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The Application of Virtual Reality Technology in Landscape Design Teaching

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***Abstract*—Virtual reality (VR) is a comprehensive information technology, which has been closely concerned by various research fields. As a typical representative of digital virtual technology, virtual reality technology integrates multiple disciplines, thus creating three-dimensional space through virtual reality technology. Introducing virtual reality technology into landscape design teaching can enrich the content of landscape design teaching and make landscape design teaching more vivid. Through virtual reality technology, the real buildings and scenic spots can be restored to the teaching class to make students feel immersive. This can shorten the distance between teachers and students, and improve the teaching quality. Based on the author's teaching and practical experience, this work first analyzed the concept and characteristics of virtual reality technology, then discussed the advantages of virtual reality technology in landscape design teaching, and finally put forward the specific application countermeasures of virtual reality technology in landscape design teaching.**

Keywords*—Virtual reality, Landscape design, Teaching, Application countermeasures

I. INTRODUCTION

With the rapid development of computer technology and communication technology, multimedia technology has been widely used. The way of computer single-dimensional digital information processing cannot meet people's actual needs, and has a deviation from the way people know the world. People are good at using touch, vision, hearing, limbs, etc., to perceive the world and to participate in information processing [1]. With the development of information technology, artificial intelligence, image processing technology, simulation, sensing technology, etc., virtual reality technology plays an increasingly important role in people's work and learning [2]. In recent years, virtual reality technology has developed rapidly. In 2016, it has ushered in a blowout, and all kinds of virtual reality equipment really go to the consumer market and get people's recognition.

II. THE CONCEPT AND CHARACTERISTICS OF VIRTUAL REALITY TECHNOLOGY

A. The concept of virtual reality technology

The ideal virtual reality technology is to create an audio-visual and realistic virtual environment through computer. Users can enter this environment and manipulate the objects in the system, and they can not only immerse in the virtual reality environment, but also query, analyze, evaluate, plan and make decisions. Virtual reality has three meanings. First, virtual reality is a multi-view, real-time and dynamic three-dimensional environment based on computer graphics. This environment can be a real representation of the real world, or a fictional world beyond the real world. Second, users can directly interact with the environment they put into by their natural skills and ways of thinking through multiple senses such as seeing, listening, touching, etc. Third, in the process of operation, the operator is the behavior subject immersed in the virtual environment in the form of a real-time data source, not just the observer outside the window. Virtual reality technology is a scientific crystallization of highly developed computer technology widely applied in various fields. It not only includes graphics, image processing, pattern recognition, multi-sensor, voice processing, network technology, parallel processing technology, artificial intelligence and other high-performance computer technology, but also involves mathematics, physics, geography, biology and other scientific fields, even involves meteorology, sociology, aesthetics and psychology and other related disciplines. This technology creates a new field for the development of human-computer interface, offers a new interface tool for the application of intelligent system engineering, and provides a new description method for large-scale data visualization of various projects. In essence, virtual reality technology is an advanced computer user interface technology. It provides users with visual, auditory, tactile, olfactory, taste and other intuitive and natural real-time sense and interaction means, to maximize the convenience of human-computer interaction. Instead of tedious typing, the whole system is more efficient [3].

B. The structure and characteristics of virtual reality technology

As shown in Figure 1, virtual reality is characterized by immersion, interaction and imagination. Immersion is the virtual reality technology according to the human visual, auditory physiological and psychological characteristics, by the computer to produce realistic three-dimensional images. Users can put themselves in the virtual environment by wearing interactive devices such as helmet display, data glove, etc., and feel lifelike while being a member of the virtual environment. Interaction is human-computer interaction in virtual reality system, which is almost natural interaction. Users can interact not only with computer keyboard and mouse, but also with

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special helmet, data glove and other sensing devices. The computer can adjust the images and sounds presented by the system according to the movement of the user's head, hand, eye, language and body. Users can inspect or operate the objects in the virtual environment through their own natural skills such as language, body movement or action. Imagination refers to that the virtual reality system is equipped with the sensing and response devices of vision, hearing, touch and kinesthetic. Therefore, users can obtain a variety of senses in the virtual environment, such as vision, hearing, touch, kinesthetic, etc., so that they can form pictures in their minds and generate associations [4].

