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Research on the Path of Virtual Simulation Technology Promoting the Integration of Material Culture into Ideological and Political Courses in Universities

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Abstract: This study focuses on the innovative paths of virtual simulation technology empowering the integration of material culture into ideological and political courses in colleges and universities. Addressing the practical dilemmas faced by traditional integration models, such as spatiotemporal limitations, content solidification, and insufficient emotional resonance, this article systematically demonstrates the unique value of virtual simulation technology in overcoming the aforementioned bottlenecks, owing to its three major characteristics: immersion, interactivity, and imagination. The study constructs an immersive teaching model of "virtual simulation + material culture museums," a concrete interpretation model of "virtual simulation + theoretical teaching," a combined exercise and training model of "virtual simulation + practical training," and a personalized expansion model of "virtual simulation + autonomous learning," forming a multi-level, three-dimensional practical scheme. Furthermore, from the aspects of resource collaborative construction, improvement of teachers' digital literacy, intelligent platform support, and multi-dimensional evaluation feedback, it proposes a systematic guarantee mechanism to ensure the effective implementation of the model, aiming to provide theoretical reference and practical guidance for promoting the digital transformation of ideological and political course teaching paradigms and enhancing the effectiveness of moral education.

1. Introduction

As an advanced cultural crystallization nurtured by the Chinese people in the practice of revolution, construction, and reform, material culture carries profound national memories and spiritual genes. It serves as a valuable resource for ideological and political courses in colleges and universities to implement the fundamental task of "fostering virtue through education." Effectively integrating material culture into ideological and political classrooms is irreplaceable for guiding students to strengthen their ideals and beliefs and cultivate a sense of national identity and

responsibility. However, traditional integration models often rely on theoretical lectures and visits to physical venues[1]. At the practical level, they face prominent constraints such as limitations of time and space, a singular narrative approach, and insufficient emotional resonance, resulting in the failure to fully release their educational effectiveness[2].

At the same time, digital technologies represented by virtual simulation are developing rapidly, injecting new impetus into the transformation of educational forms with their core characteristics of immersion, interaction, and imagination. At the national level, policy documents such as the "Education Informatization 2.0 Action Plan" have been intensively issued, explicitly advocating the deep integration of modern information technologies such as virtual simulation into the entire process of education and teaching[3,4]. In this context, exploring how virtual simulation technology can empower material culture and break through the structural bottlenecks in its integration into ideological and political courses in colleges and universities is not only an active response to the national education strategy but also an inevitable requirement for promoting the connotative development of ideological and political teaching and enhancing its sense of the times and attractiveness. This study has both theoretical deepening and practical innovation significance, aiming to provide academic support and path reference for building a new model of ideological and political education that deeply integrates "technology-content-teaching."

Currently, the academic community has formed several focuses of research around this topic. First, regarding the educational value and integration difficulties of material culture, scholars generally recognize it as a "vivid case" for ideological and political courses but point out that the dispersion of physical resources and the solidification of teaching forms limit its functional[5]. Second, regarding the educational application of virtual simulation technology, research is mostly concentrated on its practical training advantages in medicine, engineering, and other fields. In recent years, it has gradually penetrated into the humanities and social sciences, beginning to explore its potential in historical situation reproduction and emotional attitude cultivation. Third, regarding the integration of technology and ideological and political courses, existing literature has initially demonstrated the feasibility of "virtual simulation + ideological and political education," mostly elaborating its value from a macro level.

However, there are obvious shortcomings in the existing research: most achievements either focus on the description of the technical level or are limited to the interpretation of the ideological and political significance of material culture, failing to deeply couple and analyze the two; there is a lack of systematic and operable in-depth research on the specific paths, model construction, and implementation guarantee mechanisms for virtual simulation technology to empower the integration of material culture; and the theoretical discussion on how to use technology to achieve the sublimation process from knowledge transfer to value recognition and emotional internalization is still insufficient. This study is based on this academic context, striving to fill the gaps in existing research, focusing on the "path" itself, and conducting systematic and in-depth construction and analysis.

