

Innovation of Environmental Design Education under the Background of Virtual Reality Technology

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Abstract:

In recent years, virtual reality technology has been applied to all walks of life, but its application in the field of education is still in the exploratory stage. This paper mainly discusses the possibility of the application of virtual reality technology in the teaching of environmental design, and proposes the use of experiments to prove whether virtual technology has a positive impact on the course of environmental design, so as to provide a certain theoretical basis and teaching methods for the introduction of virtual technology into the classroom of environmental design.

Keywords:

VR, Environmental Design Education, Immersive Teaching

1. Introduction

With the progress of technology, VR, AR and MR Technologies are gradually applied to the education industry. Because of the innate advantages of virtual reality technology, it is quickly integrated into architectural design, interior design and other space design industry. However, the application of virtual reality technology in the teaching of environmental design is still relatively in the exploratory stage. Due to the cost problem of hardware design, technical problems, uneven ability of students, lack of innovation ability of teachers in teaching, defects of smart campus construction and other problems, virtual reality technology cannot be maturely applied to environmental design teaching.

1.1. Virtual reality technology

Virtual reality is the use of computers and human-machine interface to simulate the real world, creating a virtual three-dimensional space, referred to as VR technology. VR technology can influence people's decision-making processes and behavior through its ability to travel through time, create symbolic content, evaluate future strategies, and deliver long-term results. Virtual reality technology is a way to stimulate the spread of knowledge and culture, and is an innovative tool for the

education and space design industries. With the innovation and development of technology, new platforms and innovative ideas will be provided for environmental design education.

1.2. Virtual reality technology and education

Many studies have pointed to the use of virtual reality technology in education. The NASA Research Center has designed a virtual wind tunnel system. Using this program, scientists can manipulate the amount of virtual smoke and airflow around the shuttle (Mazuryk and Gervautz 1996). In another study, Shin et al. (2002) proposed a web-based virtual laboratory system that uses VR technology to teach engineering courses. These researches use virtual technology to try to overcome the problems of time, space, security and resources. A number of studies have shown that virtual reality technology has positive effects on the development of education.

1.3. Virtual reality and Environmental Design course

There are already many applications of VR technology in space-related courses, such as time-lapse video, power point Tours, interactive panoramas and real-time streaming of large-scale construction project websites, and adaptive e-tutorials. The development of virtual reality provides more possibilities for the teaching of space design. VR brings more opportunities to environment design, such as immersion, navigation, and interactive experiences.

Through the use of virtual reality technology, students can explore environmental and spatial details, as well as the visualization of design concepts. It provides a strong foundation for students to understand professional knowledge and practice professional works. Virtual reality can be used in different areas of architectural education, such as technical courses, building construction, design studios, modeling of student proposals and concepts, and theoretical learning. In conclusion, virtual reality is a modern technology with the ability to visualize architectural objects regardless of their physical, temporal and positional states, which encourages its integration into the teaching of architectural and environmental design.

2. Statement of Problem

The application of VR to education and teaching has feasibility and advantages, but there are also some bottlenecks and challenges. In the technical features, there are problems about resolution, health issues and compatibility. In the learner aspects, there are problems about user experience, cognitive load and learning attitude. In the teachers' teaching, there are problems about the difficulty of teaching design, the change of teaching methods, the implementation of classroom teaching, the change of teacher-student communication methods. In terms of smart campus construction, there are problems about shortage of educational resources, lack of teaching conditions, and high technical requirements for development.

3. Research Questions and Research Objectives

About research questions, how effective of using VR software and hardware to enhance the performance of environmental design students? And what are students' perceptions of using VR software and hardware to environmental design students?

About research objectives, to examine the effectiveness of using VR software and hardware to enhance the performance of students majoring in environmental design.

And to determine the degree of satisfaction of environmental design students using VR software and hardware.

4. Application of virtual reality technology in teaching method design of environmental design

This teaching method uses four kinds of software: AutoCAD, Sketchup, Vray and pano2vr. And hardware -- computers with course software and lab accessories, mainly Oculus Rift, headsets and joypads. The experiment was conducted in the computer laboratory of Environmental Design Department of Sichuan University of Media and Communication.

Traditional interior design teaching only uses the first three software, AutoCAD, Sketchup, and Vray. First, use AutoCAD to complete the layout design; Next, model in Sketchup; Finally, render the image in Vray at the correct Angle.

On the basis of traditional design process, pano2vr software is added to indoor space teaching using virtual technology. pano2vr converts Vray rendered panoramas into VR scenes that can be used to create a fully interactive virtual environment, enabling participants to walk around and browse the interior Spaces. First, use Vray to render a 360° panorama. Then, the panoramic image rendered by Vray is converted into VR scene in pano2vr software to create a completely interactive virtual environment. Students and users can watch virtual scenes on mobile phones, computers and other electronic devices, or connect VR glasses, headsets and joysticks to mobile phones, computers and other electronic devices to experience the design personally and find problems and deficiencies in the design for adjustment and modification. After modification, pano2vr software is used to output HTML files, so that users can view students' design works in electronic devices or VR glasses, and teachers can better consult and guide students' homework.

