 Design of VR-Based Ideological and Political Education Teaching Model

3.1 VR Virtual Scene Design

VR virtual scenes form the foundation of immersive ideological and political education courses and require a high level of scene detail and interactivity. This paper focuses on the Long March theme and conceptualizes the VR course scenes that present key locations. Historical images related to the Long March are collected and organized, with a clear understanding of the distinctive features of key locations [8]. Unity engine and 3ds Max software are used for scene development to simulate the terrain of geographical features like the Yellow River and snowy mountains. To enhance immersion, real map data is employed for terrain optimization, meticulously depicting terrain features and using bilinear interpolation to smooth terrain data:

$$P = \frac{(x_2-x)(y_2-y)}{(x_2-x_1)(y_2-y_1)}P_{11} + \frac{(x-x_1)(y_2-y)}{(x_2-x_1)(y_2-y_1)}P_{21} + \frac{(x_2-x)(y-y_1)}{(x_2-x_1)(y_2-y_1)}P_{12} + \frac{(x-x_1)(y-y_1)}{(x_2-x_1)(y_2-y_1)}P_{22} \quad (1)$$

Where P11, P21, P12, P22 are the four nearest neighboring points to point P, and x and y are the coordinates of point P, while x1, x2, y1, and y2 are the coordinates of these neighboring points. 3D facial modeling of the characters is carried out based on images of the Red Army. Collaborating with programmers, a real-time weather system has been developed to simulate realistic rain and snow weather conditions. These technical measures strengthen the authenticity and immersion of the scenes [9].

3.2 Design of Scenario Simulation Methods

Based on the constructed virtual scenes, it is necessary to design various ways to simulate different teaching scenarios in ideological and political education [10]. For instance, multiple interactive methods have been designed for scenario simulations. Students can initiate conversations with virtual characters, make choices, and the system will record the selection proportions of different options.

$$P(A|B) = \frac{P(A \cap B)}{P(B)} \quad (2)$$

Here, A represents a student selecting a specific option, and event B refers to a specific situation that occurred previously. Students can take on different historical roles and simulate decision-making within the same virtual scene. For specific cases, students are required to gather historical evidence, engage in reasoning, and the system provides evaluations. These scenario simulations aim to stimulate active student thinking through highly immersive virtual experiences.

3.3 Design of Typical Cases

It is essential to design VR virtual scene simulations for typical cases in conjunction with the knowledge points of ideological and political education courses. Typical cases can serve both as a positive educational tool and as a warning to students to avoid mistakes. For example, in connection with the reasons for the success of the Long March, a series of typical case scenarios have been designed. In simulating sound propagation, it is possible to mention the relationship between the intensity of sound and the distance, which can be expressed by the following formula:

$$I = \frac{P}{4\pi r^2}$$

I is the intensity of sound, P is the power of the sound source, r is the distance from the sound source.By recreating scenes such as the Zunyi Conference, students can experience the historical significance of the turning point on-site. Simulating the harsh environment of the Four Crossings of the Chishui River allows students to intuitively understand the determination and sacrifice of the Red Army. Finally, recreating the warm reception of the Red Army by the Shaanxi population highlights the importance of gaining support from the masses. These immersive virtual experiences of typical case scenarios vividly demonstrate the revolutionary spirit.

3.4 System Framework Design for Integrating VR Environment with Ideological and Political Education Resources

To harness VR technology for ideological and political education, it is necessary to design a system framework that integrates VR environments with digital teaching resources.

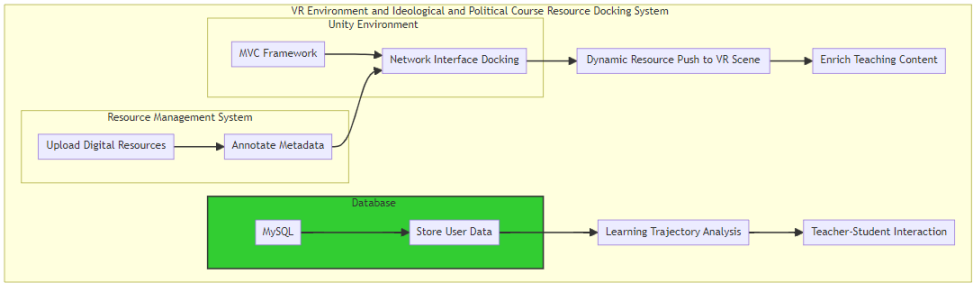

Figure 1 Framework Design Diagram

From Figure 1, it can be seen that this paper has designed a resource management system that allows the upload of various types of digital resources and metadata labeling. In Unity, using the MVC framework, the resource management system interfaces with the VR scene through a network interface. Resources can be dynamically pushed into the virtual scene based on the progress of the course, enriching the teaching content. MySQL is used to store user data, such as analyzing learning trajectories and facilitating interactions between teachers and students. This system framework achieves an organic integration of VR scenes with digital resources.

4 Implementation and Application

4.1 Development of VR Ideological and Political Education Virtual Scenes

Developing immersive VR virtual scenes for ideological and political education requires the use of 3D development tools like Unity and Unreal Engine. Taking the important theme of "The Long March" as an example, a VR virtual environment depicting key historical scenes of the Long March is conceived and designed. A significant amount of historical images related to the Long March is collected, and thorough research is conducted on the terrain, topography, and architectural features along the Long March route.

Figure 2 Long March Simulation Image

As shown in Figure 2, 3ds Max is used to construct scene models of the Yellow River, snowy mountains, and the rugged terrain, utilizing real topographical features for authenticity. Character models are carefully simulated based on historical records, and detailed scene textures are created using Photoshop to enhance realism. Resources are imported into Unity3D for debugging, and scripts are written to implement a character dialogue system. Background music is processed with mixing using old Red Army songs to enhance the sense of immersion. The final result is a VR course demo that allows students to experience the hardships of the Long March as if they were there.