2. Theoretical Logic and Practical Needs

The effective integration of material culture into ideological and political courses in universities is both a necessary requirement for implementing the fundamental task of fostering virtue through education and a strategic measure to address the complex challenges in the current ideological field. This chapter systematically elucidates the internal logic and urgent needs of integrating virtual simulation technology with material culture from three dimensions: theoretical foundation, practical difficulties, and technological advantages, laying a solid foundation for subsequent path construction.

2.1 Theoretical Basis

The deep integration of virtual simulation technology and material culture education is justified by modern learning theories, especially constructivism and situated learning theory, which provide solid theoretical support.

Constructivism posits that knowledge is not acquired through passive indoctrination but is instead a system of meaning actively constructed by learners in interaction with the environment. This theory emphasizes four key elements: learning context, collaboration, conversation, and meaning construction. Virtual simulation technology provides a "context" for learners to construct meaning by building highly realistic red historical scenes, such as recreating the hardships of the Long March or the life of revolutionary base areas. Learners are no longer bystanders of history. Instead, they can enter the historical scene through virtual avatars, engage in "conversations" with historical figures, and independently explore and deeply understand core issues such as "why revolutionary beliefs were so firm" through "collaboration" with the environment and other learners. This enables them to complete the active "meaning construction" of the core of the red spirit, realizing the deep integration of knowledge, emotion, and values.

Situated learning theory further points out that learning is essentially a social and practical process, and knowledge and skills can only be truly understood and mastered in the specific context in which they are used. This theory criticizes the phenomenon of "inert knowledge" in traditional school education, where knowledge is divorced from context. The ideals, beliefs, spirit of sacrifice, and values contained in material culture are prone to create a gap between students' cognitive experience and their life world if presented only in the form of abstract theories. Virtual simulation technology can create a "visible, audible, sensible, and interactive" material culture practice context, allowing students to be "immersed" in the arduousness of the "Three-Year Guerrilla War in Southern Jiangxi" or the military and political game of the "Shanghai Campaign." In this "context," students experience, make decisions, and reflect as members of an approximate "community of practice," thereby internalizing the abstract red gene into embodied, transferable emotional identity and value judgments, effectively solving the problems of context detachment and self-loss in traditional teaching.

2.2 Real-world Dilemmas

Despite the consensus on the educational value of material culture, its effectiveness in traditional integration models faces multiple structural limitations, primarily in the dimensions of time and space, content, and feedback.

Time and space constraints are the primary obstacle. Physical red sites (such as revolutionary sites and memorial halls) are important carriers of material culture, but their opening hours, geographical locations, and physical capacity have inherent exclusivity. Organizing large-scale student field trips faces high time costs, economic costs, and organizational management pressures. During public emergencies (such as epidemics), offline practical teaching may even be completely suspended. This makes it difficult to normalize and fully cover material culture education, and it cannot guarantee that every student can obtain equal and high-quality practical experiences.

Content presentation and interaction formats tend to be superficial. The exhibition content of physical venues is relatively fixed, the update cycle is long, and it is difficult to dynamically adjust according to teaching needs. The display methods are mostly static cultural relics and pictures supplemented by text explanations, and the form is relatively singular. Students are mostly in a passive receiving state of "taking a fleeting glance" during the visit, "can only look, cannot touch," and lack in-depth interaction links. This one-way information transmission makes it difficult to stimulate students' deep cognitive investment and emotional resonance, resulting in the spiritual

connotation behind the red story being unable to be effectively activated and deeply perceived, and the educational effect remains superficial.

Data feedback and teaching evaluation mechanisms are lacking. Traditional teaching models and physical venue visits lack the technical means to effectively collect and analyze data on students' learning processes. Teachers find it difficult to accurately grasp each student's emotional changes, cognitive difficulties, and interest focuses when learning material culture. The evaluation of teaching effectiveness mostly relies on summative essays or reports, lacking process-based, data-driven support. This "black box" state makes it impossible for teachers to precisely optimize teaching and provide personalized guidance, which restricts the continuous improvement of the effectiveness of material culture education.

