

Scene Construction and Interaction Design of Virtual Reality in the Field of Education

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Abstract: With the development of science and technology, virtual reality (VR) technology is widely used in many fields, and the education field is also actively exploring its application to innovate teaching. This article focuses on the scene construction and interactive design of VR in the field of education. It is found that different educational stages and disciplines have different demands for VR scenes. Basic education emphasizes visualization and interest, while higher education emphasizes accuracy and complexity; Science and engineering pay attention to the visualization of abstract concepts, while liberal arts pay attention to the representation of situations. The construction of VR educational scenes should follow the principles of scientificity, education and interest, covering historical scene restoration, micro-world simulation and other types. Interactive design includes interactive devices such as handles and helmets, gesture recognition and voice interaction. It should follow the principles of ease of use, naturalness and feedback, and have corresponding strategies for different disciplines and teaching objectives. The research shows that reasonable VR scene construction and interactive design are of great significance to improve the quality of education and enrich teaching forms.

1. Introduction

With the rapid development of science and technology, VR technology has set off a wave of change in many fields like a wave. From the immersive experience in the entertainment industry to the simulated surgery training in the medical field, VR technology has shown great application potential [1]. At the same time, the field of education is also actively seeking innovative teaching methods to meet the needs of personnel training in the new era [2]. Traditional teaching mode is limited by time and space and resources to some extent, and it is difficult to meet the increasingly diverse learning needs of students [3]. With its unique characteristics, VR technology has brought new dawn to the field of education.

This study aims to deeply explore the scene construction and interactive design of VR technology in the field of education, which has important purpose and significance [4]. On the one hand, it is expected to significantly improve the quality of education by reasonably constructing VR education scenes and carefully designing interaction methods [5]. For example, abstract knowledge can be presented in an intuitive way to help students better understand and absorb it. On the other hand, enrich the teaching forms, stimulate students' interest and initiative in learning, and make the learning process no longer boring.

Judging from the current research situation, the exploration of VR scene construction and interactive design in the field of education has achieved certain results [6]. Some studies have made achievements in the application of VR teaching in specific disciplines, laying the foundation for the follow-up research [7]. However, the existing research still has shortcomings. For example, the research on universality in different educational stages and disciplines is relatively lacking, and the unique needs of each stage and discipline are not fully considered. This article will analyze the theoretical basis of the integration of VR technology and education, and explain the related contents of VR scene construction and interactive design in the field of education, so as to provide strong support for educational innovation.

2. Integration of VR technology and education field

The principle of VR technology is based on computer graphics, sensor technology, etc. By creating a virtual environment, users can feel immersive. It is characterized by immersion, interactivity and imagination. Immersion makes users feel as if they are in a virtual scene and devote themselves wholeheartedly; Interaction enables users to interact naturally with the virtual environment; Imagination provides users with a broad thinking space. These characteristics make it highly applicable in the field of education.

Constructivism learning theory in educational psychology provides an important support for VR in the construction of educational scenes and interactive design. This theory emphasizes that students are active builders of knowledge, not passive recipients. In the VR education environment, students can actively explore virtual scenes and build their own knowledge system with the help of interactive devices [8]. For example, in the restoration of historical scenes, students can deeply understand historical events by interacting with the elements in the scene.

From the perspective of pedagogy principles, teaching environment and teaching methods are important contents. VR technology can innovate the teaching environment and break through the time and space limitations of traditional teaching [9]. For example, the construction of virtual campus provides students with convenient learning and communication space. In terms of teaching methods, VR can realize diversified teaching, such as simulation experiments, making the teaching process more interesting and effective. All these provide a solid theoretical foundation for the follow-up VR education scene and interaction design, and promote the deep integration of education field and VR technology.

3. Scene construction of VR in the field of education

Different education stages and disciplines have unique demand characteristics for VR scenes, which determines the importance of targeted design direction. In the stage of basic education, students are usually in the period of knowledge enlightenment and basic cognition construction. Visualized and interesting scenes can attract their attention and help them absorb knowledge. For example, in primary school science courses, students may have difficulties in understanding the growth process of organisms. VR scenes can be dynamically displayed, allowing students to intuitively observe the whole process of seed germination, flowering and fruiting. In the higher education stage, the specialty of the subject is enhanced, which requires higher accuracy, depth and complexity of the scene. Taking the medical specialty as an example, it is necessary to accurately simulate the internal structure of human body and surgical operation scenes, so as to provide students with a highly realistic practice environment.

