Practice and Exploration of Promoting Culture in Chinese Universities Based on Virtual Museums

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Abstract. With the rapid development of science and technology, virtual museums have emerged as an innovative cultural dissemination platform, bringing unprecedented opportunities and potential for cultural promotion in universities. Based on advanced digital technology, virtual museums provide richer and more diverse cultural resources and display forms; By utilizing cutting-edge VR (virtual reality), AR (augmented reality), and new media technologies, it brings viewers a more vivid and intuitive interactive experience and sense of participation; By combining network technology and big data technology, the coverage and influence of culture promotion have been greatly expanded, enabling it to reach a wider audience and achieving significant improvements in depth and breadth.

Keywords: Virtual Museum, Virtual Reality, Augmented Reality, Big Data, New Media, Culture Promotion

1   Introduction

The establishment conference of the University Museum Education Alliance in 2012 introduced the novel concept of 'University Museum Education,' emphasizing the need to foster the integration of university museums with cultural construction efforts, ultimately aiming to enhance the quality of education.[1] Virtual museums, as a pioneering format in the era of new media, have introduced transformative shifts in the cultural promotion efforts of Chinese universities. Congjie Xu and others mentioned that "Creating virtual museums is one of the important paths to achieve digital transformation of red culture."[2] This statement is a powerful interpretation of virtual museums as a transformative practical tool for promoting ideological culture. Luguang Wu pointed out that "Colleges and universities can also use new internet technologies to build online virtual museums, virtual memorial halls and other platforms, so that students can visit the ideological education base and patriotism education base without leaving home, and accept the revolutionary education and the baptism of thought."[3] This indicates that virtual museums can break the limitations of traditional physical space, allowing important historical and cultural heritage such as ideological culture to be widely disseminated through online platforms, greatly expanding the audience range of ideological

culture among student groups. This innovative model not only enriches teaching resources, but its transformative role is also reflected in providing situational immersion and interactive participation through modern technological means, strengthening the younger generation's sense of identification and pride in traditional culture, and further promoting the inheritance and development of excellent traditional cultures such as ideological culture. For example, scholars have proposed designing virtual practical tasks with the theme of the great spirit of building the Party, allowing students to deeply understand the revolutionary spirit through situational experiences, further promoting the internalization and externalization of the revolutionary spirit in the minds of students[4], fully reflecting the deepening role of virtual museums in promoting culture in universities.

2   The Concept and Characteristics of Virtual Museums

Since the rapid development of computer technology in the 1980s, the field of museum studies has undergone a revolutionary transformation. The emerging concept of virtual museums can be traced back to early media forms such as books, slides, and movies, which can display museum exhibits through images and videos. With the development of computer technology and networks, the concept of virtual museums has been further developed. Today, virtual museums refer to the use of computer technology and network connections to present museum exhibits to audiences in a virtual form. This virtual museum can showcase artworks, cultural relics, and other cultural heritage through multimedia technology, allowing visitors to interact and visit through computer interfaces.[5] This marks that the way cultural relics are disseminated is no longer limited to the physical objects themselves, but has shifted to using digital information collected from cultural relics as a medium, opening up a new mode of museum display and interaction. In terms of promoting culture in universities, virtual museums, with their rich resources and diverse forms, as well as enhanced interactivity and participation, have greatly expanded the coverage of culture promotion among student groups, while deepening the understanding and identification of culture among university students.

3   Having Rich Resource Forms

Firstly, virtual museums provide richer resources and forms for promoting the ideological spirit spirit in universities. Through digitization, virtualization and other means, virtual museums can display a large number of historical relics, pictures, audio and video materials, etc., enabling students to have a more intuitive understanding of history and experience the charm of culture. Virtual museums have shown unprecedented potential and advantages in showcasing historical relics, images, audio and video materials, and more. The virtual museum employs cutting-edge 3D scanning and modeling technology to digitize and replicate rare historical relics, ensuring their flawless presentation in the virtual realm. Students no longer need to physically visit museums to scrutinize every intricate detail of these cultural treasures; instead, they can immerse themselves in a 360-degree virtual reality (VR) experience, whether at home or school,