2.3 Empowering Advantages

Virtual simulation technology, with its three core characteristics of immersion, interactivity, and imagination, provides a powerful technical solution to address the aforementioned challenges, demonstrating unique empowering advantages.

Immersion can reshape the learning context and achieve emotional transcendence. With the aid of VR headsets, panoramic displays, and other equipment, virtual simulation technology can construct a highly realistic, even surreal, digital environment in terms of sight and sound, enabling students to experience a physiological and psychological sense of "being there." This strong sense of presence effectively shortens the spatial, temporal, and psychological distance between students and revolutionary history, "transporting" them from the current classroom environment to the years of revolutionary war. When students "stand" on the virtually recreated Luding Bridge, experiencing the cold iron chains and the rain of bullets, their understanding of "revolutionary heroism" will no longer be a dry textual definition, but an emotional shock and value recognition derived from personal experience, thereby achieving a deep transformation from "knowing" to "believing."

Interactivity can stimulate subjective consciousness and promote meaning construction. The virtual simulation environment breaks the traditional one-way teaching model, allowing students to interact in real-time with historical figures and cultural relics in the virtual environment through devices such as handles and data gloves. Students can "pick up" virtual cultural relics to view their detailed introductions, engage in dialogue and Q&A with "Marshal Chen Yi," and even participate in the decision-making process of specific historical plots. This high-intensity interactive experience transforms students from passive recipients of information into active explorers and participants in the historical process, greatly stimulating their learning subjectivity and initiative, and completing the active construction and internalization of red knowledge in the process of "learning by doing."

3. Constructing Practical Models

Building upon the theoretical logic and demonstrated practical needs, this chapter systematically constructs practical models for integrating material culture into ideological and political courses in universities and colleges using virtual simulation technology. Through the innovative design of four typical models, it aims to achieve a paradigm shift in teaching, moving from one-way indoctrination to multi-dimensional interaction[6].

3.1 Immersive Teaching Model of "Virtual Simulation + material culture Venues"

This model aims to overcome the limitations of time and space associated with physical material culture venues by digitally reconstructing them, thus achieving a revolutionary expansion of teaching scenarios. Using technologies such as 3D laser scanning, UAV oblique photography, and

panoramic photography, high-precision digital restoration of physical venues such as revolutionary sites and memorial halls is carried out to construct 1:1 digital twin scenarios. Students can enter virtual venues through VR devices, enabling autonomous navigation and roaming, and observing architectural details and exhibition layouts from multiple angles.

In terms of functional design, it goes beyond simple scene reproduction to develop in-depth interactive functions. Students can "pick up" virtual cultural relics, triggering pop-up windows displaying their historical background and spiritual connotations; hotspot links are set up in key exhibition areas, and clicking on them allows students to watch historical image data or listen to in-depth interpretations by experts. This highly immersive experience creates a strong emotional resonance among students, effectively solving the problem of "cursory viewing" in traditional venue visits, and realizing a shift in identity from "viewer" to "participant."

3.2 Embodied Interpretation Model of "Virtual Simulation + Theoretical Teaching"

Addressing the abstract nature of theoretical teaching in ideological and political courses, this model transforms theoretical concepts into perceptible and concrete situations through virtual simulation technology. When teaching "Chinese Revolutionary Morality," traditional teaching often remains at the level of conceptual interpretation, while virtual simulation can construct a virtual scenario of the "Three-Year Guerrilla War," allowing students to experience, through role-playing, the firm beliefs and noble spirit displayed by revolutionaries in extreme predicaments.

The core of this model lies in designing interactive plots with speculative value. For example, in the virtual scenario of the "Shanghai Campaign," a decision node of "dual military and political victory" is set up, and students need to make choices based on their understanding of national policies. The system will immediately provide feedback on the possible historical consequences of different decisions. This design integrates abstract theoretical principles into concrete decision-making situations, prompting students to deepen their understanding of theory through practical thinking. At the same time, a visual expression system for theoretical knowledge is developed, using dynamic infographics, space-time axes, and other technical means to clearly display the historical origin, theoretical logic, and contemporary value of the red spirit, realizing the transformation of theoretical teaching from "concept memorization" to "meaning construction."

