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Innovation and Practice of Virtual Reality Interaction Design in Chinese Medicine Science Museums

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Abstract: Chinese medicine, as a treasure of traditional Chinese culture, has a long history and deep cultural heritage. However, traditional science education methods often make it difficult to demonstrate the complexity and depth of Chinese medicine fully. With the development of virtual reality technology, VR interaction design provides new possibilities for the popularisation of Chinese medicine. Using VR technology, the interaction design of TCM science museums is innovated to enhance visitors' experience and learning. Based on this, this article studies the innovation and practice of virtual reality interaction design in Chinese medicine science museums for reference.

Keywords: Chinese medicine science museum; Virtual reality interaction design; Innovation and practice

Introductory

Innovation and Practice of Virtual Reality (VR) Interaction Design for Chinese Medicine Science Museum. By analyzing the characteristics of Chinese medicine culture and the advantages of VR technology, an interaction design scheme combining traditional Chinese medicine elements and modern technology is proposed. The program aims to provide visitors with a more intuitive and in-depth understanding of TCM knowledge through an immersive experience and to enhance the attractiveness and effectiveness of popular science education. Through the design process, technical implementation, and user feedback, the potential and value of the design for application in TCM science education is demonstrated.

1. Development history of Chinese medicine science museums

As an important place for the dissemination of Chinese medicine culture, the development of Chinese medicine science museums is closely related to the inheritance and innovation of Chinese medicine. In the early days, most of the TCM science museums relied on TCM colleges, hospitals, or museums, with static displays and explanations, covering the history, theories, and diagnostic and therapeutic methods of TCM. With the progress of science and technology, especially the development of multimedia and Internet technology, TCM science museums began to introduce interactive exhibitions, such as touch screens, multimedia presentations, etc., which enhanced the audience's sense of participation and experience. Entering the 21st century, with the rise of new technologies such as virtual reality (VR) and augmented reality (AR), TCM science museums have begun to explore more immersive and interactive display methods. Through virtual reality technology, visitors can experience the process of TCM diagnosis and treatment in an immersive way, or learn the identification and application of Chinese herbal medicines in a virtual environment. These innovations have not only enriched the presentation of popular science content but also greatly enhanced the dissemination of Chinese medicine culture and public acceptance. In the future, the TCM Science Museum will continue to integrate science and technology with culture and is committed to creating a more vivid and interactive science education platform.

2. Definition of virtual reality technology

Virtual reality technology, or VR for short, is a simulated environment created through computer technology that mimics the multi-sensory experience of real-world sight, sound, and even touch, making it seem as if the user is in a completely fictional three-dimensional space. This technology usually uses head-mounted displays, joystick controllers, or other interactive devices to enable users to interact with virtual environments. The core of virtual reality technology is immersion and interactivity. Immersion refers to the ability of the user to fully immerse themselves in the virtual environment and feel immersed in the experience. Interactivity refers to the fact that users can interact with objects in the virtual environment through various input devices, such as moving, grasping, and manipulating. This interaction is not limited to vision and hearing, but can also be extended to other senses such as touch and smell. Virtual reality technology is widely used in gaming, education, medical care, military training, urban planning, and other fields, which not only provides users with a new way of experiencing but also brings the possibility of innovation and change to various industries. With the continuous progress of technology, virtual reality technology is gradu-

ally becoming a bridge connecting the real world and the digital world.

3. Current presentation and problems of Chinese medicine science museums

Currently, the display methods of Chinese medicine museums mainly rely on traditional graphic display boards, physical displays, and on-site explanations. Although these methods can convey the basic knowledge and cultural connotation of Chinese medicine to a certain extent, it is often difficult to meet the needs of modern visitors for interactivity and experience. The display contents of TCM science museums are often too specialized and complex for ordinary visitors to understand. The lack of effective interactive and explanatory mechanisms makes it difficult for visitors to connect abstract Chinese medicine theories with real life, thus reducing the actual effect of popular science education. With the development of science and technology, traditional display methods can no longer satisfy modern people's pursuit of a sense of technology and innovative experience. Chinese medicine science museums need to introduce more modern technology elements, such as virtual reality, augmented reality, etc., to enhance the attractiveness of the display and educational effect. Therefore, the current display methods of TCM science museums have problems such as insufficient interactivity, low efficiency of information transmission, difficulty in understanding the content, and weak sense of technological experience.