through VR devices or computer screens. Zooming in, out, and rotating the relics offer an intuitive and profound understanding. Beyond cultural relics, virtual museums boast a comprehensive collection of historical images. These encompass battlefield photographs captured during the tumultuous revolutionary war, poignant life portraits of historical icons, and documentary shots that encapsulate pivotal revolutionary moments. By harnessing high-definition image displays, students can authentically immerse themselves in the ambiance of that epoch, appreciating the allure of historical figures and gaining profound insights into the rigors and grandeur of the revolutionary struggle. Furthermore, beyond cultural relics, virtual museums showcase a vast collection of historical images, enhancing the learning experience. These pictures include battlefield photos during the revolutionary war, life photos of historical figures, and documentary photos of revolutionary scenes. Virtual museums are not only repositories of artifacts but also dynamic platforms for gathering and showcasing audio-visual content related to revolutionary history. This extensive collection encompasses documentaries that chronicle the tumultuous epochs of revolution, performances of stirring revolutionary songs, and interviews with illustrious historical figures. By incorporating these audio and video materials, students are able to immerse themselves in a more vivid portrayal of history, sensing the pulse of the era and the grandeur of the heroic deeds and noble spirit of revolutionary martyrs. Additionally, these audio-visual resources enrich ideological education, imparting a greater sense of authenticity and infusing it with an infectious and compelling narrative.

In addition to the resources of historical relics, images, audio and video materials mentioned above, virtual museums also cover the restoration of cultural scenes through technologies such as virtual reality (VR) and augmented reality (AR)[6]. Since a very early age, researchers have fully demonstrated the utility and potential benefits of virtual reality (VR) [7-8] and augmented reality (AR) [9-10] for museums. And these two technologies are part of the core technologies for building virtual museums. Virtual reality technology allows users to enter a computer-generated, interactive three-dimensional environment. In virtual museums, VR technology is used to recreate revolutionary historical scenes, such as the difficulties and dangers of the Red Army's Long March and the fierce battles during the Anti-Japanese War. In addition, VR technology can also be used to create virtual historical characters. Through head mounted VR devices, visitors can immerse themselves in these historical scenes, as if traveling through time and space, experiencing the smoke and war of that era firsthand, and gaining a deeper understanding of the bravery and dedication of revolutionary martyrs. Unlike VR technology, augmented reality (AR) overlays virtual elements onto the real world to achieve a seamless integration of the real and virtual environments. In virtual museums, AR technology can be used to overlay historical elements into real-life scenes, allowing visitors to experience the charm of ideology and culture in a familiar environment. For example, when visiting revolutionary sites, AR technology can overlay virtual elements such as historical photos and artifacts onto real-life scenes, allowing visitors to see the true historical appearance of the site.

4   Provide a Stronger Interactive Experience

Virtual museums can provide stronger interactivity and participation in promoting ideology and culture, which is also closely related to the two core technologies of virtual reality (VR) [11-12] and augmented reality (AR) [13-14]. In virtual museums, visitors no longer experience simple observation and learning, but can deeply participate in the reproduction of historical events and interact with virtual characters. This immersive experience brings revolutionary innovation to the inheritance of ideology and culture. For example, the "Monument of Spirit" virtual museum simulation experimental teaching project has successfully constructed a series of efficient teaching methods, including immersive experience, process through, scenario representation, and problem extraction [15]. These methods have a significant promoting effect on the in-depth development of ideological and political work in universities under the framework of new liberal arts education. They not only enhance students' participation and learning experience, but also effectively deepen their understanding and perception of history and cultural spirit, injecting new vitality and connotation into the promotion of ideology and culture in Chinese universities.

VR technology can not only achieve precise restoration and vivid display of cultural scenes, but also be used to create virtual historical figures. Visitors can fight alongside virtual characters, experiencing the smoke and fire of the battlefield firsthand, thus gaining a more intuitive understanding of the bravery and fearlessness of revolutionary martyrs. This interaction is not limited to the reproduction of combat scenes. It can be further anticipated that with the support of cutting-edge artificial intelligence (AI) [16-17], these virtual characters can interact with visitors and tell their revolutionary stories. Furthermore, visitors can also have in-depth conversations and exchanges with virtual characters, understand their emotional journey in the revolution, and feel their firm beliefs and noble spirit. Through interaction with virtual characters, visitors can have a deeper understanding of the connotation of culture and experience the great spirit of revolutionary martyrs.