In terms of disciplines, science and engineering pay attention to the visual presentation of abstract concepts and experimental processes. For example, the electromagnetic field in physics, through the VR scene construction, students can "see" the invisible electromagnetic field distribution and changes. Liberal arts disciplines focus on situation reproduction and emotional experience, such as history disciplines can restore ancient social scenes and let students feel the historical atmosphere.

The construction of VR education scene needs to follow certain principles. Science is the foundation, and the scene content must be accurate to ensure the correctness of knowledge transfer. Education is the core, and the scene should serve the teaching objectives and help students acquire knowledge and improve their ability. Interest is an important means to stimulate students' interest in learning through vivid and interesting scenes. From the scene content, we should closely follow the teaching knowledge points; The layout should be reasonable to facilitate students' exploration; Visual effects should conform to the characteristics of disciplines and students' cognition. For example, science and engineering scenes can adopt concise and accurate styles, while liberal arts scenes create emotional pictures.

There are various types of VR education scenes. Taking the restoration of historical scenes as an example, we can construct scenes such as ancient cities and battle sites according to historical

documents and archaeological materials. Students can travel through it, interact with virtual characters and learn more about historical events. Microscopic world simulation is also an important type. In chemistry, biology and other disciplines, it can simulate microscopic scenes such as molecular structure and cell activities. Virtual campus provides students with convenient learning, communication and living environment, and breaks the space restriction.

Table 1 presents the demand characteristics of VR scenes in different educational stages and disciplines and the corresponding construction points.

Table 1 VR Scenario Requirements and Construction Key Points for Different Educational Stages and Subjects

Educational Stage	Subject	Characteristics of VR Scenario Requirements	Key Construction Points
Basic Education	Chinese Language	Combine textbook content to create emotionally rich and imaginative scenarios, aiding in the comprehension of literary works	Scenes should align with literary aesthetics, with interactive elements to guide students in experiencing emotions
Basic Education	Mathematics	Visualize abstract mathematical concepts to help students understand spatial relationships, etc.	Use simple geometric shapes to construct scenes and design dynamic demonstration processes
Higher Education	Computer Science	Simulate programming environments, network architectures, etc., for practical operational training	Accurately replicate various programming interfaces and network topologies, providing real-time feedback mechanisms

By reasonably grasping the characteristics of different needs and following the principles of construction, the advantages of VR technology in the field of education can be leveraged to provide students with a better and more efficient learning environment.

4. Interactive design of VR in the field of education

VR interactive design contains many basic elements, which play a key role in user experience and teaching effect. Interactive devices, such as handles and helmets, are the hardware foundation to realize interaction. The handle allows the user to interact with the virtual environment through operations such as keys and joysticks, and accurately control the movement and rotation of virtual objects. The helmet provides users with an immersive visual experience, and its built-in sensor can track the user's head movement and realize the real-time change of perspective, as if the user is really in a virtual scene.

Interaction mode is also an important part of interaction design, among which gesture recognition and voice interaction are typical representatives. Gesture recognition technology enables users to interact with the virtual environment naturally through simple hand movements, such as grabbing and waving, which enhances the intuition and interest of interaction. Voice interaction allows users to control scenes and query information through voice commands, further liberating their hands and improving interaction efficiency.

It is very important to follow certain principles when designing interactive VR education. The principle of usability requires that the interaction design is simple and easy to understand, and students can operate without complicated learning. For example, when operating the handle, the key layout should be ergonomic and have clear functions. The principle of naturalness advocates that the interaction mode conforms to the daily behavior habits of human beings, so that students' interaction in the virtual environment is as natural and smooth as in real life. The principle of feedback emphasizes that the system should give feedback to students' interactive operation in time and inform students of the results of the operation so as to adjust the follow-up behavior.

Different disciplines and teaching objectives have different strategic requirements for interactive design. Taking experimental teaching as an example, operational interaction is the core. In physics experiment teaching, students can simulate the operation of experimental instruments through the handle, such as adjusting resistance and connecting circuits, and the system can feed back the experimental data and results in real time to help students understand the experimental principle. In

language learning, dialogue interaction is more critical. Students practice dialogue with virtual characters, and the system gives correction and guidance according to speech recognition and semantic analysis to improve students' language expression ability. Figure 1 shows the interaction design strategies under different disciplines and teaching objectives.