5. Application of Virtual Reality Technology to Environmental Design Teaching Research Method Design

The experimental design group and the control group had 35 people respectively. The pre-test was completed before the experiment to test the basic ability of the two groups of students. Then, the experimental group completed the study of the design course with VR software and hardware, and the control group completed the study of the design course with traditional teaching methods, and finally conducted the post-test to test three variables: Creative design ability, Logical rigor, Artistic expression.

5.1. Specific process of experiment

The experiment lasted a total of 8 weeks. In the first week, the teacher taught the same overview of indoor space browsing to the two groups of students, and the students in the two groups completed the preliminary test of drawing the same venue plan. In the second and third weeks, the teacher taught the same Sketchup modeling content to the two groups of students, and the two groups completed the creation of the Sketchup model. In the fourth and fifth weeks, the teacher taught the experimental group how to render the 360° panorama with VRay, and the control group how to render the human perspective pictures with VRay. The two groups of students rendered the complete model. In the sixth and seventh weeks, the teacher taught the experimental group how to make panoramic files with interactive functions with Pano2VR, and used VR glasses and other hardware to teach the control group how to

make pictures and display boards optimized by traditional Photoshop. Students in the control group completed the interactive function of panoramic browsing files and the Pano2VR production cooperated with VR glasses and other hardware. The experimental group of students completed Photoshop optimization processing pictures and display board production. Evaluation and grading are performed at week 8.

5.2. Population sampling method

Two classes are selected from the third grade of environmental design major of Sichuan University of Media and Communication, with 35 students in each class. Experimental subjects need to have a certain design ability base. One group learned the "indoor space browsing" course using VR software and hardware, while the other group followed the traditional teaching method to learn the "indoor space browsing" course. The sample size was 35 people in the experimental group, using VR software and hardware. The control group of 35 students was taught in the traditional way. The sampling method is census sampling.

5.3. The test criteria

The course scoring standard of Sichuan University of Media and Communication is adopted. The overall score of this course is a combination of the regular score and the final score. The usual score is 100 points, accounting for 30% of the total score, including 15 points for attendance, 85 points for homework (including sketch, design creativity, schedule control, etc.); Final grade of 100:70% of the total grade.

More than 90 points of the work requires a strong program presentation ability and creative design ability. Strong writing ability, rigorous structure, rigorous logic. The relationship between the details and finishing of the final work is handled reasonably, and the renderings have strong artistic expression.

80-89 points require a certain program presentation ability and creative design ability. Have a certain ability of writing expression, the structure is more rigorous, the logic is more rigorous. The relationship between the details and finishing of the final work is reasonable, and the renderings have a certain artistic expression.

A score of 70 to 79 is a standard for having the ability to present solutions and creative design. The wording is not clear enough, and the rigor of the structure and the rigor of the logic are ordinary. The relationship between the details and finishing of the final work is more harmonious, and the artistic expression of the renderings is general.

The standard of 60-69 points is to have a certain understanding of the theoretical knowledge of interior space design. The integrity, artistry and creativity of the project works are not outstanding. The relationship between the details and finishing of the final work is poor, and the artistic expression of the renderings is weak.

The scoring criteria below 60 points are not familiar with the theoretical knowledge of interior space design and lack of performance ability of scheme design. Lack of completeness, artistic and creative presentation of works. The relationship between the details and finishing of the final work is poorly handled, and the artistic expression of the renderings is insufficient.

5.4. Data analysis method

In this study, the descriptive statistics of mean, standard deviation and frequency are utilized to described the demographic information and other data obtained from the research instrument. For the hypotheses testing, the independent sample t-test analysis is employed to test the hypotheses one to the hypotheses three. The Jamovi software version 2.34 on MacIntosh are utilized for all of the data analysis of the study.

6. Conclusions

The immersive teaching discussed in this paper refers to the use of virtual reality technology to immerse people in a completely computer-generated space, or to integrate virtual and real Spaces to achieve more immersive teaching purposes. Experiments show that virtual reality can expand the learning motivation of students majoring in environmental design. It is valuable to use virtual reality as a teaching tool in environmental design-related courses, and students can perform more effectively in the environment of virtual reality technology.

The research shows that virtual reality technology has a positive impact on the educational outcomes of indoor space browsing course. It is found that there may be gender differences in the user experience of virtual reality technology, which needs further research to confirm.

Conflicts of Interest

The author declares that there is no conflict of interest regarding the publication of this article.

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