Virtual museums can also fully utilize the advantages of new media, breaking away from the traditional mode of promoting the ideological spirit in universities mainly through classroom lectures and lecture reports, students can receive knowledge and actively participate in the promotion of the ideological spirit through online interaction [18-20], social media sharing[21-23], and other means. For example, open special ideological culture culture virtual museum accounts on mainstream social media platforms such as Weibo, WeChat, and Tiktok. Regularly publish content related to ideological culture, such as introductions to historical events, displays of cultural relics, and introductions to interactive games. The content format can be diverse, including text, images, videos, etc., to attract the interests of different users. Furthermore, big data technology [24-25] can be used to collect and analyze user behavior data. Based on the results of data analysis, content publishing strategies and promotion methods can be continuously optimized to improve the dissemination effect of ideological culture.

5   Expand the Breadth and Depth of Dissemination

Virtual museums have the characteristic of not being limited by time and space, and can achieve comprehensive coverage of ideological culture. In the promotion of ideological culture, it has a wider range of dissemination and influence. The traditional promotion of ideological culture in universities is often limited to internal units and has a limited scope of dissemination. The virtual museum can spread the content of ideological spirit propaganda to a wider audience through new media channels such as the Internet. Both students from our unit and a wider range can learn about ideological culture and feel the powerful power of the ideological spirit through virtual museums. For example, a certain vocational college aims to use virtual museums as a platform to establish ideological and political education resources that benefit all students [26]. This includes integrating ideological culture into curriculum design, conducting themed educational activities, and organizing online and offline interactive learning. Through these measures, students can continuously be exposed to and understand ideological culture in their learning and life, enhancing their patriotism and sense of historical mission. At the same time, the popularization and normalization of ideological and political education resources can also broaden the scope of dissemination of ideological culture, benefiting more students.

Virtual museums are mainly reflected in enhancing the depth of ideological culture dissemination through thematic focus, digital reproduction, integration into student life, and depth expansion. For example, a virtual museum focused on railway red culture utilizes cloud technology to allow visitors to enjoy virtual scenes of red education bases such as the Erqi Memorial Tower. This move aims to deeply integrate the essence of red culture into the daily lives of students, thereby significantly enhancing the attractiveness of red cultural resources and their profound influence in society [27]. In this case, the virtual museum focuses on railway red culture, which means it can deeply explore and showcase red history, characters, and events related to railways. This focus makes the dissemination content more specific and in-depth, which helps the audience form a deeper understanding and recognition of red culture. Through modern technologies such as VR and AR, virtual museums can restore historical scenes and reproduce historical events. Viewers can immerse themselves in the historical atmosphere of the Red Education Base, such as the Erqi Memorial Tower, through cloud travel, which greatly enhances the infectious power of ideological culture. The development of virtual museums aims to infuse ideological culture into the daily lives of students. This means that students can be exposed to ideological culture anytime and anywhere without leaving their homes. By embedding school courses, extracurricular activities, online learning, etc. in museums, they can continuously deepen their understanding and recognition of ideological culture in their daily lives. We hope that virtual museums are not just a display platform, but also a platform for learning and interaction. It can guide the audience to deeply think and explore the connotation and value of ideological culture by setting up rich interactive links, online Q&A, virtual guides, and other methods, thereby achieving the deep expansion of ideological culture dissemination.

Another successful case is the carefully constructed "Monument of Spirit" virtual museum by Jiangsu University of Science and Technology [15], which not only

represents the digital transformation of traditional physical museum visiting experience, but also serves as a model for the deep integration of technology and historical and cultural fields, providing a good demonstration effect for deepening the dissemination of party building culture. The project aims to create a highly simulated, scenario based, immersive, and highly interactive virtual platform. Through the use of advanced 3D modeling technology, detailed links to knowledge points, intuitive image display, shocking audio and video materials, detailed e-books and other multi-dimensional display forms, this project will comprehensively and stereoscopically present the critical moment, location, core tasks and historical events of a spirit cultivated or constructed by the CPC in the long history. This measure not only endows the traditional rational knowledge system with vitality and vitality, transforming it into a fresh and profound value system, but also provides students with an opportunity to systematically sort out and deeply understand the Chinese spirit forged by the CPC in the magnificent historical process, thus stimulating their patriotism and unremitting spirit of struggle.