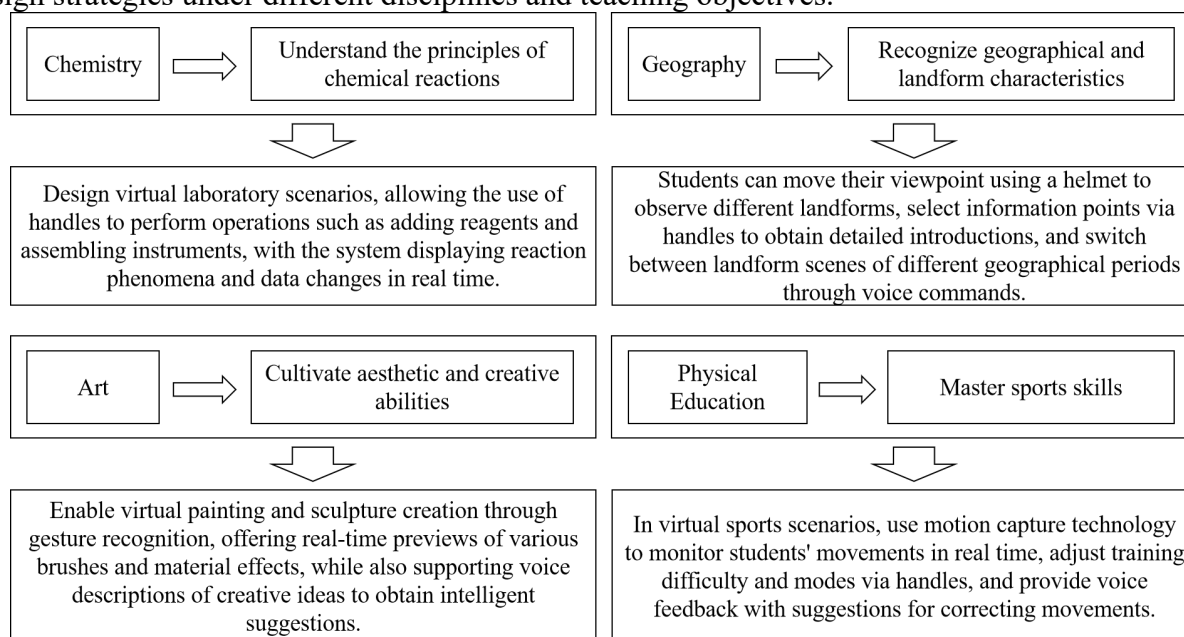


Figure 1 VR interaction design strategy

By studying the elements of VR interactive design, following the design principles, and formulating appropriate interactive strategies for different disciplines and teaching objectives, it can inject strong impetus into the application of VR in the field of education.

5. Conclusions

This article discusses the scene construction and interactive design of VR technology in the field of education. In the research process, the theoretical basis of the integration of VR technology and education field is analyzed, and its principle, characteristics and applicability to education are clarified. In the aspect of scene construction, the unique needs of different educational stages and disciplines are considered. In the stage of basic education, students' enlightenment and basic cognition are helped by visual and interesting scene design; In the higher education stage, it is more inclined to build accurate and complex scenes to meet the professional learning needs. Different disciplines have different requirements for scenes. Science and engineering emphasize the visual presentation of abstract concepts, while liberal arts pay attention to situational reproduction and emotional experience. At the same time, following the principle of combining science, education and fun, we have created various VR educational scenes such as historical scene restoration, micro-world simulation and virtual campus. As a key link, interactive design has studied its basic elements, including interactive equipment and interactive mode, and made clear its important influence on user experience and teaching effect. Based on the principles of ease of use, naturalness and feedback, this article formulates practical and effective interaction design strategies for different disciplines and teaching objectives.

The research results of VR in scene construction and interactive design in the field of education are remarkable, which has a positive role in promoting educational innovation. It enriches teaching forms, stimulates students' interest and initiative in learning, improves the quality of education, and provides a more effective way for imparting and absorbing knowledge. Follow-up research can be further deepened on this basis to promote the wide application and sustainable development of VR technology in the field of education.

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