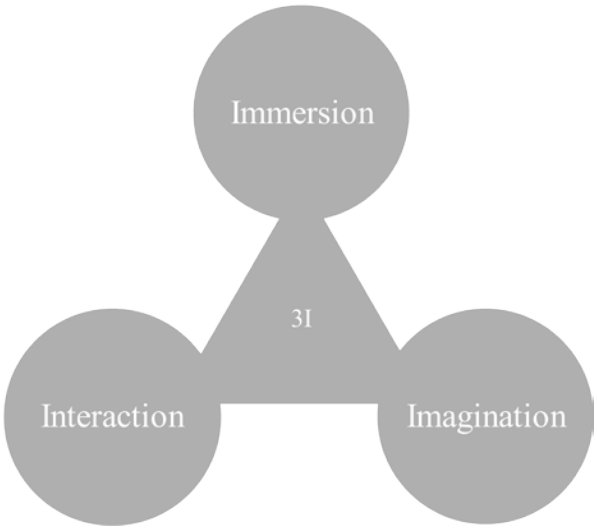

Fig.1. The characteristics of virtual reality

III. The Advantages of Virtual Reality Technology in Landscape Design Teaching

A. Bringing a realistic teaching experience to teachers and students

When the plane landscape design collides with virtual reality technology, a landscape design scheme with three-dimensional rendering is born. The virtual reality technology is introduced into the teaching of landscape design specialty (i.e., the three-dimensional modeling of landscape design project is carried out by using relevant technology, and the project modeling is designed and constructed according to the landscape planning scheme). By 3D planning and design of the original plane, various construction schemes and procedures can be simulated on the spot. The simulation can be compared again and again to determine the scheme and procedure most suitable for the landscape design, and determine the specific construction plan and precautions in the construction project [5]. When students encounter puzzles and questions in the process of teaching design, and the teacher fails to take them into account, they are easy to fall into the misunderstanding of thinking and their personal development stagnates. Due to the needs of their own development, students really need a channel to obtain a large amount of information in the design, and virtual reality technology basically meets the needs of teachers and students' development. The operation and display of three-dimensional modeling is more real and intuitive, which can effectively improve the efficiency of communication between teachers and students, save the cost of communication, and improve the quality of teaching.

B. Improving design accuracy and computational efficiency

The key technology of virtual reality system in data expression is 3D real-time database technology. The huge database facilitates students to measure the project quantity and construction time quickly and accurately, measure the cost, expense and benefit of the project, and then improve the accuracy and efficiency of the project budget. Virtual reality database offers background data support for the real system, such as engineering materials, material samples, environmental facilities, construction methods, etc. For the modeling object, detailed pictures, words, models and other comprehensive information are provided. Students can investigate similar design cases and design skills at any time through the database, and have a deeper understanding for effect, materials and usage of landscape design. The virtual database is full and accurate, and can quickly offer the required information for various managers. Students can grasp the project cost according to the virtual reality technology to select the appropriate employment materials. Virtual reality technology offers a reliable and accurate basis for students to blend virtual and reality well, and improves students' practical and professional ability.

C. Improving friendly communication between teachers and students

Virtual reality technology builds a broad platform for visual communication between teachers and students, and the normal communication between teachers and students becomes extremely convenient and smooth due to the existence of this platform. Due to the visual advantages of virtual reality technology, the original obscure technical terms communication becomes clear. The cost of communication between teachers and students is greatly reduced and the efficiency is effectively improved. When students need to complete a landscape design plan, teachers can build a 3D model for students' demonstration based on their own professional basis, which can be used for reference by students. Based on the three-dimensional model, students can refer to previous design cases and personal subjective considerations of the construction base. According to the main environment of the building base, they investigate the data to create landscape design works that can give full play to their own design ideas [6]. When students are confused in thinking, they can consult substitute teachers at any time to exchange their thoughts and ideas in the design process. Also, teachers can put forward constructive suggestions for the improvement of 3D model, so there is basically no barrier for communication between teachers and students. The collision of thinking sparks between teachers and students resulted in more creative and ideological landscape design works.

IV. The Specific Application Countermeasures of Virtual Reality Technology in Landscape Design Teaching

A. Building a virtual teaching platform

The first is the course teaching. In the analysis teaching of landscape design, teachers need to lead students to investigate the basic topography and surrounding environment of the landscape design project. The advantages and disadvantages of the design in the project design are analyzed to determine the feasibility of the project. However, in practical teaching, there are many constraints to lead students to carry out field visits, such as funds, time, distance, etc. As a result, students can only analyze design projects through cases and teachers' descriptions, which is usually too superficial. This greatly affects students' ability of thinking and judgment, resulting in a large deviation between various design schemes and the actual situation. However, the application of virtual reality technology can help to build a systematic virtual teaching platform for teaching, reorganize the teaching focus and more intuitively show the details of cases. Students can more truly contact and inspect the landscape environment in the project design, and more accurately grasp the local culture, surrounding environment and geographical situation in the project, thereby mastering the skills and key points of landscape design.