6 Empirical Research

In order to further explore the unique advantages of virtual museums in promoting university culture, this study used independent sample t-test to compare the differences in effectiveness between the dissemination mode of virtual museums and the dissemination mode of traditional high-quality courses. Specifically, focusing on the major historical theme of "the 100th anniversary of the founding of the CPC", the study carefully designed two groups of experiments:

Group A (control group): 20 college students were selected as the research sample, who received cultural and educational dissemination through participating in carefully designed high-quality online party courses. These courses focus on the narration of historical events, theoretical interpretation and on-site interaction, aiming to enhance students' understanding of the centennial struggle of the CPC.

Group B (experimental group): 20 college students were also selected as comparison samples. They received relevant cultural education by using the virtual exhibition hall of "The People's Army Celebrates the 100th Anniversary of the CPC" launched by the China Military Museum. This virtual exhibition hall integrates modern technological means such as high-definition imaging, 3D display, and interactive communication, allowing participants to browse exhibition content in person, explore and learn independently, and experience a more immersive and personalized learning process.

Before the experiment began, in order to ensure that the two groups of samples had similar initial cognitive levels on relevant cultural topics, this study conducted a strict knowledge pre-test on all participating students to ensure the objectivity and validity of the experimental results.

This study is inspired by the research project on museum visitor learning outcomes commissioned by the UK Museums, Libraries and Archives Committee at the University of Leicester [28], and combined with the specific context of this learning practice, we have constructed a targeted evaluation scale. This scale is developed around three core dimensions: knowledge and understanding, attitudes and values, and interest and

inspiration. Each dimension includes five carefully designed questions, totaling fifteen evaluation indicators, aimed at comprehensively analyzing the comprehensive effectiveness of learners through educational communication methods such as virtual museums.

This study used SPSS 26 software to analyze the reliability and validity of the data. The results showed that the constructed scale exhibited good reliability and validity in all indicators, ensuring the reliability and validity of the research results. In order to further explore the experimental effect, this study conducted independent sample t-tests on the experimental group and control group, covering the total questionnaire and its three core dimensions. Table 1 shows that the average values of the experimental group are 21.15,22.45,22.9, which are significantly higher than 11.45,10.45,7.4 of the control group in three dimensions. The test results indicated by Table 2 showed that the significance level (sig) of the mean equation t-values for each dimension was 0.000, far below the critical value of 0.05. This clearly indicates that there is a significant difference between the experimental group and the control group in the total questionnaire score and each dimension score.

Table 1. Independent sample t-test group statistics for three dimensions

Group		N	Mean	Std. Deviation	Std. Error Mean
Dimension1	A	20	21.15	3.117	0.697
	B	20	11.45	2.460	0.550
Dimension2	A	20	22.45	1.791	0.400
	B	20	10.45	3.953	0.884
Dimension3	A	20	22.90	1.714	0.383
	B	20	7.40	2.162	0.483

Table 2. Independent sample t-test of three dimensions

		Levene's Test for Equality of Variances		t-test for Equality of Means							
		F	Sig.	T	Df	Sig.(2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Dimension 1	Equal variances assumed	1.172	0.286	10.926	38	0.000	9.700	0.888	7.903	11.497
	Equal variances not assumed			10.926	36.053	0.000	9.700	0.888	7.900	11.500
Dimension 2	Equal variances assumed	3.900	0.056	12.365	38	0.000	12.000	0.970	10.035	13.965
	Equal variances			12.365	26.484	0.000	12.000	0.970	10.007	13.993

	not assumed								
Dimension 3	Equal variances assumed	3.477	0.070	25.127	38	0.000	15.500	0.617	14.251	16.749
	Equal variances not assumed			25.127	36.119	0.000	15.500	0.617	14.249	16.751

Therefore, in terms of knowledge and understanding, attitudes and values, and interest and inspiration, the experimental group demonstrated better learning outcomes than the control group. This discovery strongly supports the idea that virtual museums, as an emerging way of cultural dissemination, have more significant advantages than traditional educational methods among college students.

7   Conclusions

Virtual museums have become an undeniable innovative force in the field of ideological culture promotion in universities, leading the transformation of ideological culture promotion practices in universities. This advanced propaganda platform cleverly utilizes technological means to closely integrate precious cultural resources with the ideological innovative theory, successfully breaking the constraints of traditional museums in terms of time and space. Virtual museums not only open up new avenues for the inheritance and promotion of the ideological spirit, but also greatly broaden the boundaries of ideological culture promotion and deepen its influence through its rich resources, diverse forms, and strong interactivity and participation.

Acknowledgment

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