4. Innovative Points of Virtual Reality Interaction Design for Chinese Medicine Science Museums

4.1 Immersive Experience Design

Immersive experience design is a design concept that aims to create deep engagement and immersive feelings. It simulates real-world sensory stimuli, such as vision, hearing, touch, etc., so that users can forget about the real environment and fully engage in the virtual or augmented experience constructed by the designer. This design method is usually applied to virtual reality, augmented reality, game design, theme parks, exhibition displays, and other fields. In immersive experience design, designers will carefully construct the environmental background, character interaction, storyline, and other elements to ensure the coherence and realism of the user during the experience. Meanwhile, interaction design is also key to the immersive experience, which allows users to interact with the virtual environment through natural behaviors, such as controlling characters and events in a game or app through gestures, voice commands, or body movements. Immersive experience design aims to create an experience that transcends traditional media and interfaces, enabling users to explore the world, learn, or enjoy entertainment in new ways.

4.2 Interactive learning model

The interactive learning model is a student-centered approach to education that emphasizes participation and interaction in the learning process. In this model, students are no longer passive listeners receiving knowledge, but actively participate in learning through various activities and tasks, interacting with teachers, peers, and the learning content. The interactive learning model usually includes a variety of forms such as discussion, role-playing, gamified learning, simulation experiments, etc. It aims to stimulate students' interest and curiosity and promote their critical thinking and problem-solving skills. Through real-time feedback and collaborative learning, students can gain a deeper understanding and apply what they have learned in practice. This learning model encourages students to actively explore and construct knowledge rather than simply memorize information. It adapts to the needs of modern education for personalized and lifelong learning and helps to develop students' independent learning ability and innovative spirit. With the development of technology, the interactive learning model is also incorporating new tools and platforms, such as online collaboration tools, virtual reality, and augmented reality technologies, to provide learners with a richer and more dynamic learning experience.

4.3 Multi-sensory interaction design

Multi-sensory interaction design is a design approach that focuses on the user's sensory experience and aims to enhance the richness and depth of interactions by stimulating multiple senses - sight, sound, touch, smell, and taste - simultaneously. This design philosophy argues that through the integration of multiple senses, a more natural, intuitive, and immersive user experience can be created. In multisensory interaction design, designers consider how information and feedback are conveyed through different sensory channels to ensure that the user can fully perceive and understand the interaction content. For example, in virtual reality environments, in addition to visual and auditory simulations, haptic feedback devices can be used to allow users to feel the texture and weight of virtual objects, or to simulate the smell of a particular scene through a scent generator. Multi-sensory interaction design not only enhances the realism of the user experience but also makes the interaction more in line with the natural human perception habits. With the advancement of technology, multi-sensory interaction design is gradually being applied in many fields such as education, entertainment, medical rehabilitation, etc., bringing users a more comprehensive and profound interaction experience.

4.4 Learning Pathway Design

Personalized learning pathway design is a learner-centered educational strategy that emphasizes the importance of tailoring the unique

learning experience to each student's interests, abilities, learning styles, and progress. This design approach aims to break away from the one-size-fits-all approach of traditional education and make education more responsive to students' individual needs. In personalized learning pathway design, educators use data analytics, Learning Management Systems (LMS), and smart education technologies to track student performance and adjust the content, approach, and pace of instruction accordingly. Students can choose learning topics according to their interests, master knowledge at their own pace, and even set their own learning goals and plans under the guidance of teachers. This design not only improves the efficiency and effectiveness of learning but also stimulates students' autonomy and creativity. Personalized learning path design encourages students to become self-directed learners and develops their lifelong learning ability. With the continuous development of educational technology, personalized learning path design is gradually becoming an important part of modern education, providing a more flexible and adaptable learning environment for each student.