3.3 "Virtual Simulation + Hands-on Practice" Integrated Training Model

This model focuses on the practical cultivation of students' value judgment and political literacy, designing task-driven virtual training projects based on historical facts related to the Communist Revolution. By constructing complex historical situations and conflicts, students develop comprehensive abilities through simulated practice. For example, the "Red Financial Front" virtual training project allows students to assume the role of underground economic workers, completing tasks such as raising funds and protecting the organization in a virtual Nationalist-controlled area, experiencing the wisdom and loyalty of revolutionaries in a highly stressful environment[7].

The training process emphasizes the cultivation of students' teamwork and strategic thinking. In the "United Front Work" virtual training, students are divided into groups to represent different political forces, reaching consensus through negotiation and deeply understanding the sophistication of the country's united front strategy. The training system sets up multi-dimensional evaluation indicators, which not only assess the completion of tasks, but also pay attention to the values, thinking patterns, and team spirit demonstrated by students in the process. This role-playing-based, in-depth experience integrates the spiritual essence of the Communist Revolution into students' cognitive structure through practical operations, achieving an organic unity of knowledge transfer and value guidance.

4. Implementation Path and Guarantee Mechanism

To ensure the practical model of integrating material culture into ideological and political education (IPE) through virtual simulation technology truly takes root and exerts a long-term effect, a systematic implementation path and solid guarantee mechanism are needed as support. This chapter constructs an interconnected and coordinated guarantee system from four key dimensions: resource construction, faculty development, platform building, and evaluation feedback.

4.1 Resource Construction Path

The development of high-quality virtual simulation teaching resources is the foundation of practice. We must adhere to the principles of "content as king, technology for use, and education as the foundation" and establish a scientific resource construction path. The primary task is to build a collaborative development mechanism involving government, enterprises, universities, and research institutions. Marxist colleges and archives within universities should cooperate to ensure the authority of historical materials and the correctness of thought. They should also collaborate with enterprises possessing cutting-edge technological capabilities to ensure model accuracy and interactive experience, and introduce educational technology experts to provide instructional design and learning science guidance. This mechanism can integrate the strengths of all parties, forming a complete closed loop from historical material excavation and value extraction to technological realization[8].

In terms of resource content construction, the principle of "combining the virtual and the real, prioritizing the real over the virtual when possible, and complementing each other" should be followed. On the one hand, high-fidelity digital acquisition and reconstruction should be carried out for immovable revolutionary sites and precious cultural relics, such as using oblique photography and three-dimensional laser scanning technology to restore the original appearance of former revolutionary sites. On the other hand, for abstract revolutionary spirit and historical logic, the "imaginative" nature of virtual simulation should be boldly used for creative presentation. For example, developing an "interactive narrative module of the power of ideals and beliefs" allows students to experience the inner world of revolutionaries at critical historical junctures through key choices. Resource design must strictly follow teaching laws, be guided by the teaching focus of IPE courses and students' cognitive pain points, avoid falling into the trap of purely showcasing technology, and ensure that every virtual scene and interactive link serves a clear educational goal.

4.2 Teaching Organization and Teacher Development

Teachers are the key dynamic force in achieving the deep integration of technology and teaching. The virtual simulation teaching environment places new ability requirements on IPE teachers, necessitating a systematic capacity-building plan. Teachers must not only possess a solid theoretical foundation in material culture but also master basic digital resource operation capabilities, virtual classroom organization and management skills, and the ability to analyze student learning based on process data. Universities should establish a normalized teacher development mechanism, through organizing special training, workshops, and teaching observations, to help teachers master virtual simulation teaching software and hardware and understand the teaching design principles behind them.