4.2 Building an Ideological and Political Education Resource Repository

Building a resource database is the foundation of content creation, as shown in Figure 3 below. The conceptualization of various ideological and political education themes is carried out, and core content is identified. Subsequently, a large amount of relevant textual, image, audio, and video materials is collected. Video materials are mainly extracted from documentaries and films, while images are sourced from public websites and scanned old photographs. All resources undergo copyright processing and are categorized and labeled accordingly. Rich text editing is used for textual descriptions. All resources are imported into a MySQL database, enabling full-text search capabilities. The database can be organized by lesson topics or resources can be randomly selected for teacher combinations.

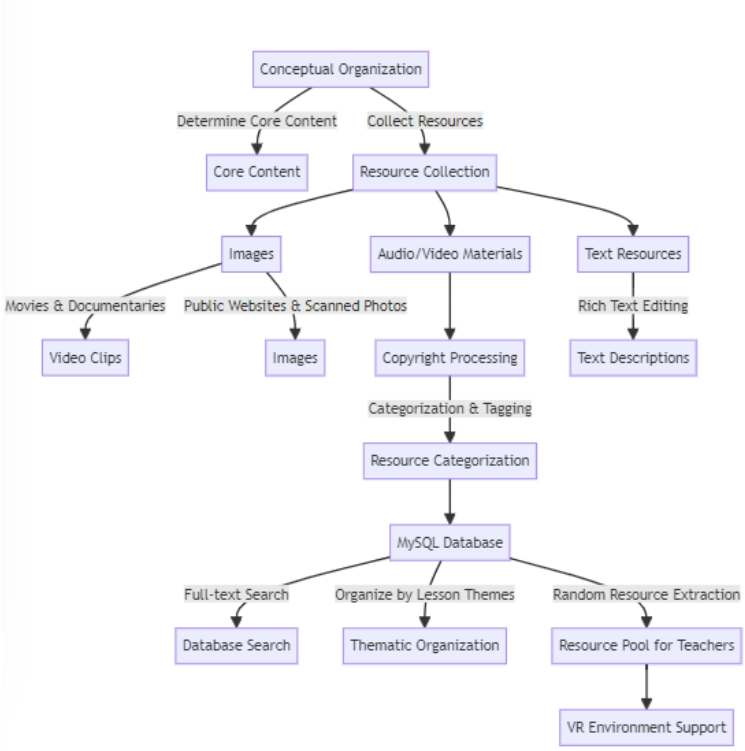

Figure 3: Construction of Ideological and Political Education Resource Database

4.3 System Integration and Testing

Following the completion of development work, an integration framework was established between the VR virtual scene software and the resource repository software. Through network communication, the dynamic import of content from the resource repository into the VR environment was achieved to enhance scene interactivity. Testing of the course demonstrations was conducted under various network conditions to ensure system stability. Additionally, resource import tools were customized for teachers with different user levels.

// Define the VR server connection parameters

VR_SERVER_IP = 'localhost'

VR_SERVER_PORT = 8888

// Create a socket for resource communication

Create socket named 'resource_socket' using TCP/IP

// Establish a connection to the VR virtual scene software

```
Connect 'resource_socket' to VR server at VR_SERVER_IP and VR_SERVER_PORT

// Prepare resource data for transmission
resource_data = "This is the data of a resource file"

// Send resource data to the VR environment
Send 'resource_data' through 'resource_socket'

// Close the socket connection
Close 'resource_socket'
```

4.4 Assessment of Application Effects

After implementing the VR teaching system in the school's ideological and political education classrooms, it is essential to conduct a scientific assessment of the learning outcomes. Following a one-semester experimental VR ideological and political education course with two classes totaling 100 students, we conducted a multidimensional evaluation of learning outcomes through questionnaire surveys and data analysis. Survey results showed that 90% of the students believed that VR teaching enhanced their interest in learning, and 80% felt that VR teaching deepened their understanding of ideological and political theory. 95% of the teachers believed that VR teaching improved the classroom atmosphere, and 82% supported its continued promotion. We also collected data on students' VR environment learning trajectories, with the number of interactive sessions increasing from an initial 20 sessions per class hour to 35 sessions in later stages, and interactive time significantly increased. This indicated an enhancement in student initiative in learning. In ideological and political theory tests, the average scores of the VR teaching experimental group improved by 12% compared to the control group. Based on these findings, VR ideological and political education has demonstrated significant effects in enhancing learning interest, deepening theoretical understanding, and improving classroom atmosphere. The research team will continue to optimize the VR teaching system and validate its application and dissemination in ideological and political education through long-term tracking with larger sample sizes.

5 Conclusion

In response to the current issues in ideological and political theory course teaching, this study utilized literature analysis and empirical research methods to design and validate an immersive teaching model based on VR technology. The research results indicate that VR technology can enhance the fidelity and interactivity of course scenes. By constructing highly realistic historical virtual scenes and using scenario simulations, it stimulates students' interest in learning and encourages active thinking. Classroom experiments have verified the significant effects of VR teaching in improving students' theoretical understanding and enhancing the

classroom atmosphere. This study provides preliminary evidence of the important role and application prospects of VR technology in advancing the reform of ideological and political theory courses. However, limitations such as a small sample size necessitate further research with larger-scale investigations to examine the long-term effects of VR teaching.

Topic Name: Research on the "Standard+Characteristics" Ideological and Political Course Practice Teaching and Education Model in Higher Vocational Colleges from the Perspective of School Enterprise Cooperation2022—XXDY—32

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