5. Practical Exploration of Virtual Reality Interaction Design in Traditional Chinese Medicine Science Museums

5.1 Interaction Design Process

The interaction design process is a series of design activities aimed at creating user-friendly interfaces. It begins with an in-depth understanding of user needs through user research to identify the behaviors, needs, and pain points of the target user group. Next, designers work on conceptual design, conceptualizing interaction models and interface layouts that meet these needs. Prototyping is a critical step in the design process that allows designers to create models that can be interacted with to test and iterate on design concepts. Through user testing, designers gather feedback to further optimize the design and ensure that the final product delivers a smooth, intuitive, and enjoyable user experience. The interaction design process emphasizes iteration and user-centredness, ensuring that the design is always focused on the user's needs and experience. As technology advances, the interaction design process continues to incorporate new tools and methods to adapt to changing user expectations and technological environments.

5.2 Technology Realisation Programme

In the practice of virtual reality interactive design for Chinese medicine science museums, the development of technical implementation solutions is the key to ensuring the success of the project. Combining the technology of AIGC generative content and Pico4VR glasses, a highly interactive and educational virtual reality experience can be constructed. Pico4VR glasses were chosen as the interactive device to provide an immersive visual and auditory experience due to their high performance and user-friendly design. Through the VR glasses, users can immersively explore TCM knowledge, such as the identification of herbs and the practice of acupuncture. Dynamic content is generated using AIGC technology, which allows real-time adjustments to the information displayed and teaching methods based on user interaction and learning progress. This personalized learning experience can improve user engagement and learning efficiency. The technical realization solution also includes the design of a stable system architecture that ensures smooth communication between the VR application and the back-end server. During the development process, a modular design is adopted to facilitate the management and updating of each functional module. At the same time, a detailed development schedule and quality control standards were set to ensure that the project was delivered on time and with the required quality. As a result, with a well-designed technical implementation solution, the TCM Science Museum can provide an innovative, interactive, and educational virtual reality experience that enables users to learn and understand TCM in a new way.

5.3 User Experience Assessment

User experience evaluation is a systematic approach to measuring and improving the performance of a product or service during user interaction. This evaluation process focuses on the user's feelings, satisfaction, and efficiency when using a product, and aims to identify potential problems and improvement points to enhance the overall user experience. Evaluations typically include a variety of tools such as user testing, questionnaires, interviews, and behavioral analysis to collect user feedback and behavioral data. Through this data, designers and product teams can understand users' needs and expectations, identify deficiencies in design, and iteratively optimize accordingly. UX assessment emphasizes the concept of user-centered design to ensure that a product or service not only functionally satisfies users' needs, but also emotionally and cognitively provides a positive user experience. As market competition intensifies, UX assessment has become an integral part of the product development and design process.

6. Future Development Trends of Virtual Reality Interaction Design for Traditional Chinese Medicine Science Museums

The future development trend of virtual reality interactive design for TCM science museums will be more immersive, interactive, and intelligent. With the continuous progress of VR technology, the future design will be able to provide a more realistic three-dimensional environ-

ment and more natural human-computer interaction, so that visitors will feel as if they are in the real world of Chinese medicine. The immersive experience will enable visitors to experience the charm of TCM culture holistically through technologies such as high-resolution visual presentation, stereo sound, and haptic feedback. For example, through VR technology, visitors can experience first-hand TCM treatments such as acupuncture and cupping, or learn about the identification and compounding of medicinal herbs in a virtual ancient herbal pharmacy. Interactivity will be enhanced by smarter interaction design. The future VR system will be able to provide personalized content and guidance based on visitors' behavior and feedback, making the learning process more personalized and efficient. In addition, by introducing AI technology, the system will be able to analyze the visitor's progress and level of understanding in real-time, thus providing customized learning paths and feedback. Intelligence will be another important trend for future development. With the development of big data and machine learning technology, the VR system will be able to collect and analyze a large amount of user data to continuously optimize the interaction design and enhance the user experience. At the same time, intelligence will also be reflected in the updating and expansion of content. The system can automatically update the display content according to the latest Chinese medicine research results and science popularisation needs, to maintain the educational value and attractiveness of the science museum.

7. Concluding remarks

In conclusion, with the further development and popularisation of VR technology, the interaction design of TCM science museums will be more diversified and intelligent, providing strong support for the inheritance and development of TCM culture.

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