More importantly, it is necessary to promote the transformation of teachers' roles from "knowledge transmitters" to "learning facilitators" and "scenario designers." In virtual simulation teaching, the teacher's responsibility is no longer one-way indoctrination but to carefully design learning tasks, guide students to engage in deep thinking in immersive experiences, and organize

post-experience reflection, discussion, and value sublimation. For example, after students complete the "Marshal Chen Yi's Three-Year Guerrilla War" VR experience, teachers need to design core topics to guide students in discussing "the contemporary embodiment of revolutionary optimism," realizing the transition from emotional shock to rational cognition. Teachers are encouraged to form interdisciplinary teaching teams, cooperating with teachers in computer science, design, and other majors to jointly develop and iterate virtual simulation teaching projects, enhancing the scientific nature and artistic expression of teaching content.

4.3 Platform Construction and Technical Support

A stable, open, and intelligent technology platform is the foundational infrastructure for supporting large-scale, personalized teaching. It is necessary to construct a comprehensive virtual simulation teaching cloud platform that integrates resource management, teaching organization, learning analysis, and data monitoring. This platform should possess multi-terminal adaptive capabilities, supporting seamless access from immersive VR devices to personal computers, tablets, and mobile phones, ensuring learning is readily accessible. The platform architecture should adopt a modular design to facilitate the access, updating, and management of different virtual simulation teaching resources.

The platform's core intelligence is embodied in its learning analysis and data monitoring capabilities. By tracking student behavior data in the virtual environment—such as the duration of stay in a particular historical scene, the selection preferences for interactive options, and the pass rate of knowledge quizzes—the platform can generate personalized learning profiles and learning reports. This provides data support for teachers to implement precise teaching interventions and optimize teaching strategies. At the same time, the platform should establish robust network security and data privacy protection mechanisms to ensure the security of the teaching process and data storage, and possess high concurrency processing capabilities to cope with the challenges of large-scale online learning.

4.4 Evaluation and Feedback Mechanism

Constructing a scientific, multi-dimensional evaluation and feedback mechanism is the core of ensuring teaching quality and continuous improvement. It is essential to break through the single knowledge assessment model and establish a three-dimensional evaluation system covering "knowledge mastery - emotional recognition - behavioral tendency." At the knowledge level, assessment can be conducted through platform-embedded interactive quizzes and the completion of scenario-based tasks. At the emotional and value level, qualitative assessments need to be combined with pre- and post-experience questionnaires, in-depth interviews, and students' verbal expressions in reflective discussions. At the behavioral tendency level, value choices made by students in virtual scenarios can be observed, and their related behavioral performance in real life can be tracked.

The evaluation subject should adhere to diversification, integrating teacher evaluation, student self-evaluation, machine evaluation, and peer evaluation. The evaluation of teaching management institutions should focus on the achievement of curriculum objectives and the innovation of teaching models. Ultimately, all evaluation data will be aggregated into a "dashboard" for teaching improvement, providing accurate and objective basis for teachers to reflect on teaching, optimize virtual simulation resource design, and for schools to formulate relevant support policies, forming a closed-loop management system of "teaching-evaluation-feedback-optimization," ensuring the continuous vitality and educational effectiveness of virtual simulation in empowering material culture teaching practice.

5. Conclusion

This study systematically explores the paths and mechanisms by which virtual simulation technology can facilitate the integration of material culture into ideological and political courses in universities. The research shows that by constructing four teaching models—"virtual simulation + material culture venues," "virtual simulation + theoretical teaching," "virtual simulation + practical training," and "virtual simulation + self-directed learning"—it is possible to effectively overcome the spatiotemporal limitations and formal constraints of traditional material culture education and achieve a paradigm shift in teaching from one-way indoctrination to multi-dimensional interaction. In terms of implementation paths, it is necessary to establish a collaborative "government-enterprise-university-research" resource development mechanism and construct a complete guarantee system covering faculty development, platform construction, and evaluation feedback to ensure the educational effectiveness of virtual simulation teaching.

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