The second is the evaluation of design works. For landscape design teachers, they can only master the layout of their design through the students' graphic design drawings when they guide students to design works. However, they can't understand the details of the students' design, such as materials, quality, etc. This often makes it difficult for teachers to make accurate guidance and evaluation of students' works. Adopting virtual reality technology can solve this problem effectively. When the teacher guides the students' works, they only need to input the relevant parameters of the design works into the simulation scene, and then the layout, material texture and other details of the design can be presented through the image display technology. In this way, when teachers need to modify, they can directly modify students' works through computers. It can be seen that virtual reality technology can help teachers and students to guide and evaluate design works at a glance and intuitively.

The third is the interaction between teachers and students. The interaction is an important part of teaching. In the traditional landscape design teaching, teachers mostly adopt the didactic teaching method and teach students by explaining knowledge points or cases. This kind of teaching method makes the interaction between teachers and students less, and the class is not interesting enough [7]. So, it is difficult to ensure the effectiveness of teaching, and may also affect the enthusiasm of students. The virtual communication platform can offer more possibilities, promote the interaction between teachers and students, and strengthen the interest of the classroom. For example, in teaching design, teachers can skillfully set up the explanation of important knowledge points in the virtual scene, thus guiding students to experience the characteristics of excellent design in the virtual scene.

B. Building a virtual laboratory

The construction of virtual laboratory can offer students with a free learning and research platform, and help students to consolidate and use knowledge in the virtual laboratory after class. Through the virtual landscape laboratory, students can understand the layout design of the whole landscape, interior decoration, modeling color, etc., study the combination characteristics of various landscape spaces, and reasonably design different plant types, sizes and layout positions.

C. Virtual reality technology assists the reality environment

Field investigation is an essential and very important link in the course of landscape design. In general, students will record by taking photos, measuring, etc., during field visits. In the real environment, the virtual reality technology can help students get more specific and detailed information of the environment more quickly. At the same time, it can also let students interact with the site in the process of field investigation, and use the virtual reality technology to experience the design effect in the target site. Students are helped to improve the feasibility of the design and give feedback on the results.

D. The design of construction drawings

The design of construction drawings is not only the implementation of the design scheme, but also an indispensable course in landscape design teaching. By applying virtual reality technology, the original plane construction drawing can be transformed into three-dimensional solid. In the teaching of construction drawing design, teachers can guide students to use virtual reality technology to determine the scope and details of landscape construction. Finally, the longitudinal landscape display is carried out in 3D planning. The design of construction drawings includes the overall layout design and local detail design of the landscape. In the overall layout design, students need to adjust and control the landscape layout according to the design requirements and aesthetic concepts, including the planting range and basic spacing of plants [8]. In the local detail design, the selection of materials and the reasonable arrangement of dimensions shall be controlled. In addition, for different construction objects, it is necessary to analyze the construction effect and difference. The three-dimensional virtual model constructed by virtual reality technology can show a clear final construction effect in the visual aspect.

V. Conclusion

Virtual reality technology, as a new technology with high-speed development, has three characteristics of immersion, interaction and imagination, and has great application value in all fields. With the help of virtual reality technology, landscape design teaching in colleges and universities has undergone great changes and achieved good results. However, the application of virtual reality technology in landscape design teaching is not optimistic, and still faces many problems to be solved. Virtual reality technology has a broad application prospect in landscape design teaching in colleges and universities. It improves the students' perceptual understanding for the space form and scale of landscape design, and promotes the communication between students and teachers. Also, it

stimulates the students' initiative and enthusiasm to participate in landscape design, and improves the feasibility of landscape design scheme. Virtual reality technology has a great role and significance in landscape design teaching in colleges and universities. I hope that through the joint efforts of the majority of designers, virtual reality technology can be more widely used in landscape design teaching in colleges and universities. It is hoped that through the common efforts from the majority of designers, virtual reality technology can be more widely applied in landscape design teaching in universities.

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